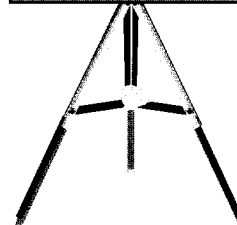
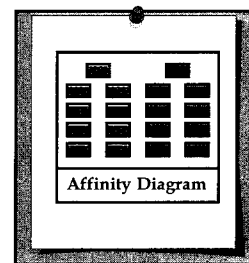
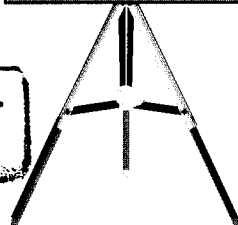
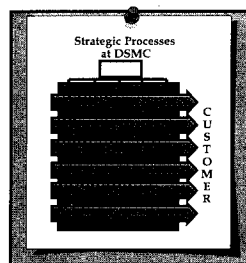
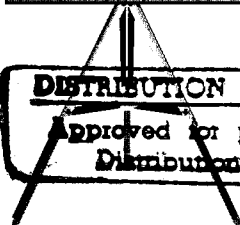
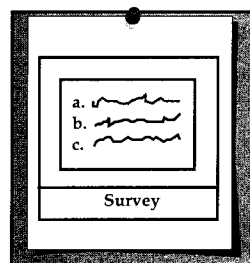
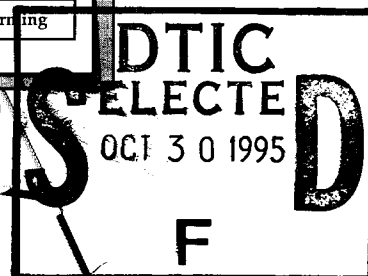
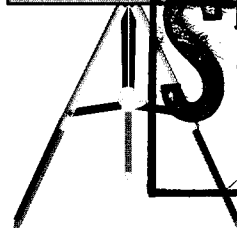
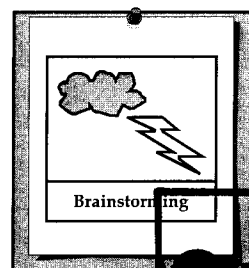
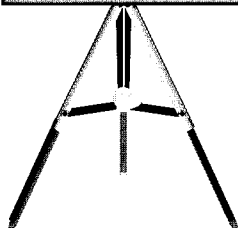
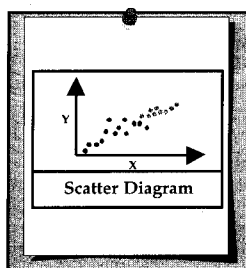
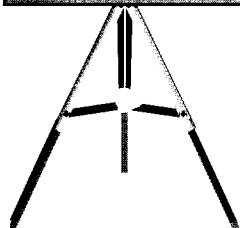
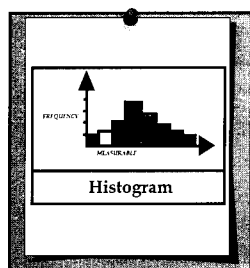


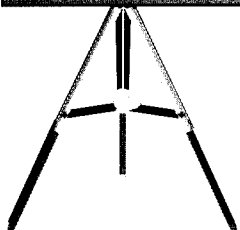


PROCESS IMPROVEMENT: THE DSMC APPROACH



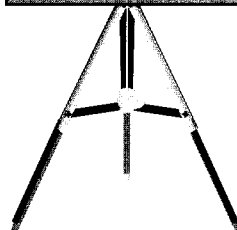
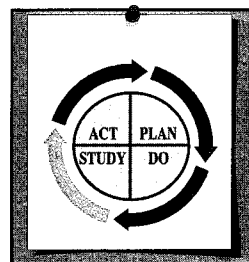
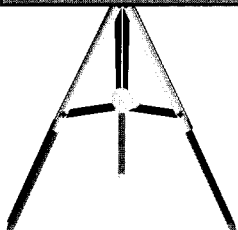
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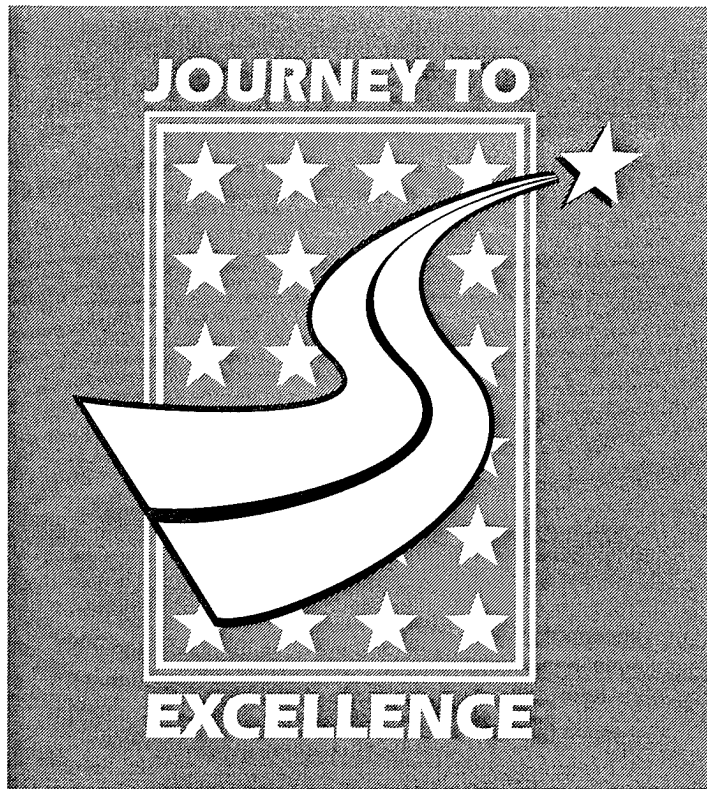
DEFENSE SYSTEMS MANAGEMENT COLLEGE
FORT BELVOIR, VIRGINIA

OCTOBER 1995

DTIC QUALITY INSPECTED 5

**"If you can keep your head when
all about you are losing theirs, it's
just possible you haven't grasped
the situation."**

**–Jean Kerr
Author**



**"To be the Academy of Distinction
Promoting Systems Management Excellence."**

Acknowledgments

The Process Improvement: The DSMC Approach is being updated to include information that is relevant to the DSMC Quality Journey. You will find most of the changes are in the Appendices.

A special note of appreciation is addressed to Alberta Ladymon, not only for her tireless efforts in proofing and editing but also for her many suggestions to make the guide more readable and therefore, more helpful. Additionally, Ms. Ladymon deserves credit for keeping the revision on schedule and for the many "friendly nudges" and schedule reminders.

Thanks also go to Margaret Brown for the typing; Greg Caruth for his suggestions and guidance; LtCol George Noyes for his suggestions; and Dr. Russ Linden for his work on Reengineering.

Mary-jo Hall
Special Assistant for Quality
Author/Editor

One of the difficulties in bringing about change in an organization is that you must do so through persons who have been most successful in that organization, no matter how faulty the system or organization is. To such persons, you see, it is the best of all possible organizations, because look who was selected by it and look who succeeded most within it. Yet these are the very people through whom we must bring about improvements.

—George Washington

Foreword

The institutionalization of quality philosophy and practice is the number one priority at the Defense Systems Management College (DSMC). This implies a management system that focuses on the needs and requirements of its customers; has a systems perspective; uses teams to make continual improvement on processes; gets everyone committed to excellence; and has the leadership to align systems, strategies, and people.

During a June 1993 off-site, DSMC leadership developed five critical success factors required for this type of management system to exist at DSMC. One of the imperatives was the development of a standard process for making continual, incremental improvements in all processes. This guidebook is the first step for this critical success factor.

This guide provides a framework for how we will build quality "into" our organization by managing and improving processes. Our goal is not to "do quality" for the sake of doing quality or to do it parallel to regular work. Our goal is to clearly define our job, understand how it fits into the overall DSMC system and then determine how to do that job in a quality way that meets all of the customers requirements.

The purpose of *Process Improvement: The DSMC Approach (PRIMA)* is to serve as a catalyst to move us from "thinking about" quality to actually doing it in our daily jobs. This handbook will assist DSMC in taking knowledge about quality management principles and turning it into "know-how" for daily operations.

Because all improvements affect the entire system we have also included the concept

behind our strategic focus. These concepts include both generic strategic planning and strategic process management. Additionally, there is information on measurement, reinvention, Baldrige Assessment, Hoshin Planning, and other aspects of information.

The ideas and concepts in this guide are not original. They have been borrowed from many sources and pulled together for our unique needs. Collectively, they represent the way DSMC is transforming into a quality system.

The following sources were used to develop this framework/guide:

Air Force Process Improvement Guide. U.S. Air Force (Electronic Systems Command).

Firing On All Cylinders, 1992. Jim Clemmer (part of Zenger-Miller Achieve).

The Quality Approach. U.S. Air Force, Fall 1993.

A Total Quality Leadership Process Improvement Model. Archster Houston and Steven Dockstader (Dept. of Navy TQL Office).

Quality Learning. David Langford.
Langford International, Inc.
P.O. Box 80133
Billings, MT 59108-0133
Phone (406)245-7773
Fax (406) 245-7779

Strategic Process Management and Service Quality System. Zenger-Miller
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(703)683-2259

*Seamless Government: A Practical Guide to
Reengineering in the Public Section.*

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Contents

Acknowledgements	v
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Foreword	vii
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Part I: The DSMC System

Background	1
DSMC Quality Journey - A Summary	1
DSMC's Strategic Direction	3
Definition of Quality	4
The Three Rings of Perceived Value	4

Part II: Our Strategic Focus

Strategic Quality Planning	7
Strategic Process Management	10

Part III: Continual Improvement

The Shewhart Chart	13
Continual Improvement Process	13

Part IV. Tools and Techniques of Quality Management

A. Basic Tools	19
B. Quality Learning Techniques	26
C. Management and Planning Tools	35
D. Management Deliberation Center	39
E. Benchmarking	40
F. Quality Improvement Story	44

Part V. Glossary of Terms

Glossary	47
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Part VI. Appendices

A. Guided Self-Directed Learning	82
B. What to Measure and How	87
C. Qual Sheets	94
D. Reengineering Overview	101
E. Articles on Hoshin Planning and Quality Function Deployment	129
F. National Performance Review	148

Government Performance and Results Act	150
Baldrige Criteria for Transformation	154
G. Questions	158
Transformation - A Journey Not a Destination	162
Sample Charter for Team	163
A Generic Model for Measuring Value-Added	166

Part I: The DSMC System

Background

The Defense Systems Management College (DSMC) was established in 1971 under the guidance of the Honorable David S. Packard, then Deputy Secretary of Defense, for the specific purpose of making a substantial improvement in the capability and effectiveness of managers for the important development and production programs of the Department of Defense (DoD).

In the 24 years of its operation, DSMC has changed strategies to meet the challenges faced by the DoD. These challenges reflect environmental issues such as the declining defense budget, different national strategy objectives, a reduced workforce, the lack of a pervasive threat, and a downsizing industrial base. Concurrently, Congress and DoD are expanding acquisition education to include more individuals and career fields.

The flagship course at DSMC is the 14-week Advanced Program Management Course (APMC). There are also 30 different short courses offered at numerous times and at all five campuses (Fort Belvoir, Boston, Huntsville, St. Louis, and Los Angeles). The expected student throughput for FY96 is approximately 9,000.

Through all of these changes, DSMC has adhered to its mission of promoting and supporting the adoption and practice of sound systems management principles by the acquisition workforce through education and training, research, consulting, and information dissemination.

Presently DSMC has numerous challenges which require that we evaluate all of our

work processes in order to be the academy of distinction promoting systems management excellence.

Besides the external environmental challenges, DSMC has many internal challenges forcing us to reinvent our processes and practices. The most pressing challenge at DSMC, like DoD, is downsizing. The repercussions associated with downsizing include a changing budget, a changing customer base, etc. Other challenges include the impact of the Defense Acquisition Workforce Improvement Act (DAWIA) and the subsequent association with the Defense Acquisition University (DAU).

DSMC Quality Journey - A Summary

During the past two years DSMC renewed its effort to transform itself to be more driven by the requirements of its customers, and to align all people, systems, and strategies through a series of initiatives aimed at developing a strategic direction. This summary outlines the major initiatives.

In 1993, DSMC developed a strategic approach to organizational change by using the vision, mission, values, processes, objectives, and performance measures as the strategic direction. The blueprint for this started with an improvement plan and included building an infrastructure to support the plan. The infrastructure included having a Leadership Team (LT) to focus on improvements and division coordinators to assist the deans with these improvements. As part of this effort the LT used the Strategic Process Management (SPM) model to identify

six processes which define our business. It was determined that resources could be allocated to work on two strategic processes, resulting in the April 1994 launch of two SPM teams - "Resourcing and Budgeting" and "Positioning".

In order to assist SPM teams develop skills necessary to solve problems, monitor processes using data, and operate as effective teams, DSMC certified eight facilitators for just-in-time skills training. This group was called the Quest Team. During 1994, Quest facilitators ran 27 sessions of the 4-hour module, "Quality through the Eyes of the Customer". On a request basis they also facilitated other training modules for various teams and departments.

Having a common approach for process improvement is also essential for organizations working to improve quality processes and systems. DSMC is no different. Everyone at DSMC has the opportunity to participate in the 3-1/2 day Quality Learning Seminar facilitated by David Langford. This seminar presents concepts on improving the learning process through the use of quality tools to improve processes. One tool that everyone uses to understand personal learning requirements in this training is the competency or capacity matrix. Process improvements are communicated throughout DSMC by the use of quality improvement storyboards.

During January, May, and September of each year David Langford also facilitates Learning Forums. The purpose of these forums is to discuss on-going improvements and exchange ideas for continuing the improvement process. These forums are open to all DSMC members as a way to share their improvement methods and further develop their tools and techniques.

Capturing the DSMC continual improvement method in the handbook, *Process Improvement: The DSMC Approach*, helps bring the tools and techniques together in a handy reference book. The handbook also includes sections on our strategic direction and is updated annually as process improvement continues.

To increase communication within the College, the Commandant uses several formats: small group Roundtable discussions, where issues are openly discussed; Fireside Chats that encourage questions from the audience and responses from the leadership, via the internal closed circuit system; Commandant's Call that highlights current issues, focuses on team recognition, introduces new members, and provides for a question and answer period; electronic bulletin boards for both Quality and team charters; quarterly reviews addressing mission area action plans; and publication of Qual Sheets documenting various aspects of the Quality Journey.

In late 1994, the Commandant issued the 1995 Strategic Guidance which contained his six goals for DSMC during 1995. All mission area action items identified in the 1995 Corporate Plan relate to one of these goals. These goals and action items will be reviewed annually to support recent improvements and updated mission requirements.

Documenting and celebrating our successes along the Quality Journey serve as motivators. One recent publication was the annual report, *1994: DSMC in Review: A Quality Journey*.

To assess our approach, deployment, and results in making improvements to our processes DSMC participated in the pilot of the

DSMC'S Strategic Direction

VISION

We want to be the academy of distinction promoting systems management excellence.

MISSION

We promote and support the adoption and practice of sound systems management principles by the acquisition workforce through education and training, research, consulting, and information dissemination.

STRATEGIC GOALS

We must enhance our ability to exceed customer needs.

We must stay focused on support Level II, III and Continuing Education products.

We must increase partnerships with the DAU and consortium schools.

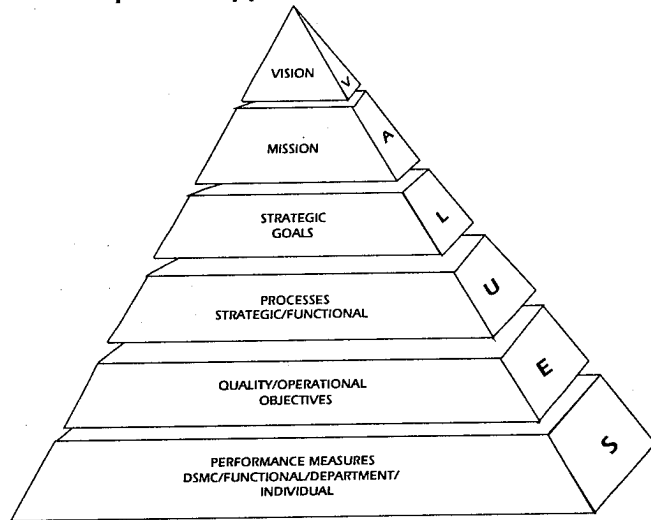
We must increase our assistance to senior DoD leadership in acquisition reform efforts.

We must align all education with appropriate learning theories, processes and technologies of adult learning.

We must expand our non-DoD customer base.

DSMC's Strategic Direction -

A Topdown Approach Starting with the Vision



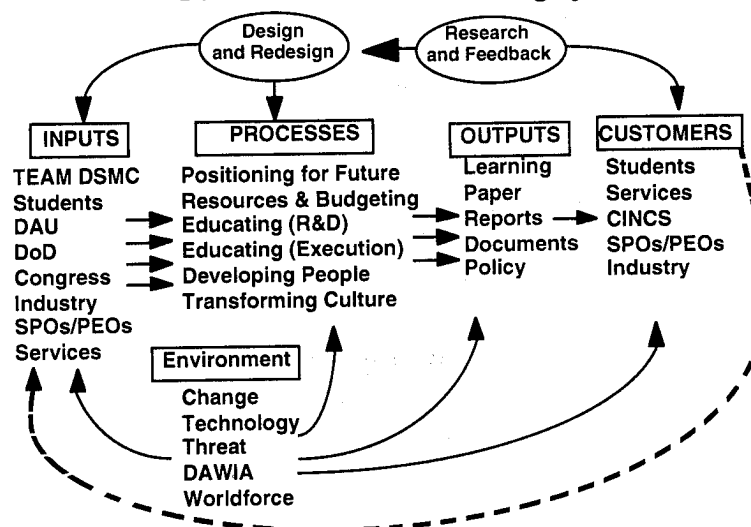
STATEMENT OF PRINCIPLES AND VALUES

The College fosters an environment that enables us to be productive and innovative without fear. To this end, these are our guiding principles. We support, respect and trust each other. We are all responsible for customer satisfaction. We take pride in our work and pursue excellence in what we do.

OUR SIX CROSS-FUNCTIONAL STRATEGIC PROCESSES

- Positioning DSMC for the Future
- Resourcing and Budgeting
- Educating (Research and Development)
- Educating (Execution)
- Developing People
- Transforming the Culture

DSMC Version of the Deming System Chart



Education Criteria under the Baldrige National Quality Awards during the spring of 1995. We also participated in 1995 The President's Quality Award Program through the Federal Quality Institute.

Our emphasis during the last two years has been building and communicating our strategic direction. We have started customer visits and made some organizational changes based on the feedback from DSMC '95.

Definition of Quality

The DSMC believes that quality is more than the delivered product. Quality must be defined through the customer's perception of value. This includes not only the basic products, i.e., education and training, research, consulting, and information dissemination, but the systems which enable us to produce those products and services such as registration, audio-visual, reprographics, library services, etc.

At DSMC we believe a customer judges DSMC by the "total experience" of doing business with us. Every encounter between a customer and a supplier is a "moment of truth" when the customer judges the quality provided by DSMC. It is our goal to provide our customers with services which will enable them to meet cost, schedule, and performance objectives for their unique system or project.

The Three Rings of Perceived Value

Quality - What is it? Dr. W. Edwards Deming says quality can only be defined by the customer. *Quality is a relative term that will change in meaning depending on the customer's needs.* He further states:

"Improvement of the process increases uniformity of output of product, reduces rework and mistakes, reduces waste of manpower, machine-time, and materials, and thus increases output with less effort."

Dr. Juran says that it is *fitness* for use.

A definition used at DSMC is "consistent conformance to customer requirements." All of these definitions suggest that there are *many* meanings to the word "quality" and the meaning is based on the perception of the customer. In order to achieve quality, a clear understanding of what quality means is needed. Additionally, people need to understand how to deliver it and how to measure it.

According to Jim Clemmer, research indicates that quality is dependent not only on the customers' perceptions but also on their expectations. In his book, *Firing On All Cylinders*, he quotes John Sharpe, Executive Vice President of Operations for Four Seasons International Hotel:

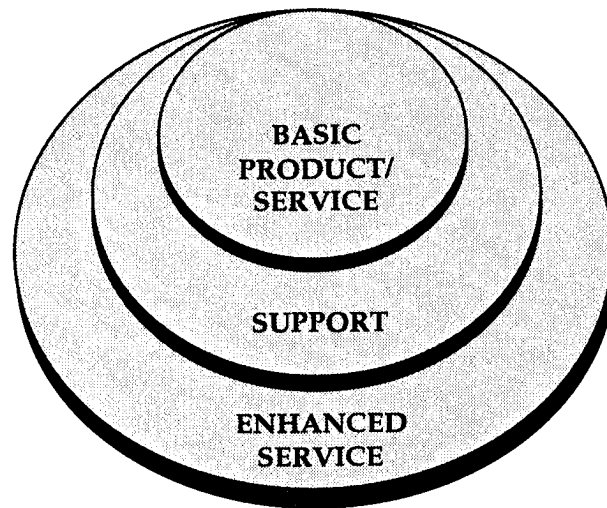
"Customers don't buy a product; they buy what the product does for them. Quality in product or service is not what we think it is. It's what our customers perceive it is — and what they need and want. If we don't give customers what they expect, they'll perceive our service as poor. If we give them what they expect, they'll perceive it as good. If we give them more than they expect, they perceive it as excellent."

According to Clemmer, another contributor to understanding the concept of customer-perceived value is Ted Levitt, Harvard Business School's "guru of marketing." In *Thinking About Management*, he states:

"A product (service) is not just its defined or descriptive core, but everything that is done

DEFINITION OF QUALITY

The Three Rings of Perceived Value



Inner Ring – Basic product or service.

Second Ring – Support services or activities to make the product or service more reliable, accessible, usable, enjoyable, convenient, dependable, accurate or useful.

Third Ring – Enhanced service to delight customers or add a “wow index” to the product/service.

(From Zenger-Miller Achieve)

with respect to it, including how it is packaged, sold, distributed, delivered, promoted, installed, repaired, field-supported, and upgraded, how users are trained in its use, and much more” (1991, p. 134).

Based on these concepts and extensive work in organizations, Achieve International (now Zenger-Miller) developed “The Three Rings of Perceived Value” as a framework to help understand and define quality. DSMC is using this concept.

At DSMC the inner ring is defined at both the macro and micro levels. At the macro level the basic products are education and training, consulting, research, and information dissemination. At the micro level it is

the basic service or product offered by anyone. For some, that inner ring is instruction; for some it is designing a viewgraph; for some it is editing an article for the *Program Manager*; and for others it is photocopying materials. The size of the ring depends on the level of quality the customers believe they are getting. The customer appeal of that product or service depends on the extent to which it meets minimum requirements. It is the most important of the three rings.

The second ring goes beyond the core products or services and includes a huge array of activities and systems which allow the basic product/service to be delivered. At DSMC,

the second ring includes the library, reprographics, the Press, etc. At the micro level this includes all systems that support the inner ring, for example, registration, audio-visual, etc. The quality of the second ring is dependent on the management systems,

processes, practices, and structures in place. The third ring deals with people and emphasizes customer delight. The human touch is key in the third ring — those intangible signs of personal care and commitment to being customer-driven.

Defining the Three Rings of Perceived Value

	First Ring	Second Ring	Third Ring
Focus	Core products and services	Administration and field support	Moments of truth
Objectives	Requirements	Satisfaction	Delight
Customer concern	Does it do the job?	Are all my needs satisfied?	Are they delightful to do business with?
Key elements	Technical expertise (high tech)	Systems, process, practices, and structure (high tech)	People (high touch)
Control	Management and professionals	Management and professionals	Frontline performers
Costs	Large and visible	Huge and hidden	Small and seemingly insignificant

Taken from Firing On All Cylinders by Jim Clemmer, 1992, Achieve International (with permission).

Part II: Our Strategic Focus

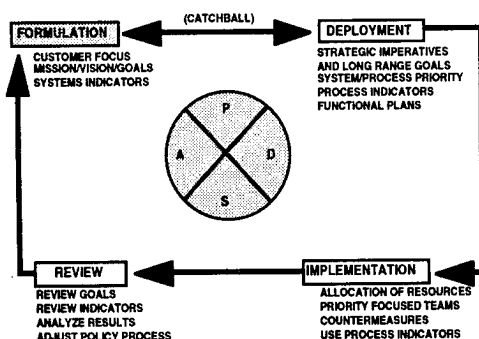
Having a strategic focus includes the Strategic Quality Planning Process of formulating the organization's direction, deploying guidance to achieve that direction, implementing plans and improving processes, and reviewing the plan to look for possible improvements. This process is based on the Shewhart cycle.

A strategic focus also includes using the formalized Strategic Process Management approach to both focusing resources and improvement on strategic issues *and* building an organizational infrastructure to facilitate continual improvement of processes.

A. STRATEGIC QUALITY PLANNING

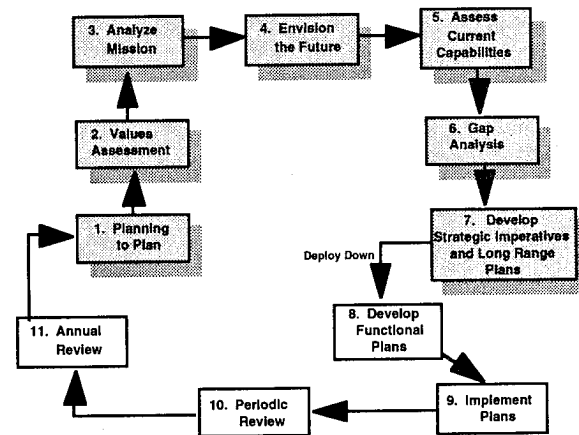
The strategic approach used by DSMC is adapted from the model espoused by the U.S. Air Force in *The Quality Approach*. The Strategic Quality Planning Process is represented as an eleven-step model that overlaps the four phases of the Shewhart cycle: Plan-Do-Study-Act (PDSA). This model is not to be confused with the 7-step Continuous Improvement Process discussed in Part III. It is a basic framework for our strategic planning.

Strategic Quality for DSMC



Strategic Quality Planning Process

Strategic Quality Planning Process



Formulation Stage

The leadership team develops or refines the mission of the organization. They envision an organization meeting the needs and expectations of customers (internal and external), thereby fulfilling its mission. In doing this, customers' needs and interests can't be just *thought* about — customers must be listened to. Strong communication skills are critical. The customers' needs are always changing, and accurate information from customers can help tailor supplier performance to fit the customers' needs. Based on this visioning process, customer-driven goals for the organization are set. The major systems that impact customer satisfaction are identified. The customers and suppliers together agree upon indicators or critical factors to determine the health of those systems; these indicators are monitored with performance measures and the metrics are used to continually improve the process.

Step 1: Planning to Plan

The leadership team decides if it's ready to begin the strategic quality planning process. Factors relating to readiness include; the level of commitment, willingness to devote the required time, and the level of trust and teamwork existing within the organization and the senior team.

Step 2: Values Assessment

Organizational values mark the boundaries of any planning process and serve as a baseline for decision making. It's critical that the senior team clearly defines — and everyone clearly understands — the organization's core values. It is even more important that everyone behaves the values. The values of an organization permeate every aspect.

Step 3: Analyze Mission

Mission statements reflect the organizational purpose, aim, key customers, requirements, and processes. The mission statement needs to be carefully analyzed, clearly defined, and understood by all. This is done by conducting an ongoing environmental scan to gather information that impacts the mission; defining customers, suppliers, and their requirements; defining key results areas; and defining strategic processes.

Step 4: Envision the Future

Without vision of the future, we can only plan for sustainment. Our image of what we want DSMC to be will provide the focus for all subsequent actions and determine our long-range quality goals. If we can't imagine how DSMC would be as the epitome of excellence, it is difficult to get beyond today.

Step 5: Assess Current Capabilities

Each key process is evaluated by its capability to meet customer requirements. If a metric system doesn't exist to measure key processes which validate the ability to meet customers' needs, one needs to be developed.

Step 6: Gap Analysis

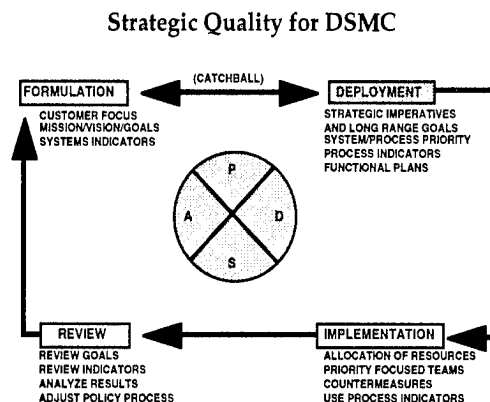
In this step, the leadership team compares the current capabilities of each strategic process to the ideal or desired state. Performance gaps serve as the basis of near-term and long-term goal setting.

Step 7: Develop Strategic Imperatives and Long-Range Goals

Long-range goals and strategic imperatives guide the quality initiatives and movement. The goals and imperatives form the basis for the action plan. The action items are prioritize and distributed to DSMC members. The feedback obtained helps us determine if our goals and objectives are feasible, and allow us to gain support and commitment from unit personnel.

Deployment Stage

The information developed in the formulation stage cascades through the organiza-



tion by a negotiation technique known as "catchball." As each level of the organization reaches agreement, they develop objectives for the improvement of processes which support those overall goals. They develop process indicators to ensure that the quality delivered by those processes consistently meets customer requirements.

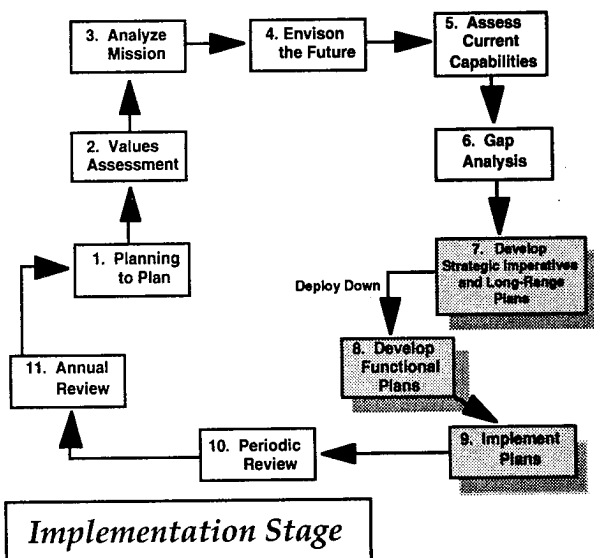
Step 7: Develop Strategic Imperatives and Long-Range Goals

This step falls in both formulation and deployment because the catchball activities ensure vertical alignment in the development and deployment of long-range goals and strategic imperatives.

Step 8: Develop Functional Plans

At this point, leadership passes their work to the division directors and strategic teams to develop the "implementation" plans necessary to achieve the organization's strategic imperatives and long-range goals.

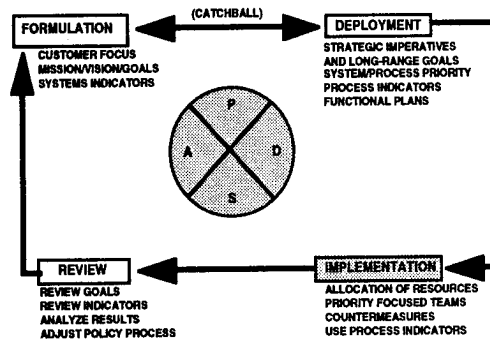
Strategic Quality Planning Process



Natural work groups practicing Quality monitor and incrementally improve the

organization's processes. In addition, strategic-focused teams are chartered to look for improvements and break throughs in areas that are critical to organizational success. These teams are explained in the Strategic Process Management section (page 12).

Strategic Quality for DSMC



Step 9: Implement Plans

Functional plans are implemented by process or project teams, individuals, or natural work groups to close gaps in current capabilities and to move the organization closer to its future vision.

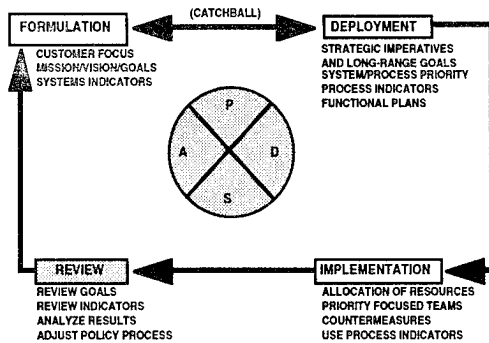
Review Stage

The planning team looks at how well the organization met the original plan. System indicators are analyzed to see if the organization is meeting customer requirements. Exceeding the plan or not meeting the plan are both areas to investigate for continuous improvement.

Step 10: Periodic Review

The functional plans should be reviewed periodically, using metric data, to assess progress. The review is usually conducted on a quarterly basis.

Strategic Quality for DSMC



Step 11: Annual Review

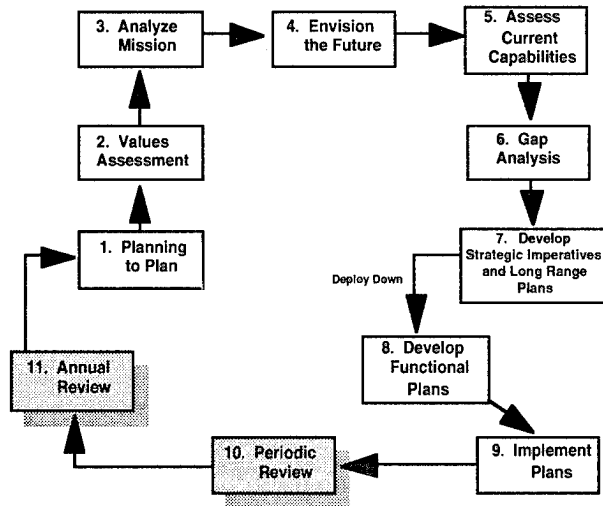
The leadership team will conduct an annual review of the goals, objectives, and functional plans using system metric data and results of the periodic reviews. The results of the year are reviewed and these results act as input into the next planning cycle.

An additional component of strategic quality planning is targeting break throughs in critical areas. We look for improvement — to unprecedented levels of performance — in service and products, or equally unprecedented reductions in waste and rework. This does not replace incremental improvement, but goes above and beyond it. The DSMC '95 restructuring project is an example of a break through strategy or reengineering a process.

B. STRATEGIC PROCESS MANAGEMENT

In order to link the improvement process to the vision and to build an infrastructure that understands, practices, and supports continual improvement, DSMC has adopted the concept of Strategic Process Management (SPM) from the Zenger-Miller approach to quality management.

Strategic Quality Planning Process



According to Zenger-Miller, SPM is a high impact implementation and skills-building process that helps improve our operations and do a better job of responding to customer needs and expectations. It focuses on:

- Reducing cycle times
- Increasing customer satisfaction
- Reducing rework and costs

A *process* is one or more definable, repeatable, and predictable activities which starts with an input, adds value to it, and produces an output — either a product or a service — for an internal or external customer.

A *strategic process* is one of the large-scale processes which define an organization. Taken together, these processes define what an organization does. They are almost always cross-functional. That is, they involve more than one function or department.

A SPM is grounded in the following observations:

- organizations are structured vertically, but most work takes place horizontally;

- all work processes consist of definable, repeatable, and predictable activities;
- if a process can't be measured, it can't be managed effectively; and
- effective work processes depend on involved, empowered employees.

The SPM is a way of thinking about all the work in the organization as a series of related processes and then organizing improvement efforts around them. This includes an organization's efforts to document, monitor, standardize, and improve these strategic processes. The outcome of SPM is processes which:

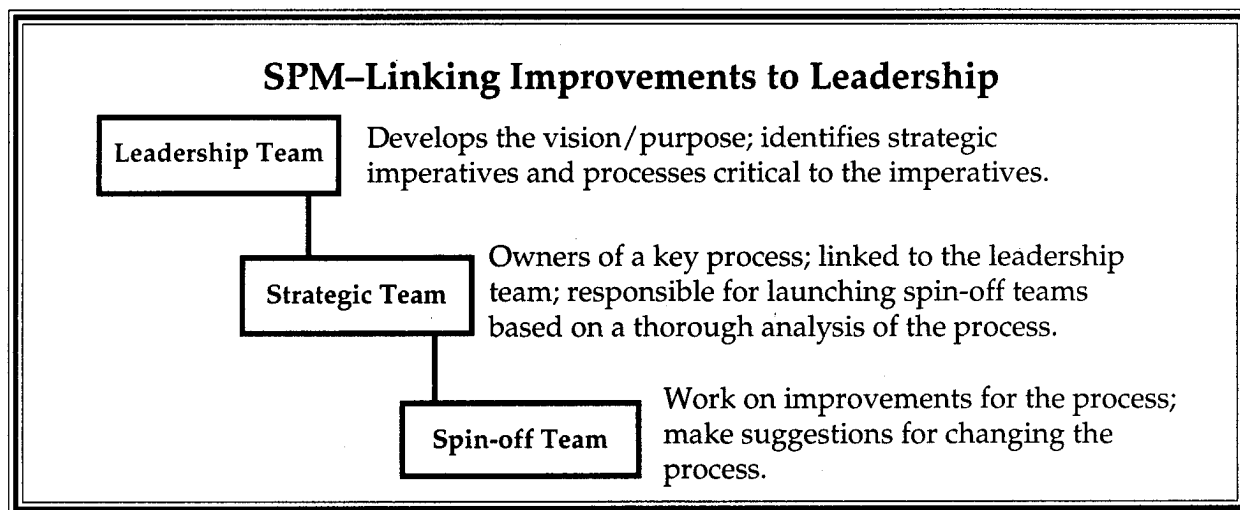
- are free of errors and unnecessary delays;
- are more efficient and free of needless complexity;
- are more responsive to customers needs now and as these needs change;
- make the best possible use of organizational resources; and

- help the organization be more competitive.

The SPM is a disciplined approach to continual improvement. It includes the following major elements that moves an organization from vertical stovepipes to horizontal management of processes related to customer requirements:

- an emphasis on identifying, describing, measuring, improving, and managing work processes;
- a structure of designated teams responsible for improving the performance of these work processes; the teams are enabled through the linkage to the leadership, alignment to the vision and empowered through training; and
- reliance on hard data.

The DSMC SPM approach is detailed in Appendix C.



Taken from the Zenger-Miller approach.

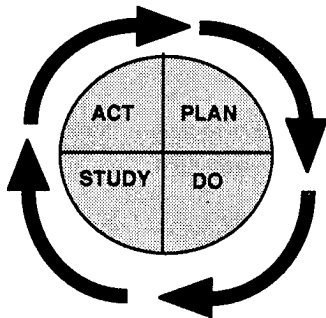
Part III: Continual Improvement

(This section is adapted from *The Quality Approach*, U.S. Air Force, Fall 1993.)

The institutionalization of the quality management philosophy at DSMC is based on process improvements in order to satisfy customers. To do that, we must learn to apply quality tools and techniques systematically and use a *process-focused* approach to achieve continual, measurable improvement in the workplace.

The Shewhart Cycle

The Shewhart Cycle, also referred to as the Ishikawa Circle or Deming Wheel, is a systematic approach to achieving continual improvement in quality. Because the approach involves repetition, it's graphically represented as a circle. The circle has four quadrants: PDSA.



Plan. Study the process flow and any existing data. Formulate possible improvements, hypotheses, experiments, or decide on methods you can use to gather data. When working with a new process, be willing to concede additional time to this quadrant.

Do. Implement the improvement effort planned. Use a small-scale test to implement; working from too large a base of change can make it difficult to assess the effects of the change. Train the people re-

sponsible for the implementation; they need to know what the goal of this change is and how they impact the implementation processes. They need to know how to work in teams and tools for collecting data.

Study. Measure the results of the improvement effort. Analyze the data collected. Study the results to see if the process was improved. This quadrant provides the opportunity to see if we measured the right things, and can also give us helpful clues about variables.

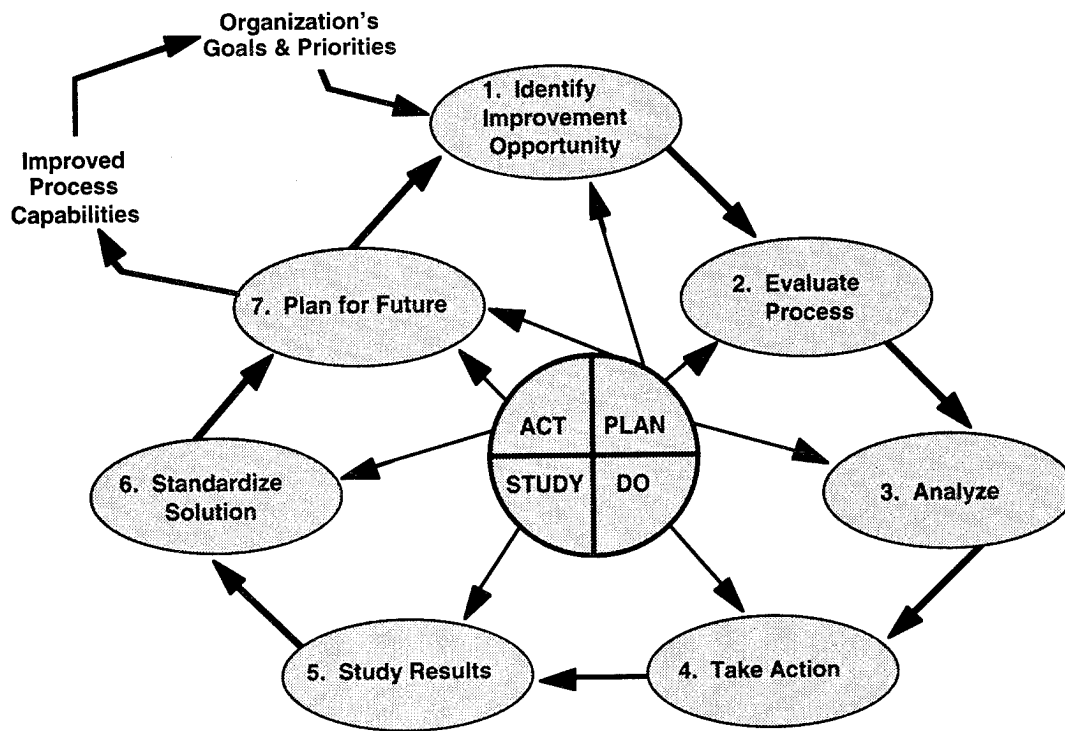
Act. If the result was a clear improvement, there's a good chance the team will agree to make the change permanent. If so, standardize and document all actions. If the results weren't successful, focus on what needs to be done to improve. Re-enter the "plan" quadrant and start over again with the newly acquired knowledge.

Continual Improvement Process

The Continual Improvement Process (CIP) is a systematic and systemic approach to plan, sequence, and implement improvement efforts using data. This process collects data and stratifies it into manageable elements. Additionally, the CIP provides a common language and methodology. This common language enables anyone involved to understand the improvement effort.

The seven steps of the CIP are based upon the Shewhart cycle. Completion of all seven steps constitutes one PDSA cycle of the process improvement model.

Continual Improvement Process



How Does CIP Work?

PLAN: Step 1 – Identify Improvement Opportunity by Defining the System	Checkpoints
Objective: To select the appropriate process for improvement by defining the system. • Must address why the process was selected and how the improvement effort supports the organization's plans, goals, and objectives. • Research for improvement opportunities – Review metrics/indicators – Survey internal/external customers – Standard procedures – Interview personnel • Systems Analysis • Run Chart • Flowchart • Project Schedule • Control Chart • Brainstorming • Multivote	1. Identifying the organization's key process. 2. Reasons for selecting a key process needing improvement and a clear understanding how it relates to organization plans. 3. Identify customer defined critical success factors. 4. Develop a macro process flowchart. 5. Prioritize candidate processes. 6. Identify process for improvement. 7. Using system analysis, identify process owner, customer, suppliers, stakeholders, the environment, and the operational boundaries identified through systems analysis. 8. Identify customer requirements. 9. Establish indicator to measure performance. 10. Develop schedule for completing the CIP and leadership reviews.

1. Identify Improvement Opportunity by Defining the System

Establish a logical framework for the improvement process by clearly defining the process. Develop indicators, such as graphs or control charts, to help visualize the need for improvement. Remember to narrow the focus to a specific process — don't aim for

large-scale success before first testing collective skills and abilities on a more manageable scale.

2. Evaluate the Process

Select an opportunity and set a target for improvement. This step will allow the team to focus in close detail, collect and interpret data relating to the process, and identify a

PLAN: Step 2 — Evaluate the Process	Checkpoints
Objective: To select a challenge problem and set a target for improvement by studying the current situation • Collect data in respect to improvement • Systems Progress Chart • Checksheet • Pareto Chart • Benchmarking • Run Chart • Control Chart • Problem Statement Matrix • Histogram • Lotus Chart • Flow Chart	11. Develop “as-is” flow chart to task level. 12. Measurements of process relevant to identifying customers and collecting data. 13. Specify a level of problem stratification for analysis. 14. Select the most significant portion of the problem. 15. Validate customer requirements against process capabilities. 16. Address the gap between desired and actual states in the problem statement. 17. Establish target for improvement using data.

PLAN: Step 3 — Analyze the Causes	Checkpoints
Objective: To identify and verify the root cause(s) of the problem • Cause and Effect Diagram • Scatter Diagram • Histogram • Pareto Chart	18. Perform cause and effect analysis on the problem. 19. Analyze potential problems for actionable root causes. 20. Select the root cause with the greatest probable impact. 21. Verify root causes using data.

specific issue to tackle. Remember, we’re using the word problem to describe any discrepancy between the *current* and *desired* state of a process.

3. Analyze the Causes

To uncover the root cause, explore the data by using analytical tools. Cause and effect diagrams, scatter diagrams, pareto charts,

graphs, and other analytical tools, arranged logically, can lead to the selection of one or more root causes.

4. Develop a Theory and Take Action

The team can propose improvements by using an Action Plan Matrix which identifies specific methods to use in attracting root causes. Evaluate the methods on the basis of

DO: Step 4 – Develop a Theory and Take Action	Checkpoints
Objective: To plan and implement actions that correct root causes • Force Field Analysis • Action Plan Chart • Cost-Benefit Chart	22. Possible actions developed and evaluated. 23. Actions were cost beneficial. 24. Action Plan developed (addresses: what, who, how, when, resources needed). 25. Actions tested (if possible) prior to full-scale implementation. 26. Cooperation and approval obtained. 27. Action plan implemented.

STUDY: Step 5 – Study Results	Checkpoints
Objective: To confirm the actions taken achieved the target • Run Chart • Histogram • Checksheet • Control Chart • Pareto Chart	28. Use same indicator from the process identification. 29. Results of actions meet or exceed target. 30. Reasons for meeting or not meeting target. 31. Additional actions to take if target is not met.

effectiveness, feasibility, and cost benefits derived. Develop a plan to implement those improvements.

or wasn't met. If the original actions weren't effective, we may have to implement additional action.

5. Study Results

Now we'll learn if the action taken allowed us to achieve our desired objective. In this confirmation step, it's important to understand *why* the target for improvement was

6. Standardize the Solutions

To make improvements part of the daily operations, integrate the team's improvement efforts into the organization. Once established in the day-to-day working op-

erations try to extend this improvement to other areas.

7. Plan for Next Improvement

The improvement process allows the team the opportunity to review the work accomplished, address remaining issues, and

evaluate the team's effectiveness. Additionally, the team can review lessons learned and start the cycle again based on the next priority improvement.

ACT: Step 6 – Standardize the Solutions	Checkpoints
Objective: To ensure the improved level of performance is maintained • Control Chart • Control System • Run Chart • Standardize Procedures • Flowchart	32. Publish method revisions and procedures. 33. Provide training on new process. 34. Establish periodic process review points. 35. Consider areas for replication.

ACT: Step 7 – Plan for Next Improvement	Checkpoints
Objective: To plan what is to be done with any remaining problems and evaluate teams effectiveness • Action Plan • Flowchart • Control System • Brainstorming	36. Analyze and evaluate remaining issues. 37. Plan future actions (if necessary). 38. Team evaluation of their problem-solving skills and effectiveness.

Part IV: Tools and Techniques of Quality Management

This section is divided into the following:

- A. Basic Tools
- B. *Quality Learning* Techniques
- C. Management and Planning Tools
- D. Management Deliberation Center
- E. Benchmarking
- F. Quality Improvement Story

How to do it:

The goal of brainstorming is to *generate* ideas. Before you start, make sure everyone in your group understands the importance of *postponing* judgments until after the brainstorming session is completed.

- Write the problem or topic on a chalk board or flip chart where all participants can see it.
- Write *all* ideas on the board and do as little editing as possible.
- Number each idea for future reference.
- Use one of the following brainstorming techniques: structured brainstorming, free-form brainstorming, or silent brainstorming.

A. Basic Tools

(Taken from *The Quality Approach* U.S. Air Force, Fall 1993 and *Air Force Process Improvement Guide*.) This section is designed to give a "bare bones" look at some of the tools referenced in the 7-step CIP model. Consider these tools as a starting point for the quality basics.

Brainstorming

A group activity designed to generate spontaneous ideas without risk. Offers a lot of information in a short time, stimulating creative thought and teamwork.

Brainstorming is a group technique for generating a "shopping list" of ideas about a specific problem or topic. It can help you:

- Generate a variety of ideas in a short time.
- Produce new, creative ideas.

Brainstorming is used solely for generating ideas; it does not involve analysis.

In Structured Brainstorming:

- Solicit *one* idea from each person in sequence.
- Participants who don't have an idea at the moment may say "pass."
- A complete round of passes ends the brainstorming session.
- The *advantage* of structured brainstorming is that each person has an equal chance to participate, regardless of rank or personality.

- The *disadvantage* of structured brainstorming is that it lacks spontaneity and can be somewhat rigid.

In free-form (or understanding) brainstorming:

- Participants simply contribute ideas as they come to mind.
- The *advantage* of free-form brainstorming is that participants can build on each other's ideas. The atmosphere is very relaxed.
- The *disadvantage* of free-form brainstorming is that the less assertive lower ranking participants may not contribute.

An ideal approach is to combine these two methods. Begin the session with a few rounds of structured brainstorming and finish up with a period of unstructured brainstorming.

In silent brainstorming:

- Have participants write ideas individually on sticky-back notes or small slips of paper.
- Collect the papers and post them for all to see.
- The *advantage* of silent brainstorming is that it prevents individuals from making disruptive "analysis" comments during the brainstorming session.
- The *disadvantage* of silent brainstorming is that the group loses the synergy that comes from an open session.

Silent brainstorming is best used in combination with other brainstorming techniques.

The result of a brainstorming session is a list of ideas. If this list is too long, the group can boil it down using one of the decision making tools described in Section 3, page 5.



Used for generating ideas, brainstorming can help:

- identify ideas for improvement opportunities (CIP Step 1);
- identify causes used to build a cause and effect diagram;
- identify steps of a process to be used in constructing a flowchart.

Points to remember:

Never judge ideas as they are generated. The goal of brainstorming is to generate a lot of ideas in a short time. Analysis of these ideas is a separate process, to be done later.

Don't quit at the first lull. All brainstorming sessions reach lulls, which are uncomfortable for the participants. Research indicates that most of the best ideas occur during the last part of a session. Try to encourage the group to push through at least two or three lulls.

Try to write down all of the ideas exactly as they were presented. When you condense an idea to one or two words for ease of recording, you are doing analysis. Analysis should be done later.

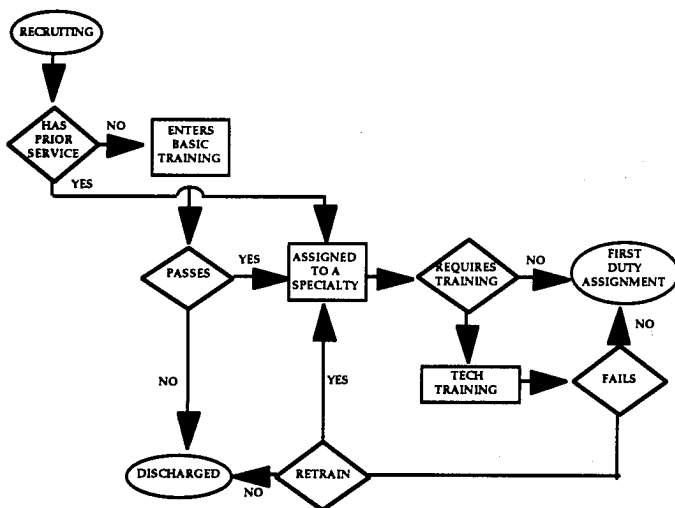
Encourage outrageous ideas. While these ideas may not be practical, they may start a flow of creative ideas that can be used. This can help you break through a lull.

Try to have a diverse group. Involve process owners, customers, and suppliers to obtain a diverse set of ideas from several perspectives.

Flowcharting

A flowchart is a graphic representation of the steps of a process. Flowcharts help us understand the process by mapping out the steps in as much or as little detail as needed.

Enlisted Accessions and Training



Used for analyzing a process, a flowchart can help:

- understand the existing process (CIP Step 1);
- locate improvement areas in a process (CIP Step 2);

- document changes to a process (CIP Step 6);
- show relationships between different steps in a process; and
- identify critical stages of a process.

These are standard flowchart symbols. When you are developing a flowchart, especially in a group environment, the goal is to chart the process. Don't waste time debating which shape a symbol should be. A flowchart that doesn't use these symbols can be just as useful as a chart that does use them.

Standard Flowchart Symbols

This Symbol...	Represents...	Some examples are:
	Start/Stop	Receive trouble report Machine operable
	Decision Point	Approve/Disapprove Accept/Reject Yes/No Pass/Fail
	Activity	Drop off travel voucher Open access panel
	Document	Fill out trouble report
	Connector (to another page or part of the diagram)	

Checksheet

A checksheet is useful in tracking how many times a particular event happens. This tool helps us learn the frequency of occurrence.

EVENT	TALLY	TOTAL
A		5
B		2
C		8
D		7
E		15
F		3

Used for collecting data, a checksheet can help:

- obtain data to evaluate a process (CIP Step 2);
- obtain data to check the results of improvement efforts (CIP Step 5);
- convert raw data into useful forms such as Pareto chart or histogram.

Pareto Chart

A bar chart which arranges contributing factors to a problem in order with respect to their degree of contribution to the problem.

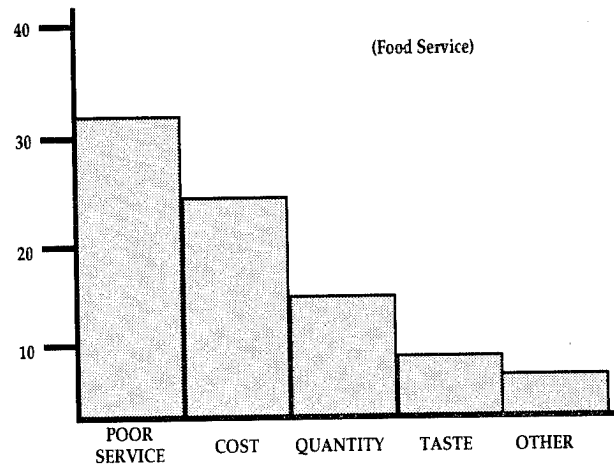
Used for analyzing problems, a Pareto chart can help:

- select improvement opportunities (CIP Step 2);

- identify root causes with greatest impact from a cause and effect diagram (CIP Step 3);

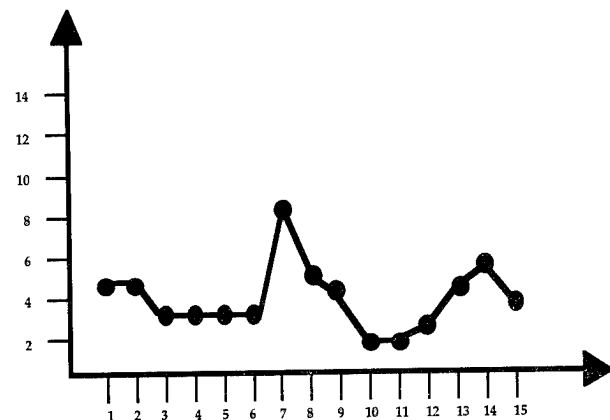
- check results of improvement efforts by comparing Pareto charts before and after action is taken (CIP Step 5).

Customer Complaints



Run Chart

Shows trends that occur in a process over time. It is important to note that this tool preserves the time order of occurrences.



Used for analyzing data, a run chart can help:

- evaluate the stability of a process (CIP Step 1);
- recognize patterns in a process (CIP Step 1); and
- document changes over time (CIP Step 5).

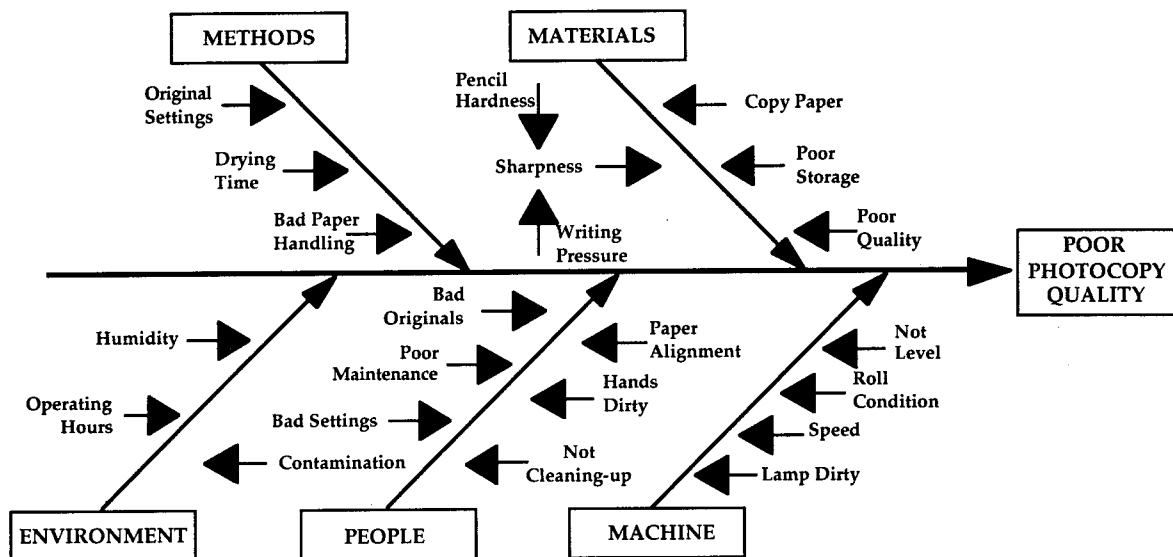
Cause and Effect Diagram

The cause and effect diagram is a graphical

illustration of the relationship between a problem or goal (the effect) and its potential contributors (the causes). Sometimes called the "fishbone" or Ishikawa diagram.

Used for analyzing problems, a cause and effect diagram can help:

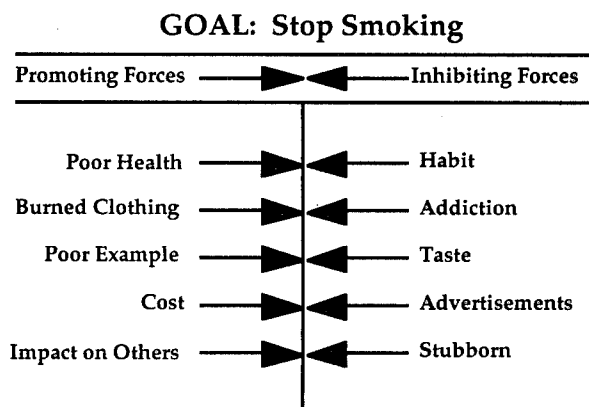
- determine root causes of a given effect (CIP Step 3);
- identify areas where there is a lack of data.



Cause and Effect Diagram

Force Field Analysis

A Force Field Analysis (FFA) illustrates the relationship and significance of factors that may influence the problem or goal. This analysis helps us better understand driving and restraining forces.



Used for making decisions, force field analysis can help:

- identify realistic improvement opportunities;
- develop systematic action plan for problem resolution (CIP Step 4); and
- create criteria for evaluating effectiveness of improvement actions.

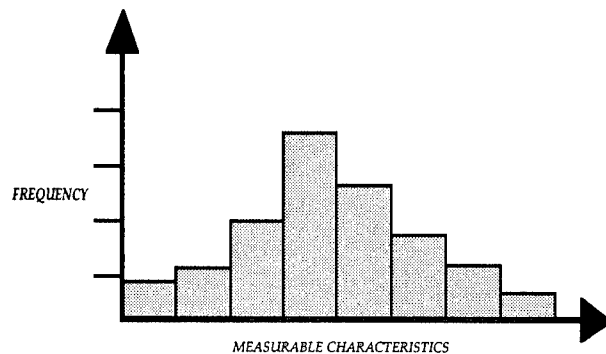
Histogram

The histogram chart displays the distribution of a measurable characteristic (for example: weight, length, speed, etc.). A histogram shows what the variability of the data is in a graphical or pictorial manner.

Used for data analysis, a histogram can help:

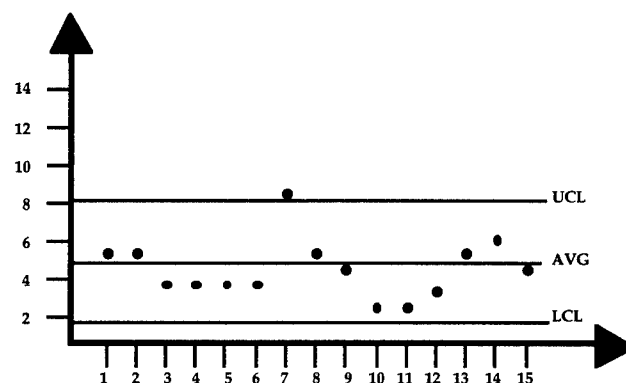
- present a picture of how the process is operating (CIP Step 5);

- compare actual process measurements with an expected distribution;
- observe patterns in the data (CIP Step 2); and
- investigate process stability (CIP Step 2).



Control Chart

A control chart shows the variability of a process over time and indicates whether the process is in a state of statistical control. The control chart is a complex tool in application and construction. Teams may need help from experts in statistical procedures and analysis for this tool to be truly effective.



Used for analyzing a process, a control chart can help:

- monitor process performance (CIP Step 6);

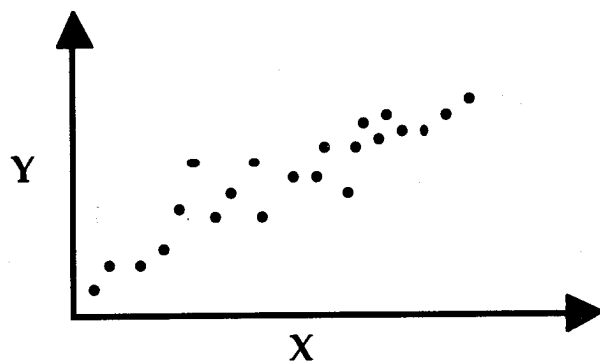
- recognize and control variability in a process (CIP Step 2);
- identify special causes of variation;
- identify changes in the process average or variability (CIP Step 5);
- make process adjustments without tampering; and
- predict process performance.

Used for data analysis, a scatter diagram can help:

- Visualize the changing relationship between two variables; and
- identify *possible* causes of problems (CIP Step 3).

Scatter Diagram

A scatter diagram depicts the relationship between two variables (X and Y).



B. Quality Learning Techniques

Other tools that may be helpful in improving processes are the capacity matrix, deployment flowchart, the purpose and vision statement, lotus diagram, survey, and the systems progress chart. These tools are from *Quality Learning* by David Langford and used with permission.

Capacity Matrix

The capacity matrix is a charting technique used to break down topic areas into steps for accomplishing a specific outcome. The matrix identifies tasks, knowledge level, and understanding of the topic area.

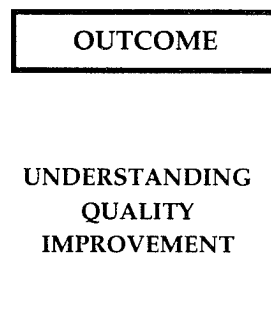
A capacity matrix can make a large insurmountable project into an easy to follow process of understanding and learning. For instance, the entire year of learning for a class can be laid out in a capacity matrix. The students can see what they will be learning, and will also be able to measure their knowledge level. The matrix shows them the depth of the learning process. The speed and depth of learning are dependent on the individual, not the instructor.

Matrices can be used to break down outcome areas into components for study, tasks to be accomplished, proof of understanding and acquiring knowledge and wisdom.

The capacity matrix can also be used to train new employees and monitor professional development. The matrix gives them the requirements for advancement.

Developing a Capacity Matrix

1. State the desired outcome.



2. List the outcomes components.

OUTCOME	CAPACITY
UNDERSTANDING QUALITY IMPROVEMENT	Statistical Quality Improvement Tool Theory
	Appreciation for a system

3. Individuals chart their own learning by shading in the appropriate rectangles (e.g. basic knowledge, understanding, comprehension, application, analysis, synthesis, and appreciation). The levels are as simple or complex as the project and group demand. (See Figure A).

4. Instructor and students discuss what is considered a quality standard of acceptance for each level.

5. After a matrix format is in place, the chart is filled in as the levels are accomplished and the standard for quality is met. (See Figure B).

6. Each level can be accompanied by a portfolio example of documentation, demonstration, or defense of quality work.

Caution!

A capacity matrix should be designed to meet the needs of a specific area. Copying

OUTCOME	COMPETENCIES/ STATISTICAL/ QUALITY IMPROVEMENT TOOL THEORY	BREAKDOWN	KNOWLEDGE	KNOW HOW				WISDOM
				UNDERSTANDING	APPLICATION	ANALYSIS	SYNTHESIS	
UNDER- STANDING QUALITY IMPROVEMENT		Flowchart						
		Lotus Diagram						
		Plan-Do- Study-Act						
		Control Chart						
		Histogram						
		Pareto Chart						

FIGURE A

OUTCOME	COMPETENCIES/ STATISTICAL/ QUALITY IMPROVEMENT TOOL THEORY	BREAKDOWN	KNOWLEDGE	KNOW HOW				WISDOM
				UNDERSTANDING	APPLICATION	ANALYSIS	SYNTHESIS	
UNDER- STANDING QUALITY IMPROVEMENT		Flowchart						
		Lotus Diagram						
		Plan-Do- Study-Act						
		Control Chart						
		Histogram						
		Pareto Chart						

FIGURE B

a matrix from other organizations can create confusion and frustration. It may not meet the needs of your group. The best policy is to construct your own matrix using examples for guidelines only.

The matrix must be filled out truthfully or it lacks meaning.

Individuals may need help when they assess their skills and knowledge since many have little or no experience in self-assessment.

Deployment Flowcharts

A deployment flowchart shows the process flow and the work groups involved in each step. It provides a graphic representation of

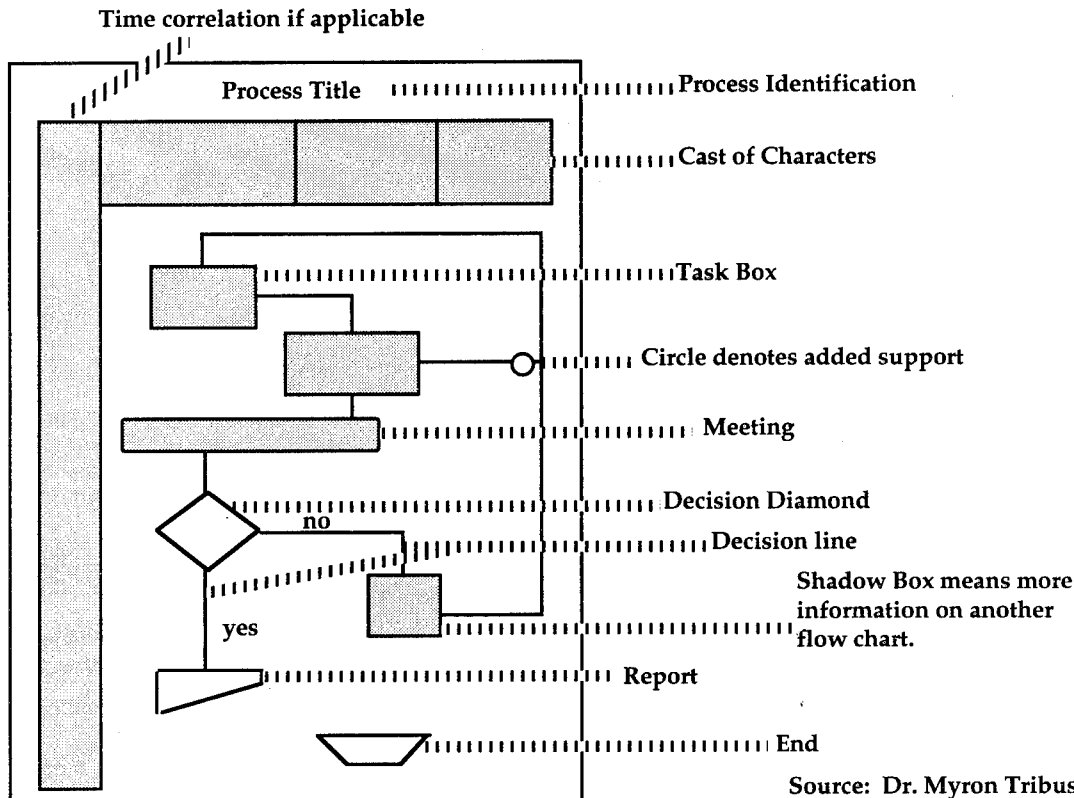
a given process or system work groups, or individuals responsible for each activity.

A deployment flowchart is used anytime individuals or groups need to analyze a process in order to improve a system.

Deployment flowcharts are used for various functions such as training agenda, daily schedule, meeting analysis, emergency procedures, purchasing process, communication procedures, maintenance process, etc.)

Deployment Flowcharts:

- Identify involvement in a process, as it relates to the whole process.
- Define work processes.



Source: Dr. Myron Tribus
Deployment Flow Charting
Quality & Productivity, Inc.,
Los Angeles, CA 90024

- Visualize a process or system.

Deployment Process

1. Select a process or system to analyze.
2. Identify the cast of characters (people involved in the process).
3. Document the existing process using the flowchart symbols.
4. Discuss changes to be made in the process with all those involved with the process.
5. Update the deployment flowchart with the proposed changes and implement the new process
6. Study the effectiveness of the change and return to step #1 above.

Purpose & Vision

Purpose statements identify why an organization exists. Vision statements define what the organization wants to become.

A purpose and vision statement is used when an organization or group needs to focus all efforts toward continuous improvement and change in a specific direction.

Purpose and vision statements are needed in all organizations where people work together to achieve a common goal or mission.

Purpose and Vision Statements:

- Challenges the current systems fundamental beliefs.
- Encourages the study of the system and seeks answers to the question, "How do you know?"

- Involves an active learning participation of quality.
- Allows individuals to evaluate actions related to organizational goals and future accomplishments.

Purpose and Vision Process

1. With all members of the team or group sitting around a table, give each person a sheet of paper.
2. Each team member is given 5 to 10 minutes to write a purpose and vision statement on why the organization (unit group, department) exists (purpose) and where it is headed (vision).
3. Pass statements to the person designated as the recorder. The recorder will write all of the statements on a big piece of flip chart paper or on a chalk board for the whole group to see.
4. Taking all of the personal ideas, feelings, thoughts, etc., into consideration, the group brainstorms and creates a statement that all can agree upon.
5. Once the final statement is complete, all the team members sign it.
6. The statement should be periodically re-evaluated by all team members to ensure its validity.

Caution!

What might be important to an individual may not be important to an organization.

All must compromise to make forward progress.

Challenges current beliefs on how to run a system.

Make sure it is short, understandable, and easy to remember.

Lotus Diagram

The Lotus Diagram is an analytical, organizational tool for breaking broad topics into components, which can then be prioritized for implementation.

The Lotus process is used when teams or individuals need a process for organizing and prioritizing components of a larger whole.

Examples:

- Preparation for writing projects, such as organizational plans.
- Analyzing major components of historical events such as the Civil War, etc.
- Devising strategies of implementation.

Lotus Diagrams work best on an 8 1/2 " X 11" worksheet for individuals. A larger version is necessary for teams, so that all can see and participate in the formation.

Lotus Diagrams:

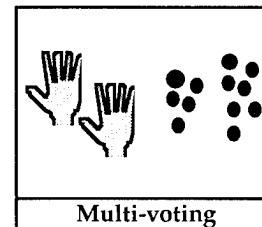
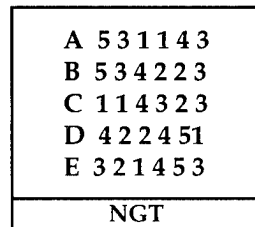
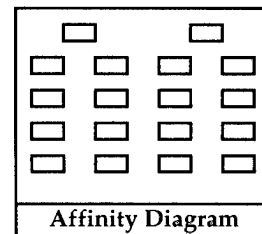
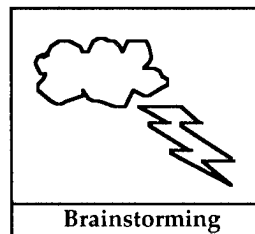
- Are spatial and interactive.
- Promote logical, creative thinking.
- Promote prioritizing for action.
- Require active brainstorming and analysis from all individuals.
- Create an automatic recording device for information.
- Are effective with all ages.
- Provide an effective communication tool.

Lotus Process

1. Choose a topic and clearly state it.

"What are the main components of Project XYZ?"

2. Using the brainstorming, affinity, NGT, or multi-voting process, focus and prioritize the major topics.



3. Write the main topic in the center rectangle of the lotus diagram.

4. Place each of the subtopics in the rectangles surrounding the center rectangle. The lotus chart can take up to eight subtopics.

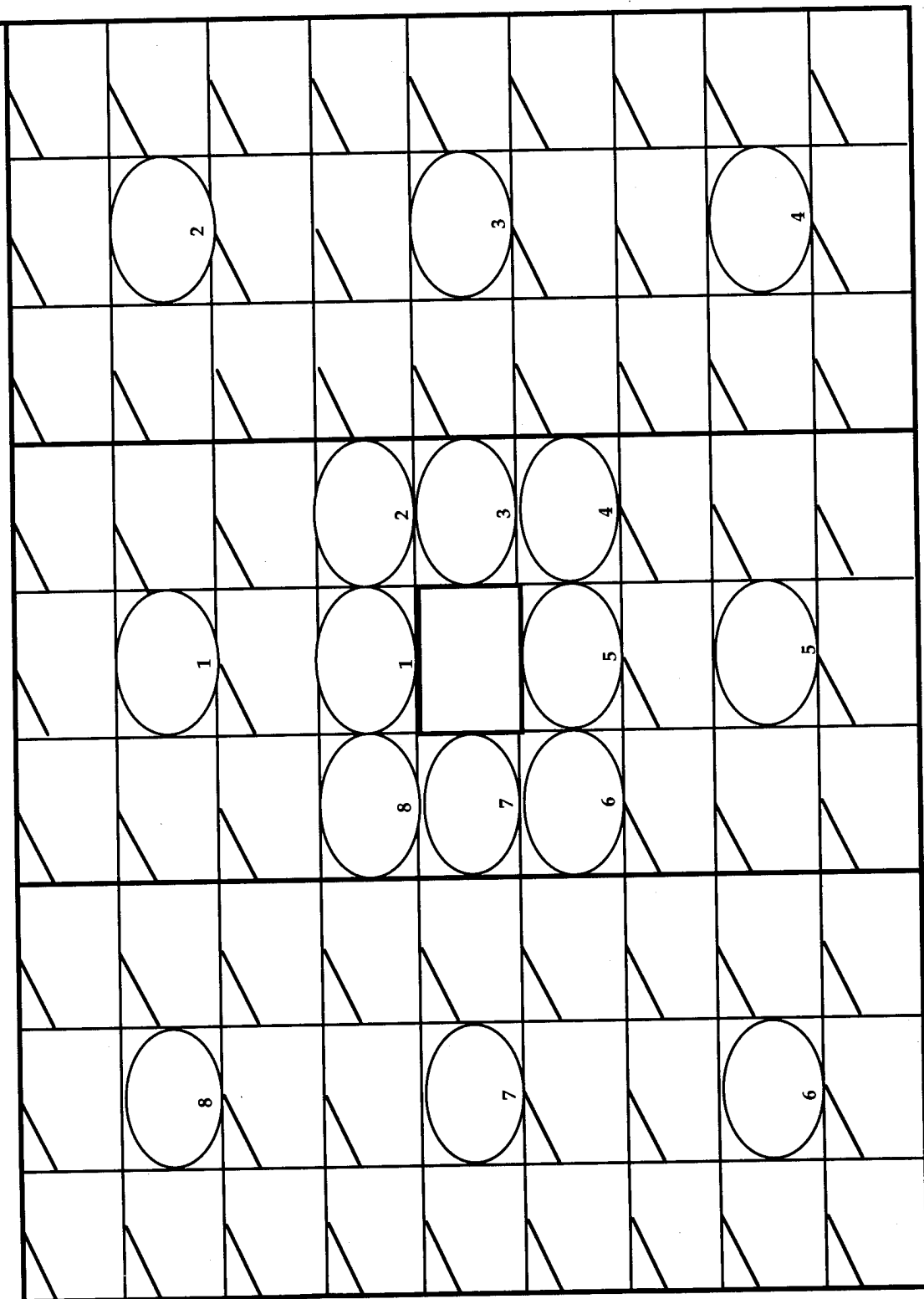
5. Transfer each of the subtopics to its corresponding numbered rectangle and brainstorm more sub-topics or applications.

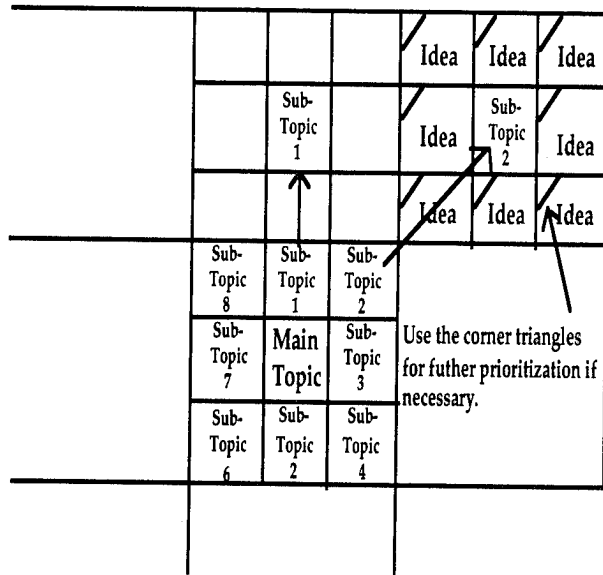
Note: Subtopics then become main topics on new lotus diagram if further analysis is needed.

Caution!

Brainstorming should be done in silence. Talking at this point tends to inhibit participation.

Lotus Diagram *Langford International*





If ideas have previously been prioritized, they can be placed on the lotus diagram according to their appropriate number. If there is no priority, the numbers on the lotus diagram serve only as locators.

Surveys

A Survey is used to collect data from a variable number of items or people for a comparative study. They are used when a new project is planned, to prove the need and the demand of the customer.

Surveys can be used anywhere in the organization to find out specific information which is necessary to make improvements in a process.

Surveys:

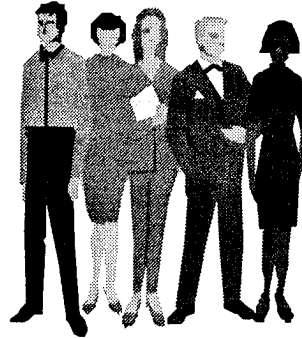
- Are an inexpensive way to test a system or product.
- Can be used with a large number of people or a small group.
- Can give you an overall view, determined by the questions you ask.

- Show if an organization is meeting its quality goals.

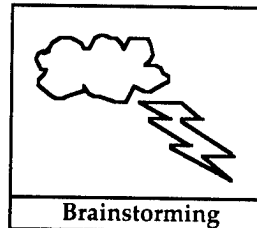
- Help identify satisfied and dissatisfied customers or employees.

Survey Process

1. Determine the group to be studied.



2. Determine what questions will be asked.



SURVEY

- 1.
- 2.
- 3.
- 4.

Note: Train your data collectors thoroughly. Everyone must know how to ask the questions, who to approach, and how to approach them.

3. Compile your results in chart form using a Pareto chart, histogram, and other tools that will give you clarification.

4. Use the compounded data to form a base for improvement.



5. Continue to take data to monitor improvements, and make sure the improvements you have made are working.

Caution!

Data must be collected honestly and consistently.

An untrained collector can skew the data to reflect personal biases.

A poor, inconsistent survey will give you invalid data.

Make sure there is enough time allowed for the collecting process.

System Progress Chart

A System Progress Chart is a visual technique used to answer questions, "Where did we start?" – "Where are we now?" – "Where are we going?"

The System Progress Chart is valuable when you become bogged down while working to implement change. It will show you how much progress you have made, where you stand in the scheme of things, and direct you toward goals for the future.

A System Progress Chart can be used in any goal oriented system. It was used at DSMC to help build the Quality Improvement Plan.

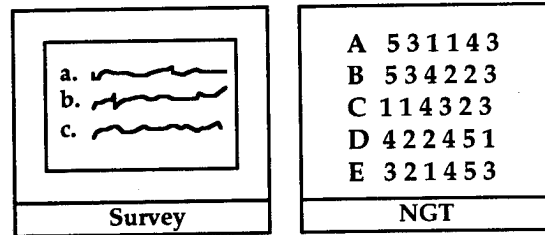
System Progress Chart:

- Encourages goal setting.
- Demonstrates where one fits into the system.

– Is a means to unite a group and show whether or not a system is working.

System Progress Process

1. Using tools such as the NGT, survey, or brainstorming, compile a consensus to the question, "Where did we start?"



2. Form the first section of the System Progress Diagram

1% Planning Time
7-50 Minute Class Periods
No Student Planning
Involvement

3. Through the same process, answer the question, "Where are we now?"

1% Planning Time
7-50 Minute Class Periods
No Student Planning
Involvement

90 minute classes
10% Planning Time
Confusion of Process
Ownership
Student as Resource

4. The final step answers the questions, "What is our vision?" or "Where are we going?"

1% Planning Time
7-50 Minute Class Periods
No Student Planning
Involvement

90 minute classes
10% Planning time
Confusion of Process
Ownership
Student as Resource

50% Planning Time
Intrinsic Motivation
Process Ownership
Total Student Involvement
in Planning

Caution!

Sometimes it is necessary for the leader of an improvement process to compile the System Progress Chart as a planning tool and as an encouragement to the team.

It is best to utilize as many team members as possible in the System Progress Chart process. Their input will give new perspective, as well as giving them a sense of value.

C. Management and Planning Tools

(The tools in this section are taken from the *Air Force Process Improvement Guide*. They also appear in numerous other guides to include *The Team Handbook*, etc.)

Affinity Diagram

An affinity diagram is a technique for organizing verbal information into a visual pattern. An affinity diagram starts with specific ideas and helps you work toward broad categories. This is the opposite of a cause and effect diagram, which starts with the broad causes and works toward specifics. You can use either technique to explore all aspects of an issue. Affinity diagrams can help you:

- Organize and give structure to a list of factors that contribute to a problem.
- Identify key areas where improvement is most needed.

Use the Affinity Process to:

Identify the problem. Write the problem or issue on a chalkboard or flip chart.

Generate ideas. Use an idea-generation technique to identify all facets of the problem. Use index cards or sticky-back notes to record the ideas.

Cluster your ideas (on cards or paper) into related groups. Use questions like "Which other ideas are similar?" and "Is this idea somehow connected to any others?" to help group the ideas together.

Create affinity cards. For each group, create an affinity card, a card that has a short

statement describing the entire group of ideas.

Cluster related affinity cards. Put all of the individual ideas in a group under their affinity card. Now try to group the affinity cards under even broader groups. You can continue to group the cards until your definition of "group" becomes too broad to have any meaning.

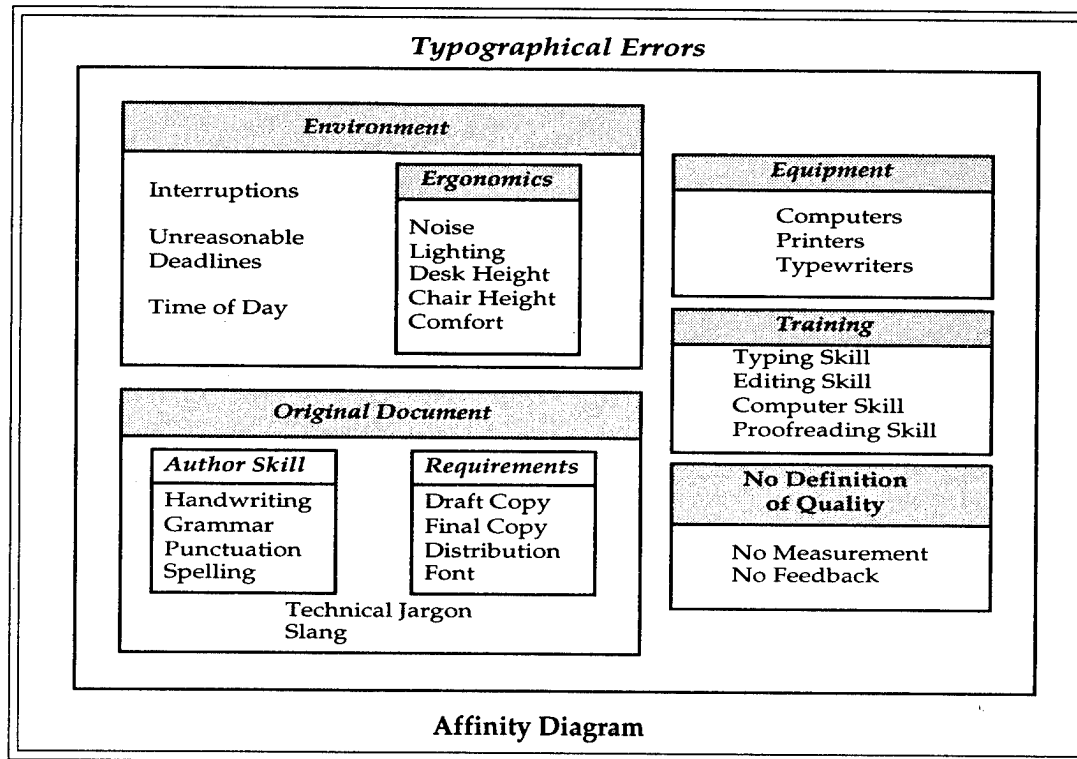
Create an affinity diagram. Lay out all of the ideas and affinity cards on a single piece of paper or a blackboard. Draw outlines of the groups with the affinity cards at the top of each group. The resulting hierarchical structure will give you valuable insight into the problem.

Affinity Diagram Example

A publication team wanted to reduce the number of typographical errors in their program's documentation. As part of a first step, they conducted a brainstorming session that produced the following list of factors that influenced errors.

Computers	No Feedback
Proofreading Skill	Printers
Unreasonable Deadlines	Noise
Lighting	Typewriters
Chair Height	Comfort
Desk Height	Time of Day
Technical Jargon	Interruptions
Handwriting	Grammar
Slang	Spelling
Draft Copy	Punctuation
Distribution	Font
Final Copy	Editing Skill
Computer Skill	Typing Skill
No Measurements	

The following affinity diagram helped them to focus on areas for further analysis.



Five Whys

Five Whys is a technique for discovering the root cause (or causes) of a problem by repeatedly asking the question, "Why?" Five is an arbitrary figure. You never know exactly how many times you'll have to ask why. The Five Whys technique helps you:

- Identify the root cause(s) of a problem.
- See how different causes of a problem might be related.

How to do it:

- Describe the problem in very specific terms.
- Ask why it happens.
- If the answer doesn't identify a root cause, ask why again. You know you've identified the root cause when asking why

doesn't yield any more useful information.

- Continue asking why until the root causes are identified. This may take more than five whys.

Points to remember:

- Always focus on the process-aspects of a problem, rather than the personalities involved. Finding scapegoats does not solve problems!

Pairwise Ranking

Pairwise ranking is a structured method for ranking a small list of items in priority order. It can help you:

- Prioritize a small list.
- Make decisions in a consensus-oriented manner.

How to do it:

Construct a pairwise matrix

Each box in the matrix represents the intersection (or pairing) of two items. If your list has five items, the pairwise matrix would look like this, with the top box representing idea 1 paired with idea 2:

1				
2		2		
3			3	
4				4
5				

Rank each pair. For each pair, have the group (using a consensus-oriented discussion) determine which of the two ideas is preferred. Then, for each pair, write the number of the preferable idea in the appropriate box. Repeat this process until the matrix is filled.

1 and 2 compared 2 is better				
1				
2	2	2		
3			3	
4				4
5				
1 and 3 compared 1 is better				
1				
2	2	2		
3	1		3	
4				4
5				
...and so on until...				
4 and 5 compared 5 is better				
1				
2	2	2		
3	1	2	3	
4	1	2	3	4
5	5	5	5	5

Count the number of times each alternative appears in the matrix.

Alternative	1	2	3	4	5
Count	2	3	1	0	4
Rank					

Alternative 5 ranks 1st overall

Rank all items. Rank the alternatives by the total number of times they appear in the matrix. To break a tie (where two ideas appear the same number of times), look at the box in which those two ideas are compared. The idea appearing in that box receives the higher ranking.

Alternative	1	2	3	4	5
Count	2	3	1	0	4
Rank	3rd	2nd	4th	5th	1st

Alternative 5 appears 4 times in the matrix.

Pairwise Ranking Example

A program team was asked to recommend a site for testing a unique portion of a system. A feasibility study produced a list of six possible locations. The team then used pairwise ranking to determine that Nellis AFB was best suited for this particular test.

- | | |
|------------------|----------------|
| 1. Fort Huachuca | 4. Nellis AFB |
| 2. Edwards AFB | 5. Eglin AFB |
| 3. Kirtland AFB | 6. Hanscom AFB |

1					
2	2	2			
3	1	3	3		
4	4	4	4	4	
5	5	5	5	4	5
6	1	6	6	4	5

Site	1	2	3	4	5	6
Count	2	1	1	5	4	2
Rank	3rd	6th	5th	1st	2nd	4th

Bone Diagram

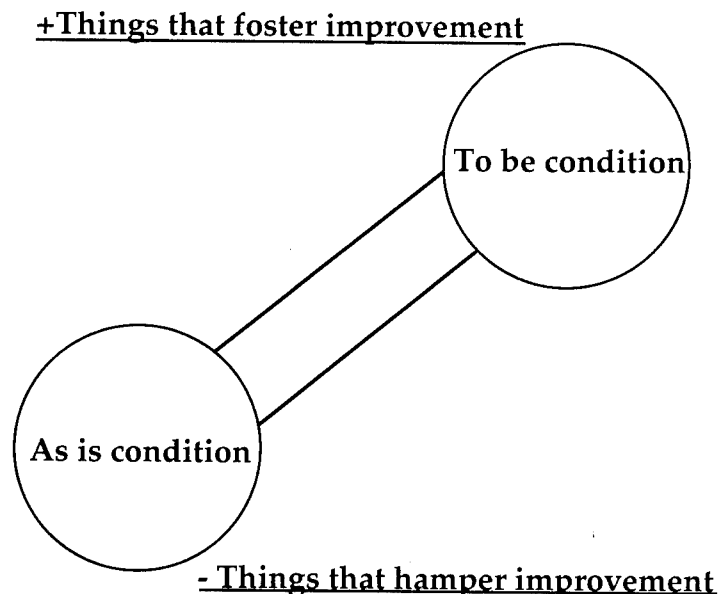
The bone diagram is a combination of imagineering and force field analysis. It is a visual tool that facilitates the identification of the problem, the solution, and the factors that can either support or hamper the movement toward the new goal.

Steps in Constructing a Bone Diagram

The first step is to define the "as is condition". A number of tools can (flowchart, brainstorming, etc.) be used to identify the base. The next step is to define the "to be condition". Here you may want to use imagineering to assist you in imagining the new "improved state". Imagineering is a tool to get groups to develop a shared vision

of what the perfect process, system, project (et al) would look like. Each person on the team is given a few minutes to identify (write down) as many responses to defining the stated "to be condition". The team facilitator collects and compiles the data and then posts all responses. The team then reviews the responses, and using a consensus tool comes up with a short description of the new state.

The team now needs to identify the factors that facilitate or hamper achieving the new state. Using brainstorming techniques the team will begin to identify those factors. Once the factors have been identified the team needs to work to strengthen those things that would facilitate achieving the goal, and work to find ways to eliminate or dampen the effects those factors could have to hamper achieving the new goal.



Note: This tool was suggested by Lt Col George Noyes, USAF and professor at DSMC.

D. Management Deliberation Center

The Management Deliberation Center (MDC) is a facility designed specifically to assist groups in dealing with complex problems. In particular, the MDC can assist groups involved with process improvement and the various tools used on the Quality Journey.

The MDC can be configured to accommodate different size groups, has rear screen projection, and audio and video systems. It can be used in a chauffeured mode with ample whiteboards or with participants using built-in computers to facilitate problem solving.

The technology available provides tools such as brainstorming, idea organization, vote, topic commenter, alternative evaluation, policy formation, stakeholder analysis, questionnaire, group matrix, group outliner, group writer, group dictionary, and pairwise evaluation.

Graphics tools are also available to assist with charts such as affinity diagrams, flowcharts, and cause and effect diagrams.

The various tools allow a group to tailor a session to meet their particular needs. Key features of the technology include parallel and simultaneous processing of ideas, anonymous input, and the development of a complete record of each session

Used for quality efforts, the Management Deliberation Center can help:

- Groups to be more productive;
- Participants to contribute more fully;
- Groups to develop consensus and be more focused;
- Keep meetings on track;
- Reduce time spent in meetings;
- Document groups efforts;
- Improve the quality of group efforts; and
- Enhance the use of Quality Management Tools and Techniques.

MDC Process

1. Group Leader meets with an MDC trained facilitator to plan the session.
2. The process (steps) to be used in the session is defined.
3. The tools to be used in each step are defined.
4. The technology to be used for each step, if any, is defined.
5. The session is scheduled.
6. The session is conducted.

E. Benchmarking

Benchmarking is the process of measuring products, services, and practices against the toughest competitors or those known as leaders in their field. Benchmarking can help you:

- Understand how you compare with similar organizations.
- Identify areas for process improvement.

How to do it:

Identify the process to be benchmarked.

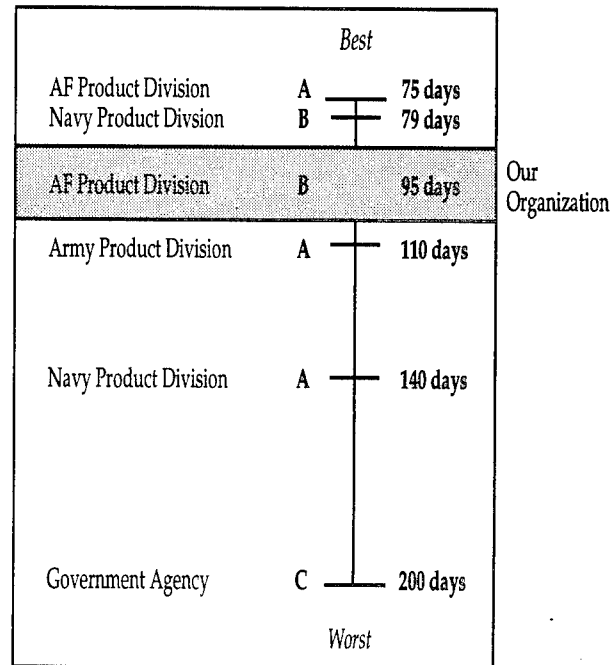
Select a process that is important to both your organization and your customers. Be sure the process in your organization is similar to, and measured in the same manner, as the one it's being compared to.

Study other organizations. Develop a list of organizations with comparable products and services. Determine what specific processes the organization performs. Based on this information, rank the organizations from best to worst.

Compare and evaluate. Compare your process to the best and worst cases, and list the important differences. These differences can suggest potential improvements to your process.

Benchmarking Example

Using inputs their customers provided, the executive leaders at AF Product Division B decided that their source selection process needed improvement. As part of the initial analysis, they wanted to see how their process compared with others. They determined that the average number of days



Source Selection
(Average number of days required)

required for source selection was an important process measure.

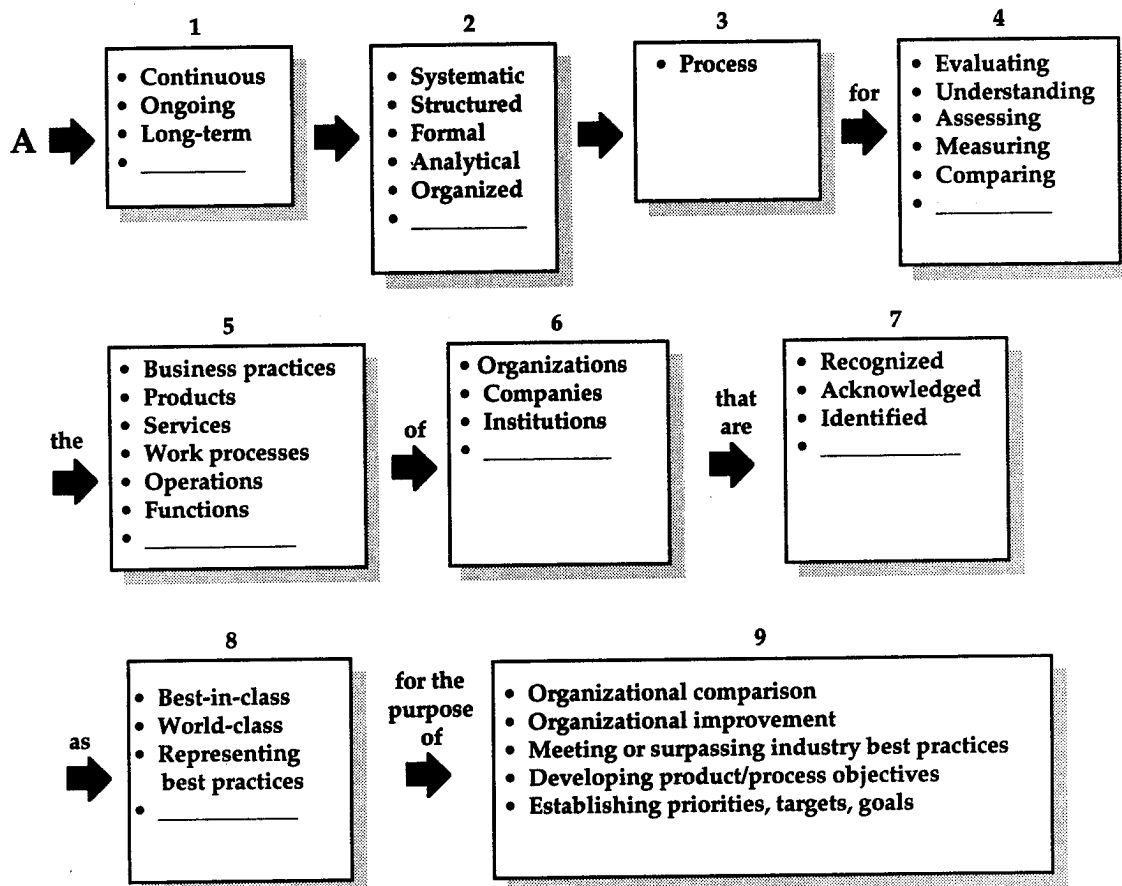
As a result of this analysis, representatives visited AF Product Division A and Navy Division B and studied their source selection procedures.

Note: Benchmarking is *not* replicating a process from an organization that excels. It is studying the process, clearly understanding the theory behind the process and then re-studying your own process to determine improvements.

Benchmarking Defined

Benchmarking can actually be defined in many ways. The definition that follows was developed by Air Force Materiel Command. Take any word from each of the mini boxes and put together a sentence.

Benchmarking Concept/Definition



(Submitted By AFMC)

* NOTE: DSMC's LRC has videotapes on benchmarking.
 DSMC's Acker Library has books on benchmarking.

The following thoughts on benchmarking are provided by Russell Linden's book titled *Seamless Government: A Practical Guide to Reengineering in the Public Section*.

"Benchmarking is the continuous process of measuring products, services, and practices against the toughest competitors or those companies recognized as industry leaders."

— David T. Kearns
Former CEO, XEROX

- Consider similar organizations: in size, in same industry
- Consider those in different industries, performing similar functions
- Determine what the partner might gain from the interaction

The Benchmarking Process:

1. Decide What to Benchmark.

Possible Criteria:

- Impact on Customers
- Major Impact on Performance - Quality, Reliability, Cost, Efficiency
- Major Room for Improvement

2. Identify Performance Indicators to Measure

Cost:

- Productivity
- Process efficiency
- Cost of Resources

Quality:

- Customer Satisfaction
- Effectiveness
- Timeliness
- Level of Service

3. Document Your Current Performance

- Measure for cost, quality
- Identify key cost drivers, other factors influencing performance
- Note possible areas for improvement

4. Identify Potential Benchmarking Partners

- Look for "best in class" organizations

5. Select one or more partners, collect data

Secondary Sources:

National, local, trade press
Federal and state government sources
Trade, professional publications
Other published research

Primary Sources:

Site visit, telephone calls
Extensive interviews of:

- customers
- personnel
- suppliers
- industry experts

6. Confirm data

- Is it accurate?
- Is it applicable to the process being analyzed in your organization?

7. Analyze data to determine appropriate benchmark

- Ensure the data are relevant
- Ensure the data are quantifiable
- Ensure the data are transferable to your organization

8. Write case study of best practice, propose benchmark(s) for your process

- Describe the process to be improved, and its current performance

- Compare with benchmark partner's process and performance level
- Propose new standard for your process, and how it could be improved
- When and how will the process improvement effort be measured? Who will do measuring?
- Propose implementation plan

Break Through Thinking Skills

Technology can do a great deal to facilitate reengineering projects. So can the human mind. Here are tips — methods for achieving true break throughs in your thinking, and in your work designs.

1. Right answers — Forget what you were taught in school. There can be several "right" answers. Don't stop at the first — look for the second and third right answers.

2. Logic — Our "left brains" continually seek logic. Forget logic when seeking break throughs and allow the rest of your brain to search, intuitively. The time for logic and careful analysis is later, after all possible ideas are out.

3. Rules — Rather than following them, challenge them.

4. Practicality — Like logic, this will help, later. The search for break throughs is first one of imagination, not practicality.

5. Seriousness — Some of our most creative ideas come when our guards are down; when we're tired, not trying too hard, feeling playful.

Roger Von Oech: *Eliminate Barriers to Creativity (Whack on the Side of the Head)* New York: Warner Books, 1983

F. Quality Improvement Story

The Quality Improvement Storyboard (QIS) is a visual depiction of the P-D-S-A cycle using an eight step problem solving method. There are several reasons to use the QIS. However the most important reason for using the QIS is that it provides a structured framework for improvement. It provides discipline and consistency to any improvement process. The QIS is a communications tool. It tells the improvement process without a formal briefing. It can be used to get feedback from stakeholders who are not involved in the improvement. It is also a marketing tool and helps to "sell" the project to others. Additionally, the QIS assists in presenting a lot of complicated data in a concise and easily interpreted manner.

The QIS is an alternative to a lengthy narrative. It captures and tracks the basic ideas, plans, activities, and process actions.

At DSMC the QIS is the standard way to display team improvements.

The QIS has the following sections:

1. Team information

- People involved in the project.

2. Identify improvement opportunity by defining the system

- Initial conditions.

- Definition of the system, project purpose; why this project is in need of improvement.

3. Evaluate the present process; baseline the current situation; flowchart process to define it. Observe the process as it exists today.

4. Analyze the causes of the current situation. What are the problems? What are the root causes of the problems?

5. Develop a theory or hypothesis for change; take action to improve the current situation.

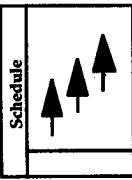
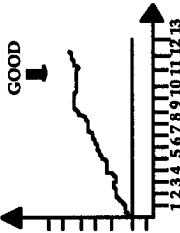
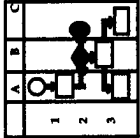
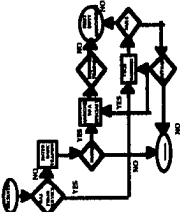
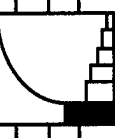
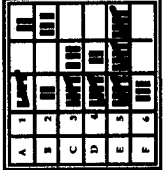
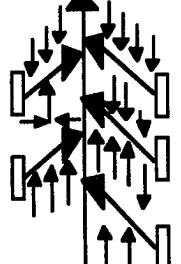
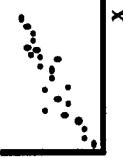
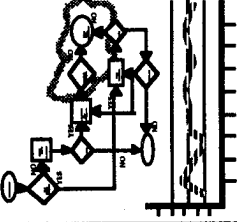
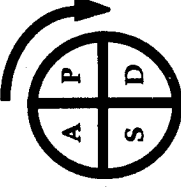
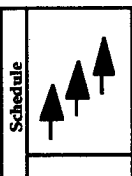
6. Study and analyze the results of the improvement process. How effective is the new process?

7. Standardize the solution after desired results are achieved; train others to incorporate new actions and behaviors.

8. Establish future plans based on the lessons learned in the improvement cycle. How can you apply these lessons to other situations?

(Note: This model of the QIS was developed by David Langford. It is used throughout DSMC with his permission.)

Quality Improvement Storyboard

1. Team Info	2. Identify Improvement Opportunity by Defining the System	3. Evaluate Process by Studying the Current Situation
 	 	  
4. Analyze the Cause	5. Develop a Theory and Take Action	6. Study and Analyze Results
	 	 
7. Standardize Solution	8. Plan for Future	LESSONS LEARNED: +/-
	 	LESSONS LEARNED: +/-

Part V: Glossary of Terms

The terms used in this Glossary were compiled from various sources, primarily those listed in the Foreword.

1-10-100 RULE - the rule that states that if a problem is not fixed when it occurs, it will only become more costly to fix later in terms of both time and money. This rule of thumb recognizes that it makes a difference when a problem or error is discovered and resolved.

14 POINTS - W. Edwards Deming's 14 management practices to help companies increase their quality and productivity: 1) create constancy of purpose for improving products and services, 2) adopt the new philosophy, 3) cease dependence on inspection to achieve quality, 4) end the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier, 5) improve constantly and forever every process for planning, production, and service, 6) institute training on the job, 7) adopt and institute leadership, 8) drive out fear, 9) break down barriers between staff areas, 10) eliminate slogans, exhortations, and targets for the work force, 11) eliminate numerical quotas for the work force and numerical goals for management, 12) remove barriers that rob people of pride of workmanship and eliminate the annual rating or merit system, 13) institute a vigorous program of education and self-improvement for everyone, and 14) put everybody in the company to work to accomplish the transformation.

80-20 - a term referring to the Pareto principle, which was first defined by J. M. Juran in 1950. The principle suggests that most effects come from relatively few causes; that

is, 80% of the effects come from 20% of the possible cause.

ACADEMY - an intensive, five-day process designed to educate Corporate Service/Quality coordinators about their role in the corporate service/quality rollout. In particular, they learn to write a comprehensive Service/Quality Plan. (There are two types of Academy: Public which is attended by a cross-section of organizations; and Internal which is designed specifically for departmental or divisional coordinators.) DSMC chose to use the Internal Academy in August 1993.

ACCEPTABLE QUALITY LEVEL - when a continuing series of lots is considered, a quality level that, for the purposes of sampling inspecting, is the limit of a satisfactory process average.

ACCEPTANCE SAMPLING - inspection of a sample from a lot to decide whether to accept or not accept that lot. There are two types: attributes sampling and variables sampling. In attributes sampling, the presence or absence of a characteristic is noted in each of the units inspected. In variables sampling, the numerical magnitude of a characteristic is measured and recorded for each inspected unit, this involves reference to a continuous scale of some kind.

ACCEPTANCE SAMPLING PLAN - a specific plan that indicates the sampling

sizes and the associated acceptance or non-acceptance criteria to be used. In attributes sampling, for example, there are single, double, multiple, sequential, chain, and skip-lot sampling plans. In variables sampling, there are single, double, and sequential sampling plans.

ACCREDITATION - certification by a duly recognized body of the facilities, capability, objectivity, competence, and integrity of an agency, service, or operational group or individual to provide the specific service or operation needed. For example, the Registrar Accreditation Board accredits those organizations that register companies to the ISO 9000 standards.

ACTION PLAN - the steps a team develops to implement a solution or the actions needed to make continual progress toward a solution.

ACTIVITIES - the steps of a process.

ACTIVITY-BASED COSTING - an alternative to traditional cost accounting that allows the organization to determine the actual cost of the services, products, or programs it produces.

AFFINITY DIAGRAM - a tool that provides a way to organize the group brainstorming output and categorize it for further analysis. It includes putting ideas, opinions, etc., on cards and moving them around to see how they tend to group themselves in an attempt to organize what may be a large amount of seemingly unrelated data.

AGENDA - list of business to be transacted at a meeting. A plan for conducting a meeting.

ALIGNMENT - the process of matching supplier capabilities (what is deliverable)

with customer needs (what is expected). Alignment, both horizontally and vertically, needs to be further aligned with the organization's goals.

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC) - a professional, not-for-profit association that develops, promotes, and applies quality-related information and technology for the private sector, government, and academia. The Society serves more than 96,000 individual and 700 corporate members in the United States and 63 other countries. The address for ASQC is P.O. Box 3005, Milwaukee, Wisconsin 53201-30051 and the phone is (414) 272-8575.

ANALYSIS OF MEANS - a statistical procedure for troubleshooting industrial processes and analyzing the results of experimental designs with factors at fixed levels. It provides a graphical display of data. Ellis R. Ott developed the procedure in 1967 because he observed that non-statisticians had difficulty understanding analysis of variance. Analysis of means is easier for quality practitioners to use because it is an extension of the control chart. In 1973, Edward G. Schilling further extended the concept, enabling analysis of means to be used with non-normal distributions and attributes data when the normal approximation to the binomial distribution does not apply. This is referred to as analysis of means for treatment effects.

ANALYSIS OF VARIANCE - a basic statistical technique for analyzing experimental data. It subdivides the total variation of a data set into meaningful component parts associated with specific sources of variation in order to test hypothesis on the parameters of the model or to estimate variance components. There are three models: fixed, random, and mixed.

ANOM - analysis of means

ANOVA - analysis of variance

AOQ - average outgoing quality

AOQL - average outgoing quality limit

APPRAISAL COSTS - costs associated with inspecting a product to ensure that it meets the customer's needs and expectation.

AS-IS MODEL - a model that represents the way the organization currently does business.

ATTRIBUTE CHART - any one of a specific group of control chart types that plot counts of occurrences of items, as opposed to variable measurement values.

ATTRIBUTE DATA - go/no-go information. The control charts based on attribute data include percent chart, number of affected units chart, count chart, count-per-unit chart, quality score chart, and demerit chart.

AVAILABILITY - the ability of a product to be in a state to perform its designated function under stated conditions at a given time. Availability can be expressed by the ratio:

$$\frac{\text{uptime}}{\text{uptime} + \text{downtime}}$$

uptime being when the product is operative (in active use and in standby state) and downtime being when the product is inoperative (while under repair, awaiting spare parts, etc.).

AUGMENTED PRODUCT - a product that offers more than the customer is accustomed.

AVERAGE CHART - a control chart in which the sub-group average, $\bar{X}$, is used to evaluate the stability of the process level.

AVERAGE OUTGOING QUALITY - the expected average quality level of outgoing product for a given value of incoming product quality.

AVERAGE OUTGOING QUALITY LIMIT - the maximum average outgoing quality over all possible levels of incoming quality for a given acceptance sampling plan and disposal specification.

BACKWARD CHAINING - a method of process mapping that begins "at the end" with the desired outputs of a process, and moves backward to identify the essential sub-process necessary to produce each subsequent output.

BALDRIGE ASSESSMENT - a review of how quality is integrated into an organization using the Malcolm Baldrige National Quality Award criteria as a guide.

BALDRIGE AWARD - see Malcolm Baldrige National Quality Award.

BENCHMARKING - a systematic process for evaluating the products, services, and work processes or organizations recognized as leaders for the purpose of improving the company. It involves analyzing your own process, then seeking out the best performers in a given area, and comparing yourself against that performer in terms of indicators, such as cycle time, process, costs, customer service, and output. One unique aspect of benchmarking is that since it deals with one process or procedure, an organization can benchmark against a very different mission orientated company.

BEST OF CLASS - one of a group of similar organizations whose overall performance, effectiveness, efficiency, and adaptability is superior to all others.

BEST PRACTICES - those ideas, philosophies, attitudes, approaches, operational methods, systems and techniques that have put the top players at the head of the pack. The "signature" elements that are hallmarks of effectiveness. The inventions or discoveries the quality champions have put to use to lift their organizations above the expectations of their customers. (Albrecht 1992)

BIG Q, LITTLE Q - a term used to contrast the difference between managing for quality in all business processes and products (big Q) and managing for quality in a limited capacity - traditionally in only factory products and processes (little Q).

BLEMISH - an imperfection that is severe enough to be noticed but should not cause any real impairment with respect to intended normal or reasonably foreseeable use. (See also "defect," "imperfection," and "non-conformity.")

BLOCK DIAGRAM - a diagram that shows the operation, interrelationships, and interdependencies of components in a system. Boxes, or blocks (hence the name), represent the components; connecting lines between the blocks represent interfaces. There are two types of block diagrams; a functional block diagram which shows a system's subsystems and lower-level products, their interrelationships, and interfaces with other systems; and a reliability block diagram which is similar to the functional block diagram except that it is modified to emphasize those aspects influencing reliability.

BLUEPRINT (OR PROCESS BLUEPRINT) - a flowchart of a process that includes the

following elements: starting and ending points of the process, the work steps in the process, hand-off points between functions, and time between customer contact points. A blueprint is most powerful when used to depict strategic cross-functional processes.

BRAINSTORMING - a tool teams use to generate a large number of ideas on a particular subject. Each person provides as many ideas as possible. Ideas can be written or spoken.

BREAKAWAY STRATEGY - a concept for winning and keeping the customer's business that can set your organization apart from the other competitive choices in the customer's mind.

BREAK THROUGH - a dramatic improvement in work processes. It can occur in technology, in the way work is organized, or in the way people think. Although breakthroughs are important, they don't happen all the time. Improvement most often results from small, continuous changes.

BUSINESS PROCESS INNOVATION - the radical change of a process including new work strategies, the actual process design activity, and the implementation of the change in all its complex technological, human, and organizational dimensions (see Business Process Reengineering).

BUSINESS PROCESS REENGINEERING - the process of challenging fundamental assumptions on which the organization is built, and radically redesigning the systems, processes, and structure around desired outcomes, not around functions or departments.

C-CHART - control chart for plotting data based on the total number of non-conformance (defects) in a sample.

CALIBRATION - the comparison of a measurement instrument or system of unverified accuracy to a measurement instrument or a system of a known accuracy to detect any variation from the required performance specification.

CAPABLE PROCESS - a process in which the control limits on a chart are inside the specification limits. A chart is used to judge the capability of a process. In a capable process, normal variation will not cause a product to be defective.

CAPACITY MATRIX (formerly referred to as Competency Matrix) - a charting technique that breaks down outcomes into specific competencies to be accomplished and shows the different levels of learning (knowledge) achieved. Using Blooms taxonomy, the matrix identifies tasks, knowledge levels, and depth of understanding of each area so that a persons capacity can be evaluated. It is a self-evaluation tool. (Tool is copyrighted from David Langford.)

CASCADE TRAINING - providing core quality training with implementation by and from each level in the organization until it reaches the last worker.

CAUSE-AND-EFFECT DIAGRAM - a tool for analyzing process dispersion. It is also referred to as the Ishikawa diagram, because Kaoru Ishikawa developed it, and the fishbone diagram because the complete diagram resembles a fish skeleton. The diagram illustrates the main causes and sub-causes leading to an effect (symptom). The cause-and-effect diagram is one of the seven tools of quality.

CENTER LINE - the middle line on a control chart. When a process is in statistical control, half of the points plotted, over

time, will fall above the center line and half will fall below it.

CHECKLIST - a tool used to ensure that all important steps or actions in an operation have been taken. Checklists contain items that are important or relevant to an issue or situation.

CHECK SHEET - a simple data-recording device. The check sheet is custom-designed by the user, which allows him or her to readily interpret the results. The check sheet is one of the seven tools of quality.

CHIMNEYS/SILOS - narrow focus on a specific functional area with a vertical hierarchy structure.

CM - DSMC Commandant.

COMMON CAUSES - after gathering data and charting the data points, these are the causes of variation that are inherent (universal and ordinary) in a process over time. They affect every outcome of the process and everyone working in the process (also see "special causes"). Common causes of variation can be altered only by changing the system.

A process affected only by common causes is in statistical control. Common causes of variation:

- are large in process
- individually have a small effect on the process
- form no definite pattern or trend
- may currently be impractical to remove
- are present in the process due to design and operating limitations

COMPANY CULTURE - a system of values, beliefs and behaviors inherent in a company. To optimize business performance,

top management must define and create the necessary culture.

COMPETITIVE BENCHMARKING - the measuring of products, services, or processes against the toughest competitors or against those companies known as leaders.

COMPUTER-AIDED ACQUISITION AND LOGISTICS SUPPORT (CALS) - a strategy for instituting within DoD and industry an integrated "system of systems" to create, transmit, and use technical information in digital form to design, manufacture, and support weapon systems and equipment, and apply communication and computer technology to the acquisition and support of major weapon systems and information systems.

COMPUTER-AIDED DESIGN (CAD) - automated system for assisting in design process.

COMPUTER-AIDED ENGINEERING (CAE) - automated system for assisting in engineering process.

COMPUTER-AIDED MANUFACTURING (CAM) - automated system for assisting process design for manufacturing.

COMPUTER INTEGRATED MANUFACTURING (CIM) - the integration of computer-aided design and computer-aided manufacturing for all design and manufacturing processes.

COMPUTER SYSTEMS - items such as hardware, software, firmware, robotics, expert systems, and artificial intelligence.

CONCURRENT ENGINEERING (CE) - systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and sup-

port. This approach is intended to cause the developers, from the outset, to consider all elements of the product life cycle from conception through disposal, including quality, cost, schedule, and user requirements.

CONFORMANCE - an affirmative indication or judgment that a product or service has met the requirements of a relevant specification, contract, or regulation.

CONSENSOGRAM - (Langford consensogram) - a tool used to survey an entire group's response to a specific question, usually in the form of a percentage response about commitment, effort, and so on. (Example: "How confident do you feel about your interviewing skills at this point in the class?" A person will respond in a percentage form on a small sticky note that can be posted with other responses, giving a profile of class confidence levels.)

CONSENSUS - a resolution or treatment of an issue that all members of the group can support, whether or not they fully agree with it. Preferred to voting.

CONSENSUS DECISION - a decision made after all aspects of an issue, both positive and negative, have been brought out to the extent that everyone openly understands and supports the decision and the reasons for making it.

CONSTANCY OF PURPOSE - a clearly articulated and consistent sense of the aim of a system. For improvement to come about, everyone in the system must have constancy of purpose, one of W. Edwards Demings' 14 points.

CONTINUAL IMPROVEMENT - making incremental changes to products, services, or processes through incremental and break

through improvements as a means to meet and exceed customer expectations and requirements or other set objectives.

CONTROL CHART - a statistical tool with upper and lower control limits on which values of some statistical measure for a series of samples or subgroups are plotted. The chart frequently shows a central line to help detect a trend of plotted values toward either control limit.

CONTROL LIMITS - a statistically derived limit for a process that indicates the spread of variation attributable to chance variation in the process. Control limits are computed from averages.

CONSTRUCT FAILURE - an intellectual malfunction that leads to the wrong basic idea about what is going on.

COORDINATOR - the individual(s) within an organization responsible for its total quality initiative, which may include, but is not limited to, strategic process management. Coordinator, who usually works closely with the executive team, creates strategic and tactical implementation plans and helps get the plans launched. Coordinators may also perform the functions of the internal process management consultant (see "Internal process management consultant"). At DSMC the coordinator is called the Special Assistance for Quality (SAQ).

CORPORATE CULTURE - values and practices that are shared across all groups in an organization. (The books that started the trend include: *Theory Z*, by Ouchi, *The Art of Japanese Management* by Athos, *Corporate Cultures* by Deal and Kennedy, and *In Search of Excellence* by Peters and Waterman.)

COST OF QUALITY - a term used to capture the total cost or expenditures an organization undertakes to achieve a given level of quality. It consists of three components - the cost of conformance, the cost of nonconformance, and the cost of lost opportunity.

Cost of conformance - costs involved in ensuring that work outputs of a product, service, or work process meet all of the customer expectations. This is the expected or required cost of insuring that business is done the right way. It includes costs of prevention (prevent mistakes prior to occurring) and inspection/appraisal (finding mistakes before delivery).

Cost of nonconformance - costs generated when requirements are not met. Sometimes referred to as the "cost of poor quality", including cost to rework, scrap, wasted times, and avoidable input.

Cost of lost opportunity - the profit impact of lost revenues which result from failing to meet customer expectations.

COST DRIVERS - the factors that cause work to be performed. ABC helps managers identify and reduce "negative cost drivers" (factors that require non-value-added work to be done).

COUNT CHART - a control chart for evaluating the stability of a process in terms of the count of events of a given classification occurring in a sample.

CRAWFORD SLIPS - an alternative to the brainstorming tool; instead of generating ideas aloud, participants record them on small slips of paper, with one idea per slip. This tool minimizes influences from the group and reduces fear when there is danger that this might exist in a group.

CRITERIA RATING FORM - method using a matrix and ratings to assist a group in making a decision based on previously agreed upon set of criteria.

CULTURE - a prevailing pattern of activities, interactions, norms, sentiments, beliefs, attitudes, values, and products in an organization. The shared experience of a group.

CULTURE CHANGE - what happens during the long-term learning period required for reassessment and adjustment of previously held work values and methods of management and workers. All of the people in the organization from top to bottom abandon the old ways (that's close enough, lowest bidder, fight fires, management versus workers, if it works don't fix it, short term results, etc.) and adopt the new ways (continuous improvement, valuing diversity process focus, prevention, empowerment, long term, vision).

CUSTOMER - one who derives benefit from a process; the person, group, or unit that receives the process output. Customers can be internal or external to the organization. Customers can also be an immediate, intermediate, or end users of a work process.

CUSTOMER DELIGHT - the result of delivering a product or service that exceeds customer expectations.

CUSTOMER NEEDS/REQUIREMENTS - the benefit that a customer requires from a system. Needs may be expressed or implied, and form the basis for improvement that ultimately creates customer expectations.

CUSTOMER SATISFACTION - a primary ingredient in quality. The customer must be satisfied with the output of the supplier so

that he or she can use that output properly for his or her part of the process. A dissatisfied customer has to spend more time or other resources to ensure the process is worked properly. A dissatisfied customer is frustrated in some way or another.

CUSTOMER-SUPPLIER PARTNERSHIP - a long-term relationship between a buyer and a supplier characterized by teamwork and mutual confidence. The supplier is considered an extension of the buyer's organization. The partnership is based on several commitments. The buyer provides long-term contracts and uses fewer supplies. The supplier implements quality assurance processes so that incoming inspection can be minimized. The supplier also helps the buyer reduce costs and improve product and process designs.

CUSTOMER/SUPPLIER ANALYSIS - techniques that provide insight into the customer's needs and expectations and involve an organization's suppliers in the development of the organizations' requirements and the suppliers' conformance to them.

CYCLE TIME - the time needed to complete a process from beginning to end.

DATA - facts that can be used as the basis for discussion or decision.

DATA MODEL - the representation of the flow of data in a process.

D-CHART - See demerit chart.

DECISION MATRIX - a matrix used by teams to evaluate problems or possible solutions. After a matrix is drawn to evaluate possible solutions, for example, the team lists them in the far-left vertical column.

Next, the team selects criteria to rate the possible solutions, writing them across the top row. Third, each possible solution is rated on a scale of 1 to 5 for each criterion and the rating recorded in the corresponding grid. Finally, the ratings of all the criteria for each possible solution are added to determine its total score. The total score is then used to help decide which solution deserves the most attention.

DEFECT - a product or service nonfulfillment of an intended requirement or reasonable expectation for use, including safety considerations. There are four classes of defects: Class 1, Very Serious, leads directly to severe injury or catastrophic, economic loss; Class 2, Serious, leads directly to significant injury or significant economic loss; Class 3, Major, is related to major problems with respect to intended normal or reasonably foreseeable use; and Class 4, Minor, is related to minor problems with respect to intended normal or reasonably foreseeable use.

DEMERIT CHART - a control chart for evaluating a process in terms of a demerit (or quality score), i.e., a weighted sum of counts of various classified conformities.

DEMING CYCLE - see "plan-do-study-act cycle" or Deming Wheel (also known as the Shewart Cycle).

DEMING PRIZE - award given annually to organizations that, according to the award guidelines, have successfully applied company-wide quality control based on statistical quality control and will keep up with it in the future. Although the award is named in honor of W. Edwards Deming, its criteria are not specifically related to Deming's teachings. There are three separate divisions for the award: the Deming Application Prize, the Deming Prize for Individuals, and the

Deming Prize for Overseas Companies. The award process is overseen by the Deming Prize committee of the Union of Japanese Scientists and Engineers in Tokyo.

DEMING WHEEL - graphic representation of Plan-Do-Study-Act (PDSA). To achieve quality improvement, Dr. Deming says you must plan for it (plan), implement it (do), analyze the results (study), and take action (act) for continuous improvement. Also known as Shewhart cycle.

DEPENDABILITY - the degree to which a product is operable and capable of performing its required function at any randomly chosen time during its specified operating time, provided that the product is available at the start of that period.

(Nonoperation-related influences are not included.) Dependability can be expressed by the ratio:

$$\frac{\text{time available}}{\text{time available} + \text{time required}}$$

DEPLOYMENT - managing the many components and people involved in building the organization culture. Deployment includes the plans, policies, and procedures established by the leadership.

DESIGN OF EXPERIMENTS - a branch of applied statistics dealing with planning, conducting, analyzing, and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters.

DESIGN PHASES - the three phases of the design of a product or process are, according to Taguchi, systems design, parameter design, and tolerance design.

DETAILED PROCESS DIAGRAM - a flowchart, consisting of symbols and words, that completely describes a process.

DETECTION - identification of nonconformance after the fact.

DEVIATION - any nonconformance to a standard or requirement.

DESIGNING IN QUALITY VS. INSPECTING IN QUALITY - implementing quality improvement throughout all phases of the process rather than only inspecting output.

DIAGNOSTIC JOURNEY AND REMEDIAL JOURNEY - a two-phase investigation used by teams to solve chronic quality problems. In the first phase-the diagnostic journey-the team journeys from the symptom of a chronic problem to its cause. In the second phase-the remedial journey-the team journeys from the cause to its remedy.

DOE - design of experiments

DOWNSTREAM - those points in a process that occur *after* one's output.

DRIVING FORCES - those forces that are pushing toward the achievement of a goal.

DUMB RULES - committees with at least one senior executive on each one that is mandated to seek and destroy bureaucratic rules and forms that are no longer useful.

EDUCATION - learning how to think about and solve problems within a specific environment. (Taken from the Academic Board letter dated, 24 May 1993.)

EFFECT - a problem or defect that occurs on the specific job to which a group or team is assigned.

EFFECTIVENESS - a characteristic used to describe a process in which output conforms to requirements.

EFFICIENCY - a characteristic used to describe a process that produces the required output at a perceived minimum cost.

EMPLOYEE INVOLVEMENT - a practice within an organization whereby employees regularly participate in making decisions on how their work areas operate, including making suggestions for improvement, planning, goal setting, and monitoring performance.

EMPOWERMENT - a condition whereby employees have the enabling skills, authority, and resources to make decisions and take action in their work areas without prior approval. For example, an operator can stop a production process if one detects a problem or a customer service representative can send out a replacement product if a customer calls with a problem.

END USER - the ultimate customer for an output.

EXECUTIVE FLOWCHART - a comprehensive eight-column diagram of a process containing the following information: the primary output of the process; the primary customers and their expectations; the person (or position) performing each step; the outputs of various steps in the process, the people who receive them, and their expectations for the outputs; and the suppliers to various steps in the process, the input they supply, and the requirements the input must meet.

EXECUTIVE SPONSOR - the executive champion of a cross-functional strategic process, so named because he or she has pri-

mary responsibility for the key outputs of the strategic process and may oversee the management of most of the people who perform the process. In addition to providing help and resources to the strategic team, the executive process owner serves as a liaison between the executive and strategic teams.

EXPERIMENTAL DESIGN - a formal plan that details the specifics for conducting an experiment, such as which responses, factors, levels, blocks, treatments, and tools are to be used.

EXTERNAL CUSTOMER - a person or organization who receives a product, a service, or information but is not part of the organization supplying it.

EXTRINSIC REWARD - a reward given by other people.

FACILITATOR - one who assists the group or team in applying the TQM tools and techniques.

FAILURE MODE ANALYSIS - a procedure to determine which malfunction symptoms appear immediately before or after a failure of a critical parameter in a system. After all the possible causes are listed for each symptom, the product is designed to eliminate the problems.

FAILURE MODE EFFECTS ANALYSIS - a procedure in which each potential failure mode in every sub-item of an item is analyzed to determine its effect on other sub-items and on the required function of the item.

FAILURE MODE EFFECTS AND CRITICALITY ANALYSIS - a procedure that is performed after a failure mode effects analysis to classify each potential failure effect

according to its severity and probability of occurrence.

FISHBONE DIAGRAM - see "cause-and-effect diagram".

FITNESS FOR USE - a term used to indicate that a product or service fits the customer's defined purpose for that product or service.

FLOWCHART - a graphical representation of the steps in a process. Flowcharts are drawn using a series of generally accepted graphic symbols to illustrate starting and ending points, decision points, and relationships among other points, while better understanding processes. The flowchart is one of the seven classical tools of quality.

FOCUS SETTING - technique used to focus on a specific outcome.

FMA - failure mode analysis.

FMEA - failure mode effects analysis

FMECA - failure mode effects and criticality analysis

FORCE FIELD ANALYSIS - a technique for visually analyzing the forces that will aid or hinder an organization in reaching an objective. An arrow pointing to an objective is drawn down the middle of a piece of paper. The factors that will aid the objective's achievement (called the driving forces) are listed on the left side of the arrow, the factors that will hinder its achievement (called the restraining forces) are listed on the right side of the arrow. This tool was originally developed by psychologist, Kurt Lewin.

FUNCTION - a set of related activities that contribute to a process (e.g., marketing, engineering, accounting, etc.).

FUNCTIONAL ORGANIZATION - an organization responsible for a major organizational function, such as marketing, sales, design, manufacturing, or distribution.

FUNCTIONAL TEAM - a team consisting of representatives from only one function.

FUNNEL EXPERIMENT - an experiment that demonstrates the effects of tampering. Marbles are dropped through a funnel in an attempt to hit a flat-surfaced target below. The experiment shows that adjusting a stable process to compensate for an undesirable result or an extraordinarily good result will produce output that is worse than if the process had been left alone.

GANTT CHART - a type of bar chart used in process planning and control to display planned work and finished work in relation to time.

GAUGE REPEATABILITY AND REPRODUCIBILITY - the evaluation of a gauging instrument's accuracy by determining whether the measurements taken with it are repeatable (i.e., there is close agreement among a number of consecutive measurements of the output for the same value of the input under the same operating conditions) and reproducible (i.e., there is close agreement among repeated measurements of the output for the same value of input made under the same operating conditions over a period of time).

GDT - geometric dimensioning and tolerancing.

GENERIC PRODUCT - the basic item.

GEOMETRIC DIMENSIONING AND TOLERANCING - a method to minimize production costs by showing the dimension

and tolerancing on a drawing while considering the functions or relationships of part features.

GO/NO-GO - state of a unit or product. Two parameters are possible; go (conforms to specification) and no-go (does not conform to specification).

GOAL - the specific desired outcome.

GR&R - gauge repeatability and reproducibility.

GROUP BEHAVIOR NORMS - common or pervasive ways to acting that are found in a group and that persist because group members tend to behave in ways that teach these practices to new members, rewarding those that fit in and sanctioning those that do not.

GROUPWARE - a generic term for several types of software that allows people to create, access, and share information across networks (see MDC in Part III of this guide).

GSA - Government Services Administration.

GUIDELINE - a suggested practice that is not mandatory in programs intended to comply with a standard.

HIGH-LEVERAGE IMPROVEMENT OPPORTUNITY - a potential improvement area (or "hot spot") that data indicate will result in vital progress toward an improvement objective.

HISTOGRAM - a tool that graphically displays a summary of variation in a set of data. The pictorial nature of the histogram lets people see patterns that are difficult to see in a simple table of numbers. The histogram is one of the seven tools of quality.

HITTING THE WALL - a crisis point, or series of setbacks, in which the organization is losing its old culture and the new culture is forming, but not yet firm and viable.

HOSHIN PLANNING - break through planning. A Japanese strategic planning process in which a company develops up to four vision statements that indicate where the company should be in the next five years. Company goals and work plans are developed based on the vision statements. Periodic audits are then conducted to monitor progress.

IDEF - pronounced "Eye-Deaf," a set of modeling techniques that portray the processes and information structure of an organization.

IDP - Individual Development Plan.

IMPERFECTION - a quality characteristic's departure from its intended level or state without any association to conformance to specification requirements or to the usability of a product or service.

IMPROVEMENT METHODOLOGY - a method for making improvements in an organization.

IMPROVEMENT OBJECTIVE - a description of proposed process improvements, including measurements and anticipated data. An improvement objective serves as a short-term improvement target for the strategic or spin-off team that created it. Improvement objectives are often set, met, and set again to drive continuous improvement.

INCAPABLE PROCESS - a process in which the control limits on a chart are outside the specification limits. Incapable processes may produce defective products even when the process is in statistical control.

INFORMATION - a set of related data.

INPUT - the resources and information needed to operate a process. Any given step in a process takes an input, adds some value, and outputs it to the next step.

INPUT-OUTPUT MODEL - a way of describing a work process that lists all the products and services, knowledge/skills, activities, and resources needed to produce another product or service.

INSPECTION - measuring, examining, testing, or gauging one or more characteristics of a product or service and comparing the results with specified requirements to determine whether conformity is achieved for each characteristic.

INSTANT PUDDING - a term used to illustrate an obstacle to achieving quality: the supposition that quality and productivity improvement is achieved quickly through an affirmation or faith rather than through sufficient effort and education. W. Edwards Deming used this term-which was initially coined by James Bakken of the Ford Motor Co., in his book *Out of Crisis*.

INTEGRATED PRODUCT TEAM (IPT) - A subset of a Program Team. It is typically comprised of individuals from multiple competencies and is led by a Team Leader. An IPT for a major product may itself be comprised of multiple IPTs, associated with key sub-products. An IPT is multidisciplinary in nature, and will be responsible for its products (either goods, services, or a combination of the two) in accordance with Program Manager cost/schedule/performance guidelines and in consonance with the philosophy of self-managing, empowered teams.

INTERNAL CUSTOMER - the recipient (person or department) of another person's or department's output (product, service, or information) within an organization.

IN-CONTROL PROCESS - a process in which the statistical measure being evaluated is in a state of statistical control (i.e., the variations among the observed sampling results can be attributed to a constant system of chance causes). (See "out-of-control process")

IN-PLANT QUALITY EVALUATION PROGRAM (IQUE) - method by which in-plant government personnel evaluate contractor controls over product quality.

IN-STATISTICAL CONTROL - what is said of a process affected only by common causes; that is, points on the control chart fall within the control limits and show only random variation. When a process is in statistical control, performance can be predicted from past measurements. You should not take action when a process is in statistical control; overcorrecting a process increases, rather than reduces, variation.

ISO 9000 SERIES STANDARDS - a set of five individual but related international standards on quality management and quality assurance developed to help companies effectively document the quality system elements to be implemented to maintain an efficient quality system. The standards, initially published in 1987, are not specific to any particular industry, product, or service. The standards were developed by the International Organization for Standardization (ISO), a specialized international agency for standardization composed of the national standards bodies of 91 countries.

JUST-IN-TIME MANUFACTURING - an optimal material requirement planning sys-

tem for a manufacturing process in which there is little or no manufacturing material inventory on hand at the manufacturing site and little or no incoming inspection.

KAIZEN - a Japanese term that means gradual unending improvement by doing little things better and setting and achieving increasingly higher standards. The term was made famous by Masaaki Imai in his book *Kaizen: The Key to Japan's Competitive Success*.

LEAD - Leadership Education and Development.

LEADERSHIP OFF-SITE - Quality Executive Retreat is a three-day session conducted by Achieve for executive groups about to undertake a comprehensive service/quality initiative. It acquaints executives with the details of a service/quality initiative. They emerge from the Retreat understanding the level of commitment required to make the initiative successful. It also provides them with an opportunity to determine whether they are, indeed, ready to proceed.

LEARN-USE-TEACH-INSPECT (LUTI) - term referring to the responsibilities of group managers in implementing Quality Management. In training led by their managers, groups first learn (L) the principles and tools of quality, then the family group uses (U) the principles and tools in their work. The group members then teach (T) these same principles and tools to their subordinates. Finally, they inspect (I) the application of the philosophy and tools used by their subordinates and make recommendations. Inspect, in this case, means coach, monitor, encourage, retrain, facilitate, and so on; not just "inspect."

LEAD TEAM - a team that oversees several other teams.

LIFE CYCLE COST - the total cost of a system or item over its full lifetime, including the cost of acquisition, ownership, and disposal.

LINE CHART - a chart that describes and compares quantifiable information.

LISTENING TO CUSTOMERS - service/quality can be defined only through the eyes of the customers. Priorities, measurements, resource allocations, etc. must be developed from the outside in. Methods dialogue, market research focus groups, advisory groups, customer surveys, customer hot lines, customer complaints, team visits, user groups and conferences, quality function deployment, etc. NOTE: If you are going to listen, be prepared to act on what you hear.

LIST REDUCTION - method for processing outputs of brainstorming session. It clarifies options so all group members understand and then reduces options to a manageable number.

LOGISTICS - the aspect of military science dealing with the procurement, maintenance, and transportation of materiel, facilities, and people.

LOSS FUNCTION - the function of an organization that examines the costs associated with any variation from the target value of a quality characteristic.

LOT - a defined quantity of product accumulated under conditions that are considered uniform for sampling purposes.

LOWER CONTROL LIMIT (LCL) - control limit for points below the central line in a control chart.

MAINTAINABILITY - the probability that a given maintenance action for an item un-

der given usage conditions can be performed within a stated time interval when the maintenance is performed under stated conditions using stated procedures and resources. Maintainability has two categories: serviceability (the ease of conducting scheduled inspections and servicing) and repairability (the ease of restoring service after a failure).

MAINTENANCE - routine duties required to make available all of the past improvements made in the details and management of the work process, on a daily basis. This is driven by a disciplined dedication to the continuous accumulation of past improvements, and by standardization (either written or understood) of these improvements in the daily work process.

MALCOLM BALDRIGE NATIONAL QUALITY AWARD - The United States equivalent of the Deming Prize. This is the most prestigious Quality prize in North America, and is available only to U.S. companies. The application criteria are very demanding. Winners include: Xerox, Motorola, Miliken, IBM, and Federal Express. A U.S. government award established by the National Quality Improvement Act of 1987 to promote quality awareness, recognize quality achievements of U.S. companies, and publicize successful quality strategies. Two awards may be given annually in three categories: manufacturing company, service company, and small business. Companies submitting entries are judged by Baldrige examiners according to criteria which include seven categories: leadership; information and analysis; strategic quality planning; human resource development and management; management of process quality; quality and operational results; and customer focus and satisfaction. The award is named after the late Secretary of Commerce Malcolm Baldrige, a proponent of quality

management. The U.S. Commerce Department's National Institute of Standards and Technology manages the award, and administered by ASQC.

MANAGEMENT - the leadership of an organization.

MANUFACTURING RESOURCE PLANNING II (MRPII) - system for planning and controlling a manufacturing company's operation.

MAPPING - (as in process mapping) - the first step taken by the Design Team in a reengineering project.

MEAN TIME BETWEEN FAILURES - the average time interval between failures for repairable product for a defined unit of measure (e.g., operating hours, cycles, miles).

MEASURABLE CHARACTERISTIC - a general description of that measurable part of the process - such as errors in shipment - that a team needs to improve in order to achieve its improvement objectives.

MEASUREMENT - a key element in quality improvement. Gathering data to estimate performance. The data should be gathered at early and strategic points in the process so that potential problems can be prevented before they become problems that must be fixed. The later stages of the process are measured to verify that the output is meeting the customer's requirement.

MEETING - the technique of bringing people together in a group to work for a common goal.

MEETING ASSESSMENT - a process where the team collects information about the effectiveness of their meeting; done to

focus the team on how their meeting skills are doing so that they can continually improve (see *Team Handbook*).

MEETING ROLES - the roles listed below have been established as the minimum number required to operate meetings successfully within the Total Quality Management environment. If fewer than five people are present then multiple roles will need to be assigned. Members may assume multiple roles as required; for example: leader/scribe, scribe/recorder, facilitator/process guide, process guide/timekeeper, etc. (see *Team Handbook*).

Facilitator - helps a group or team (usually in meetings) free itself from internal obstacles or difficulties so the group may more efficiently and effectively do its work; focuses on how the members are working with each other. A group interaction improver.

Process guide - helps the group execute a process and apply tools.

Recorder - keeps detailed notes during the meeting in order to publish minutes. Techniques: review how the minutes will read for each agenda item as the group finishes with each item; a highly skilled word processing person can take minutes real time, print them, and distribute them before the participants leave.

Team leader - responsible for leading the team and managing the meeting process. The highest ranking person present does not necessarily have to become the team leader, sometimes this is the person with the most knowledge or background on the meeting agenda item(s).

Timekeeper - responsible for seeing that meetings begin and end on time, sets

break time and recalls members to restart meetings at end of breaks, keeps the team aware of agreed-upon time limits for each part of the agenda, reallocates time for agenda items as agreed to by the team.

Scribe - publicly records (writes on flip chart or white board, so everyone can view the information) the team's ideas, decisions, and recommendations. May also act as a recorder, subsequently publishing and distributing the minutes of the meeting.

MENTOR - a person assigned as management interface support for a team.

METACOGNITION - consciousness or awareness of the thinking and learning process itself and of the ways in which students learn best; knowing what one knows.

METRICS - using the results of measurement to eliminate problems and improve processes.

MIL-Q-9858A - a military standard that describes quality program requirements.

MIL-STD-105E - a military standard that describes the sampling procedures and tables for inspection by attributes.

MIL-STD-45662A - a military standard that describes the requirements for creating and maintaining a calibration system for measurement and test equipment.

MISSION - a brief statement that summarizes a group's (or team's) reason for being. It is the written statement given for the creation of the group and the assignment of the task which identifies: who the group is, what the group is to do, who the work is being done for, and why the work is being done.

MISTAKE PROOFING - technique for avoiding simple, human error at work; poka yoke.

MODEL - a simplified version of an actual phenomenon (e.g., flowcharts model activities in an organization process).

MOMENT OF TRUTH CONCEPT (MOT) - the moment when one has the opportunity to meet (or exceed) a customer's expectations during the customer transaction. When the customer uses the product or service. (Albrecht, 1992)

MONITORING MEASURE - a specific formula or calculation that shows how well a process is performing against an improvement objective. For example, if an improvement objective is "reduce the number of new products returned by customers because of shipping errors from three to zero per week," the monitoring measure might be the "number of returns per week."

MONITORING PLAN - a way to measure and track how a process is performing, including the impact of improvements on the process. A monitoring plan includes a measurable attribute, a process quality indication, a unit of measure, a data collection plan, and the charting of data to track performance.

MTBF - mean time between failures.

MULTIVARIATE CONTROL CHART - a control chart for evaluating the stability for a process in terms of the levels of two or more variables or characteristics.

NECESSARY AND AVOIDABLE COSTS - the two types of costs that make up the cost of quality. Necessary costs are required to achieve and sustain a defined standard of work. Avoidable costs occur whenever wrong things are done or things are done

wrong. Necessary costs include prevention and inspection costs. Avoidable costs include some inspection (or appraisal) costs and failure costs.

NOMINAL GROUP TECHNIQUE - a technique, similar to brainstorming, used by teams to generate ideas on a particular subject in order to make decisions. Team members are asked to silently come up with as many ideas as possible, writing them down. Each member is then asked to share ideas one at a time in round-robin sequence as they are recorded. After all the ideas are recorded, they are discussed and prioritized by the group.

NONCONFORMITY - the nonfulfillment of a specified requirement.

NONDESTRUCTIVE TESTING AND EVALUATION - testing and evaluation methods that do not damage or destroy the product being tested.

NON-VALUE-ADDED - term used to describe a process, activity, or task that does not provide any value to the product.

NON-VALUE-ADDED ACTIVITY - steps in an organizational process that a customer doesn't care about, and wouldn't pay for, e.g., reviews, re-works, and sign-offs.

np CHART - number of affected units chart.

NPR - National Performance Review

NUMBER OF AFFECTED UNITS CHART - a control chart for evaluating the stability of a process in terms of the total number of units in a sample in which an even number of a given classification occurs.

OC CURVE - operating characteristic curve.

OLE - Organizational Leadership for Executives - U.S. Army sponsored required training program.

OPERATING CHARACTERISTIC CURVE - a graph used to determine the probability of accepting lots as a function of the lots' or processes' quality level when using various sampling plans. There are three types: Type A curves, which give the probability of acceptance for an individual lot coming from finite production (will not continue in the future); Type B curves, which give the probability of acceptance for lots coming from a continuous process; and Type C curves, which, for a continuous sampling plan, give the long-run percentage of product accepted during the sampling phase.

OPERATIONAL DEFINITION - clear and highly specific explanation of terms that are used in the improvement process. In order to pursue that process, everyone involved must have the same understanding of the meanings of these terms.

OPPORTUNITY FOR IMPROVEMENT - Either a problem preventing one from meeting a customer expectation, or a chance to exceed customer expectations.

OPTIMIZATION - deriving the best possible outcome from a system by focusing on the entire system rather than only its parts. Rendering a system fully effective demands an understanding of system purpose and customer needs as well as an appreciation of variation.

OUTCOME - impacts and/or consequences resulting from the outputs of a process.

OUT-OF-CONTROL PROCESS - (1) a process in which the statistical measure being evaluated is not in a state of statistical control

(i.e., the variations among the observed sampling results can be attributed to a constant system of chance causes); a process for which the outcome is unpredictable. (2) A system is said to be statistically out of control when data points fall outside statistically calculated control charts; when there is a run of seven points or more that are either above or below the center line; when a run of data points goes in the same direction (up or down); or when data patterns appear too close or too far from the average. Analysis is based on the data itself, not on subjective judgment.

OUT-OF-SPEC - a term used to indicate that a unit does not meet a given specification.

OUTPUT - information, material, products, or services produced by an individual, team, functional group, or organization as the result of a process.

OWNER - the person who can change the process without further approval.

OWNERSHIP - the power to have control over; possessing the authority to carry out the required actions.

p CHART - see Percent Chart.

PAIRED COMPARISONS - a voting method to help a group quantify the preferences of its members by comparing head-to-head each option with every other option.

PARADIGM - the result of a person's experiences which creates the perceptions they use to estimate the accuracy of information. A person's way of seeing, categorizing, filtering, or rejecting information. A mind-set or an attitude.

PARAMETER (OR ROBUST) DESIGN - design of product (or process) that makes the performance (or output) insensitive to variation by moving toward the best target values of quality characteristics.

PARAMETRIC DESIGN - the design phase in which the sensitivity to noise, or the disruption of a function, is reduced.

PARETO CHART - a graphical tool for ranking causes from most significant to least significant. It is based on the Pareto principle, which was first defined by J. M. Juran in 1950. The principle, named after 19th-century economist Vilfredo Pareto, suggests that most effects come from relatively few causes; that is, 80 percent of the effects come from 20 percent of the possible causes. The Pareto chart is one of the seven tools of quality.

PARETO DIAGRAM - like a histogram, this can also be considered a type of bar chart. It provides additional information, however, by ranking related items with respect to frequency of occurrence, from greatest to least. This helps to separate items that are significant in terms of number of occurrences from those that are less significant. A cumulative percentage line appears above the bars. This tool was developed by Italian economist Vilfredo Pareto.

PARETO'S PRINCIPLE - the principle that a large percentage of the results are caused by a small percentage of the causes. For instance, 80 percent of results are caused by 20 percent of causes.

PDSA CYCLE - See Plan-Do-Study-Act.

PEOPLE INVOLVEMENT - individual and group activities.

PERCENT CHART - a control chart for evaluating the stability of a process in terms of the percent of the total number of units in a sample in which an event of a given classification occurs. The percent chart is also referred to as a proportion chart.

PERFORMANCE - a term used to describe both the work product itself and a general process characteristic. The broad performance characteristics that are of interest to management include quality (effectiveness), cost (efficiency), and schedule. Performance is the highly effective common measurement that links the quality of the work product to efficiency and productivity

PERFORMANCE STANDARD - No non-conformance. Meeting customer requirements completely and consistently. Once a customer and supplier mutually establish a clearly defined, well understood requirement, the supplier's performance standard, then, is to meet that requirement every time. "Close enough" doesn't meet the performance standard. If the requirement isn't being met every time, the customer and supplier get together to improve their process to reduce or eliminate the nonconformances. Crosby calls this "zero defects."

PERT CHART - an acronym formed from the words Program Evaluation and Review Technique. A method used for complex projects to manage time and cost. Similar to Critical Path Method (CPM).

PIE CHART - a chart in circular form that is divided to show the relationship between items and the whole.

PLAN - a specified course of action designed to attain a stated objective.

PLAN-DO-STUDY-ACT CYCLE - a four-stage process for quality improvement. In the first stage (plan), a plan to effect im-

provement is developed. In the second stage (do), the plan is carried out, preferably on a small scale. In the third stage (study), the effects of the plan are observed. In the last stage (act), the results are studied to determine what was learned and what can be predicted. The four stages of plan-do-study-act are essential to continuous improvement success, and are the basis for a seven-step improvement process that is characterized by improvement efforts. (The seven steps are (1) defining the system; (2) assessing the current situations; (3) analyzing causes; (4) trying out an improvement theory; (5) studying the results; (6) standardizing the improvement; and (7) planning for continuous improvement.) The plan-do-study-act cycle is sometimes referred to as the Shewhart cycle (because Walter A. Shewhart discussed the concept in his book *Statistical Method From the Viewpoint of Quality Control*) and as the Deming cycle (because W. Edwards Deming introduced the concept in Japan). It is also referred to as the Plan-Do-Check-Act cycle.

POKA YOKE - see mistake proofing.

POLICY - a statement of principles and beliefs, or an adopted course, to guide the overall management of affairs in support of a stated aim or goal. It is largely related to fundamental conduct and usually defines a general framework within which other business and management actions are carried out.

POPULATION - a complete collection of items (product observations, data) about certain characteristics that is then used to make conclusions and decisions for the purpose of process assessment and quality improvement.

POTENTIAL PRODUCT - anything that can be used to attract and hold customers beyond the augmented product.

POWER FIXES - a highly visible, senior management level action that eliminates performance barriers and increases subordinates' level of authority.

PRESENTATION - tool for providing information, gaining approval, or requesting action.

PREVENTION - a future-oriented approach to quality management that achieves quality improvement through corrective action on a process.

PREVENTION COSTS - costs incurred in product or process planning to ensure that defects do not occur.

PROBLEM - a question or situation proposed for solution; an opportunity or "treasure" that motivates us to improve our processes.

PROBLEM STATEMENT - a statement that describes in specific, concrete, and measurable terms what is wrong. The problem statement is made up of the as-is state and desired state.

PROCESS - Three definitions:

1. A definable, repeatable, and predictable activity that starts with an input, adds value to it, and produces an output - for either an internal or external customer.

2. Specific: A standardized sequence or method for reaching a goal. There are two main processes:

- a. Problem-Solving Process (PSP).
- b. Quality Improvement Process (QIP).

3. General: A series of actions that transforms inputs into outputs. A set of sequential tasks that takes an input from

supplier, works on that input so that it changes into an output, and supplies that output to the next customer. All work (loading bombs, five-year defense plans, work scheduling, typing, making your breakfast, etc.) is a process that can be broken down into steps where suppliers' outputs become customers' inputs.

PROCESS ACTION TEAM (PAT) - a cross-functional work team made up of experienced employees from different departments brought together to solve problems and control processes which cross functional lines. These are workforce level teams. (See Spin-off team.)

PROCESS ANALYSIS - tool used to improve a process and reduce process time by eliminating non-value-added activities and/or simplifying the process.

PROCESS CAPABILITY - long-term performance level after a process has been brought under control.

PROCESS CAPABILITY INDEX - the value of the tolerance specified for the characteristic divided by the process capability. There are several types of process capability indexes, including the widely used C_{pk} and C_p .

PROCESS CONTROL - in statistics, the set of activities used to detect and remove special causes of variation in order to maintain or restore stability.

PROCESS DESIGN - the development of a process.

PROCESS DIAGRAM - a tool for defining a process.

PROCESS IMPROVEMENT - the set of activities used to detect and remove com-

mon causes of variation in order to improve process capability. Process improvement leads to quality improvement.

PROCESS IMPROVEMENT TEAM - a team of employees with representative skills and functions chosen to work on a specific process or processes.

PROCESS LOGISTICS - all aspects of logistics within an organization.

PROCESS MANAGEMENT - a management approach comprising quality management and process optimization.

PROCESS OPTIMIZATION - the major aspect of process management that concerns itself with the efficiency and productivity of the process, that is, economic factors.

PROCESS OWNER - a designated person within a process who has the authority to manage the process and is responsible for its overall performance.

PROCESS PERFORMANCE - a measure of the effectiveness and efficiency with which a process satisfies customer requirements.

PROCESS PROFILE - a summary description of the scope of a strategic process. It includes key outputs, external customers, groups, or departments involved in the process, and its starting and ending points. An executive team creates a process profile to establish the scope of a strategic process and to determine who should be on a strategic team.

PROCESS REENGINEERING - a radical changing and restructuring of business processes. Process reengineering - or innovation - can help organizations make major gains against critical competitive or finan-

cial issues. It is used when competitive pressures, financial necessities, or technological breakthroughs mandate (or at least allow) a radical redesign of a process. Process reengineering is an integral part of process management, not a stand-alone approach, and is accomplished with process management tools and techniques. It is an optional path toward improvement when standardization and incremental improvements are not enough.

PROCESS REVIEW - an objective assessment of the methodology applied to a process, with emphasis on the potential for long-term process results rather than the actual short-term results achieved.

PRODUCT - an output of a process provided to an internal or external customer, including goods, systems, equipment, hardware, software, services, and information.

PRODUCT DESIGN - the development of the product.

PRODUCTION PROCESS - the manufacture of the product.

PRODUCTIVITY - the value added by the process divided by the value of the labor and capital consumed.

PROJECT TEAM - a team of individuals at any level who are selected by either a spin-off team or strategic team to solve specific problems or work on specific projects. A project team generally disbands once the work is completed.

PURPOSE - the aim of a system or of a system improvement. Purpose is determined through leadership and consensus, and is closely related to the needs and expectations of the customers of the system.

QIP (QUALITY IMPROVEMENT PROCESS) - a logical, systematic, and disciplined approach used to continually improve new or existing processes. An elaboration of PDSA cycle with emphasis on the "P".

QIT (QUALITY IMPROVEMENT TEAM) - a team brought together to improve a process or solve a problem. Also called a Process Action Team.

QUALITY - conformance to requirements. Quality happens when the supplier and customer mutually establish a clearly understood requirement and then the supplier meets (or exceeds to the mutual benefit) the requirement. When the customer is satisfied or more than satisfied (delighted), quality is in place for that process. The customer defines quality; when their needs change, the supplier will work with the customer to meet those changed needs.

QUALITY CONTROL - the process of measuring quality performance, comparing it with the standard, and acting on the difference. Generally an older term associated with inspection as a way to weed out low-quality products and services.

QUALITY COORDINATOR - the senior staff person assigned by the executive steering committee or quality council to write the service/quality plan and advise senior executives of the details of the quality rollout. Coordinators, who usually work closely with the executive team, create strategic and tactical implementation plans and help get them launched. Coordinators may also perform the functions of the internal process management consultant.

QUALITY (DoD) - conformance to a set of customer requirements that, if met, result

in a product or service that is fit for its intended use.

QUALITY FORUM - an informal network for those at DSMC interested in discussing quality practices; held in 1993-94. In 1995 these forums were incorporated into the elective program for the Program Management Course (PMC).

QUALITY FUNCTION DEPLOYMENT (QFD) - a disciplined approach used to transform customer requirements (the voice of the customer) into product development requirements.

QUALITY GRID - a quality improvement concept that divides work into what you do (doing right things) and how you do it (doing things right).

QUALITY IMPROVEMENT - a way of life for organizations adopting the quality culture. The opposite of "if it works, don't fix it." A part of the culture change which demands that all processes can and should be continually improved.

QUALITY IMPROVEMENT STORY - a systemic approach to process improvement in order to anticipate a customer's needs and expectations that are graphically represented by steps taken to improve processes or systems.

QUALITY IMPROVEMENT TEAM - a group of individuals charged with the responsibility of planning and implementing quality improvement.

QUALITY LEARNING (QL) - a systemic approach to the learning process which relies on a complete philosophy of education that includes adult learning theory, continual improvement, motivation, systems thinking, profound knowledge, and brain

theory. It is based on the tenets that learning is fun and intrinsically motivating, change is good, failure is a positive learning experience, people can learn to become responsible for their own learning process, ranking and rating (grading) are destructive to the learning process, and people can manage themselves given training and the opportunity. The term is a trademark of David Langford.

QUALITY (PRODUCT) - conformance to requirements.

QUALITY (TAGUCHI) - the measure or degree of loss a product causes after being shipped, other than any losses caused by its intrinsic functions.

QUINCUNX - a tool that creates frequency distributions. Beads tumble over numerous horizontal rows of pins, which force the beads to the right or left. After a random journey, the beads drop into vertical slots. After many beads are dropped, a frequency distribution results. In the classroom, quincunxes are often used to simulate a manufacturing process. The quincunx was invented by English scientist Francis Galton in the 1890's.

QWG - Quality Work Group (at DSMC October 1992 - October 1993).

R-CHART - a control chart of the range of variables as a function of time, lot number or similar chronological variable.

RAB - Registrar Accreditation Board.

RAM - reliability/availability/maintainability.

R&M 2000 - the reliability and maintainability approach of the Department of Defense to increase combat capability by reducing costs through specific practices.

RANDOM SAMPLING - a commonly used sampling technique in which sample units are selected in such a manner that all combinations of units under consideration have an equal chance of being selected as the sample.

RANDOM VARIATION - the combined effect of all factors causing random differences between data points. The causes of random variation are called common causes.

RANGE - the difference between the maximum value and the minimum value of data in a sample.

RANGE CHART - a control chart in which the subgroup range, R , is used to evaluate the stability of the variability within a process.

RECOGNITION - special attention paid to an individual or group.

RED BEAD EXPERIMENT - an experiment developed by W. Edwards Deming to illustrate that it is impossible to put employees in rank order of performance for the coming year based on their performance during the past year because performance differences must be attributed to the system, not to employees. Four thousand red and white beads (20 percent red) in a jar and six people are needed for the experiment. The participants' goal is to produce white beads, because the customer will not accept red beads. One person begins by stirring the beads and then, blindfolded, selects a sample of 50 beads. That person hands the jar to the next person, who repeats the process, and so on. When everyone has his or her sample, the number of red beads for each is counted. The limits of variation between employees that can be attributed to the system are calculated. Everyone will fall within the calculated limits of variation that

could arise from the system. The calculations will show that there is no evidence one person will be a better performer than another in the future. The experiment shows that it would be a waste of management's time to try to find out why, say, John produced four red beads and Jane produced 15 percent; instead, management should improve the system, making it possible for everyone to produce more white beads.

REENGINEERING - fundamental organizational change effort to improve performance through occasional quantum leaps and questioning existing structures and systems (see Appendix D).

REGRESSION ANALYSIS - a statistical technique for determining the best mathematical expression describing the functional relationship between one response and one or more independent variables.

RELIABILITY - the probability of a product performing its intended function under stated conditions without failure for a given period of time.

REQUIREMENT - a formal statement of a particular need and the expected manner in which it is to be met.

REQUIREMENTS - expectations for a product or service. The "it" in "Do it right the first time." Specific and measurable customer needs with an associated performance standard.

RESTRAINING FORCES - forces that keep a situation from improving.

REWARD - recompense, either external or internal. External rewards to an individual are controlled by other people; they are pay, promotion, and benefits. Internal rewards come from the task or individual; they in-

clude things such as a challenge, a feeling of accomplishment, a feeling of belonging, and a sense of pride.

RICOCHETS, RECOVERIES, AND BRIDGES - terms used in *Firing on All Cylinders* (J. Clemmer, B. Sheehy, and Associates) to describe the Three Rings of Perceived Value.

Ricochet: Failure of first or second ring. Any product, service, or output of a process which does not meet the customers' requirements or expectations (i.e., errors, defects, scraps).

Recovery: A pre-impact recovery is any action an organization takes to prevent a ricochet from hitting the customer. A post-impact recovery is any action an organization takes to do it right the second time after a ricochet hits the customer in order to reverse the customer's shrinking perception of value.

Bridge: A bridge is a systematic investigation into the root cause of a ricochet to determine how processes or systems can be improved to prevent future ricochets; correct action.

RIGHT THE FIRST TIME - a term used to convey the concept that it is beneficial and more cost-effective to take the necessary steps up front to ensure a product or service meets its requirements than to provide a product or service that will need rework or not meet customer's needs. In other words, an organization should engage in defect prevention rather than defect detection.

ROBUST DESIGN - the design of a product for minimal quality losses.

ROBUSTNESS - the condition of a product or process design that remains relatively

stable with a minimum of variation even though factors that influence operations or usage, such as environment and wear, are constantly changing.

ROOT CAUSE - underlying reason for non-conformance within a process. When it is removed or corrected, the nonconformance is eliminated.

RULES OF CONDUCT - rules that provide guidance for group or team conduct.

RUN CHART - a statistical tool that records data chronologically. Observations are entered on a chart over a period of time in order to observe a system's behavior with respect to trends and patterns. After collecting data over a sufficient period of time, a control chart can be constructed that provides additional information about the system.

SAQ - Special Assistant for Quality.

s CHART - sample standard deviation chart.

SAMPLE - a finite number of items taken from a population.

SAMPLE SIZE - number of units to be selected for the random samples.

SAMPLE STANDARD DEVIATION CHART - a control chart in which the subgroup standard deviation s , is used to evaluate the stability of the variability within a process.

SAMPLING - the collection of some, but not all, of the data.

SATISFACTION - a mandatory condition that the supplier ensures for the customer.

SCATTER CHART - a chart that depicts the relationship between two or more factors.

SCATTER DIAGRAM - a graphical technique to analyze the relationship between two variables. Two sets of data are plotted on a graph, with the y axis being used for the variable to be predicted and the x axis being used for the variable to make the prediction. The graph will show possible relationships (although two variables might appear to be related, they might not; be those who know most about the variables must make that evaluation). The scatter diagram is one of the seven tools of quality.

SCRAP - the loss in labor and materials resulting from defects that cannot economically be repaired or used.

SELECTION GRID - tool for comparing each problem, opportunity, or alternative against all others.

SELECTION MATRIX - technique for rating problems, opportunities, or alternatives based on specific criteria.

SEVEN TOOLS OF QUALITY - the seven classical tools are: flowchart, Pareto chart, cause-and effect diagram, check sheet, histogram, scatter diagram, and the control chart.

SHARED VALUES - Important concerns and goals that are shared by most of the people the group, that tend to shape group behavior and that often persist overtime even with changes in group membership (Kotter & Heskett, 1992).

SHEWHART CYCLE - see "plan-do-study-act" cycle.

SIGNALING LEADERSHIP COMMITMENT - those visible actions effective senior managers take to signal strong, unmistakable commitment to service/quality improvement and to personally lead

the journey. Since actions speak louder than words, leadership needs to work hard on visibly signaling commitments so strongly and consistently that there can be no room for doubt. Areas that need this signaling are:

(a) teamwork (research concludes that the way an organization behaves as a whole is a reflection of the way the executive team behaves);

(b) continually learning the skills of teaming and improvement techniques; and

(c) management by wandering around.

SIGNAL-TO-NOISE RATIO - a mathematical equation that indicates the magnitude of an experimental effect above the effect of experimental error due to chance fluctuations.

SKILL DEVELOPMENT - equips all players with the tools, techniques, and skills to enable them to contribute and support service/quality; this is the "knowing how to do" something, which differs from knowing about something.

Skills are divided into (1) technical, (2) data based tools and techniques, and (3) interpersonal, human, or people skills.

(1) Technical skills are specific skills needed to do a specific function; core competencies for a job.

(2) Data based tools and techniques involve collecting relevant data on a problem or process in order to analyze using statistical tools and then determine root causes. Tools and techniques include elementary statistics such as the "seven classical tools," the new management and

planning tools, process management, and structured problem-solving.

(3) Interpersonal, human, and people skills are considered the lubricates to maintain data based tools and techniques. How to participate in a team is a skill. These skills include coaching, consensus building, conflict management, meeting management, facilitation, etc.

SIMULATION - technique of observing and manipulating an artificial mechanism (model) that represents a real-world process that, for technical or economical reasons, is not suitable or available for direct experimentation.

SIX-SIGMA QUALITY - a term used generally to indicate that a process is well within specifications i.e., that the specified range is ± 6 standard deviation. The term is usually associated with Motorola, which named one of its key operational initiatives "Six Sigma Quality."

S/N RATIO - signal-to-noise ratio.

SOLUTION - a change that can successfully eliminate or neutralize a cause of defects.

SOP - the acronym for standard operating procedure.

SORTING - arranging information in some order, such as in classes categories.

SPC - statistical process control.

SPECIAL CAUSE - an abnormal cause of variation in a process - causes of variation that arise because of special circumstances. They are not an inherent part of a process. Special causes are also referred to as assignable causes. Unexpected variation that occurs whenever a measurement falls outside

the normal range of variation (outside the control limits). Special causes of variation

- are small in number within the process
- individually can have a large effect on the process
- affect the process in unpredictable ways
- should be removed

SPECIFICATION - a document containing a detailed description or enumeration of particulars. Formal description of a work product and the intended manner of providing it. (The provider's view of the work product.) The level of performance required by a customer of a product or process.

SPECIFICATION LIMITS - limits established for a process that are determined by engineering or customer inputs. Specification limits are applied to individual occurrences and are not related to natural tolerance limits.

SPIN-OFF TEAM - a team of individuals appointed by the strategic team to take responsibility for improving a sub-process within a strategic process. Spin-off teams are generally temporary and can be functional or cross-functional.

SPIN-OFF TEAM LEADERS - a member of a strategic team with primary responsibility for the sub-process identified as a key improvement opportunity by the strategic team. A spin-off team leader remains a member of the strategic team.

SQC - statistical quality control.

STABLE PROCESS - a process in statistical control; consistent, variation.

STANDARD DEVIATION - a parameter describing the spread of the process output. The positive square root of the variance.

STANDARDIZATION - the activities involved in ensuring that a process operates in a controlled way to produce consistent, predictable outputs.

STANDARDS AND SPECIFICATIONS - overall requirements for a process as a whole (rather than for one or more specific steps). Standards and specifications are requirements that must be met in order for the process to be working "up to expectations." Examples are timelines, error rates, and tolerance specifications.

STATISTIC - any parameter that can be determined on the basis of the quantitative characteristics of a sample.

STATISTICAL CONTROL - term used to describe a process from which all special causes of variation have been removed, leaving only common causes. Such a process is also said to be stable.

STATISTICAL ESTIMATION - the analysis of a sample parameter for the purpose of predicting the values of the corresponding population parameter.

STATISTICAL METHODS - the application of the theory of probability to problems of variation.

STATISTICAL PROCESS CONTROL (SPC) - the use of data and statistical tools to monitor processes over time. SPC helps to prevent problems in a system rather than merely detecting those that are occurring.

STATISTICAL QUALITY CONTROL - the application of statistical techniques to control quality. Often the term "statistical process control" is used interchangeably with

"statistical quality control," although statistical quality control includes acceptance sampling as well as statistical process control.

STATISTICS - the branch of applied mathematics that describes and analyzes empirical observations for the purpose of predicting certain events in order to make decisions in the face of uncertainty.

STEERING GROUP - an executive-level steering committee.

STRATEGIC IMPERATIVES - issues or objectives arising from the business strategy which are essential to your success. The key question is "What are those things we must accomplish in the next 36-48 months for our business to be successful?" Also referred to as "imperatives" or critical success factors.

STRATEGIC PROCESS - one of the handful of large-scale processes which define an organization. Taken together, they answer the question, "What does the organization do?" Strategic processes are almost always cross-functional.

STRATEGIC PROCESS MANAGEMENT - an organization's efforts to document, monitor, standardize, improve, and possibly pursue innovation for its strategic processes. Strategic process management also includes a structure of related terms.

STRATEGIC QUALITY MANAGEMENT PLANNING CYCLE - a plan consisting of several stages: defining the vision, determining strategic improvement opportunities, selecting strategic opportunities for improvement, developing and maintaining the QM action plan using a disciplined methodology, evaluating results, and doing it over again in a never-ending cycle.

STRATEGIC TEAM - (or strategic process management team) is a team of managers representing different functions involved in a strategic process earmarked for improvements. A strategic team is appointed by the executive team.

STRATEGIC TEAM LEADER - the functional manager who has primary responsibility for a major or critical piece of the strategic process. The strategic team leader has the critical responsibilities of communicating progress to the executive team and/or executive process owner and of keeping the effort on track. Although this person heads up the strategic team, the actual leading of team meetings may be shared with the internal process management consultant and/or other team members.

STRATEGIC TEAM MEMBERS - upper and middle managers who represent the functions that make up a strategic process selected by the executive team for improvement. Strategic team members may also become eventual leaders of the spin-off teams their strategic team appoints.

STRATEGY - a broad course of action, chosen from a number of alternatives, to accomplish a stated goal in the face of uncertainty.

STRETCH GOALS - goals beyond what is easily achievable, which will require a change or improvement in current processes in order to reach the goal in the specified time.

STRUCTURE - certain formal organizational arrangements.

STRUCTURAL VARIATION - variation caused by regular, systematic, changes in output, such as seasonal patterns and long-term trends.

STUMP SPEECH - the speech which tells the leader/organization's philosophy of quality. It includes organization's business, where the organization is going, and organizational beliefs. This speech helps to focus and guide the organization, while helping to push operations down to where they belong.

SUB-PROCESSES - the internal processes that make up a process.

SUBOPTIMIZATION - a phenomenon that occurs when attention or resources are diverted to a subsystem or a part of a system without considering the effect that will be derived by the system as a whole.

SUBSYSTEM - a component of a larger system, to which the same understandings of customer, purpose, and variation apply. Subsystems contribute to the purpose of the larger system of which they are parts, even though they may have specifically defined purposes of their own.

SUPPORT SYSTEM - a system within an organization that guides the organization through the QM process.

SUPPLIER - the person or group who provides input(s) to a process. Suppliers can be internal or external. The supplier's output is the input to the customer, the next step in the process.

SUPPLIER/CUSTOMER ANALYSIS - techniques used to obtain and exchange information for conveying an organization's needs and requirements to suppliers and mutually determining the needs and expectations of the customers.

SUPPLIER LOGISTICS - all the logistics inputs into an organization.

SUPPLIER QUALITY ASSURANCE - confidence that a supplier's product or service will fulfill its customer's needs. This confidence is achieved by creating a relationship between the customer and supplier that ensures the product will be fit for use with minimal corrective action and inspection. According to J. M. Juran, there are nine primary activities needed: 1) define product and program quality requirements, 2) evaluate alternative suppliers, 3) select suppliers, 4) conduct joint quality planning, 5) cooperate with the supplier during the execution of the contract, 6) obtain proof of conformance requirements, 7) certify qualified suppliers, 8) conduct quality improvement programs as required, and 9) create and use supplier quality ratings.

SUPPLIER SPECIFICATIONS - customer requirements lead to supplier specifications. These specifications (developed from customer requirements, are reformatted into work action terms understood by the input/output workers) state precisely what work is to be performed. These specifications are phrased in measurable terms whenever possible. Stated another way, specifications are what the supplier needs internally to produce the output.

SYSTEM - a collection of processes and people that are aligned toward serving a common purpose or aim. A system includes inputs, outputs, feedback mechanisms, and customers. Laszlo defined a system as a collection of parts with an identifiable set of internal relationship as well as identifiable external relationships to other systems.

SYSTEM IMPROVEMENT - a method that focuses on the development or redesign of systems.

SYSTEMS (PARTS) OR CONCEPT DESIGN - this design phase arrives at the

design architecture (size, shape, materials, number of parts) by looking at the best available technology. In American usage, commonly called the parts design phase.

SYSTEMS THINKING - "a discipline for seeing wholes. It is a framework for seeing interrelationship rather than things, for seeing patterns of change rather than static 'snapshot.' Systems influence behavior. When placed in the same system, people, however different, tend to produce similar results." We must look beyond individual mistakes or bad luck to understand important problems. (Peter Senge, *The Fifth Discipline*).

TAGUCHI APPROACH - techniques for reducing the variation of a product or process performance to minimize loss minimize loss.

TAGUCHI METHODS - the American Supplier Institute's trademarked term for the quality engineering methodology developed by Genichi Taguchi. In this engineering approach to quality control, Taguchi calls for off-line quality control, on-line quality control, and a system of experimental designs to improve quality and reduce costs.

TAMPERING - action taken to compensate for variation within the control limits of a stable system, generally without benefit of adequate data. Tampering increases rather than decreases variation, as evidenced in the funnel experiment. (Responding to special causes as if they were common causes.)

TARGET - an ideal level of operation that you work toward over the long term. It is based on long-term customer and business needs and requirements. In addition to meeting specifications, your goal is to move the process toward the target and toward making a more consistent product.

TASK - one of a number of actions required to complete an activity.

TAXON LEARNING - learning that depends on taxon memory, consisting of items that do not depend on specific physical contexts. Information is placed in taxon memory through memorization and practice, and is often associated with rote learning processes and physical learning (like riding a bike). Taxon memory includes information or skills that can be recalled and used with little reference to meaning.

TEAM - a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they will hold themselves mutually accountable. (*The Wisdom of Teams*, 1993)

TEAMWORK - shared responsibility for the completion of a task or problem.

THERBLING - the smallest observable human action, such as a reach, a grasp, a wait, a twist, or a press of a switch. A reversal of the letters in the last name of Frank Gilberth, who was the hero of "Cheaper By the Dozen," a 1940's film about an efficiency expert.

THREE RINGS OF PERCEIVED VALUE - The first ring is the basic product - the core product the customer wants. The second ring is those activities designed to support the basic product or to make it functional - something people can get at or something they can purchase. Almost all management activities can be said to fall within the first or second rings. The third ring, which contains the enhanced product, consists of the myriad of things employees can do to make the customer's experience superior. The customer's core requirements are met in the first ring and expectations are met in the

second ring. But, expectations can only be exceeded in the third ring.

TOLERANCE DESIGN - a stage of design that focuses on setting tight tolerances to reduce variation in performance. Because it is the phase most responsible for adding costs, it is essential to reduce the need for setting tight tolerances by successfully producing robust products and processes in the earlier parameter design phase.

TOP-DOWN PROCESS DIAGRAM - a chart of the major steps and substeps in a process.

TOP-MANAGEMENT COMMITMENT - participation of the highest-level officials in their organization's quality improvement efforts. Their participation includes establishing and serving on a quality committee, establishing quality policies and goals, deploying those goals to lower levels of the organization, providing the resources and training that is needed to achieve the goals, participating in quality improvement teams; reviewing progress organization wide; recognizing those who have performed well; and revising the current reward system to reflect the importance of achieving the quality goals.

TOTAL QUALITY MANAGEMENT (TQM) - "a comprehensive philosophy of living and working in organizations that emphasize the relentless pursuit of continuous improvement." This pursuit "calls for a major transformation of organization values, norms, structures, and processes." (*Quality: Transforming Post-Secondary Education*, E. Chafee and L Sherr)

TRAINING - to learn how to do specific tasks in specific jobs (taken from Academic board letter to ALL DSMC, dated 24 May 1993).

TRAINING FACILITATORS - DSMC has 15 certified facilitators to use the modular Zenger-Miller training which is available on the GSA Schedule. These facilitators do the in-house training for Strategic Process Management application, the DSMC orientation training, etc.

TREND CHART - a graph in which the values of a series of categories are connected by a continuous line. (Also called a line graph.)

TREND CONTROL CHART - a control chart in which the deviation of the subgroup average, X-bar, from an expected trend in the process level is used to evaluate the stability of a process.

TWELVE CYLINDERS (IMPLEMENTATION ARCHITECTURE) - the service/quality implementation process with its four supporting pillars - values, skills, alignment, and deployment, as described in *Firing on All Cylinders* by J. Clemmer, B. Sheehy, and Associates. (NOTE: There are also two deployment cylinders.)

TYPE I ERROR - an incorrect decision to reject something (such as a statistical hypothesis or a lot of products) when it is acceptable.

TYPE II ERROR - an incorrect decision to accept something when it is unacceptable.

U CHART - control chart for plotting data based on the number of nonconformances in each unit (defects per unit).

UNCONSCIOUS INCOMPETENCE - not aware of one's own inability to do a task or one's lack of knowledge.

UPPER CONTROL LIMIT - the upper control limit of a process above which you don't expect process variation.

VALUE - the numerical measure of a variable. Values can also represent the count of a particular attribute or group of attributes.

VALUE ENGINEERING - an organized effort directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving essential functions at the lowest life cycle cost consistent with performance, reliability, maintainability, interchangeability, product quality, and safety.

VARIABLE - a data item that takes on values within some range with a certain frequency or pattern.

VARIABLES DATA - measurement information. Control charts based on variables data include average (X-bar) chart, range (R) chart, and sample standard deviation (s) chart.

VARIANCE - in quality management terminology, any nonconformance to specifications, in statistics, the square of the standard deviation.

VARIATION - a change in data, a characteristic, or a function that is caused by one of four factors: special causes, common causes, tampering, or structural variation. The random differences observed between repeated measurements of any process. These differences are also called variability. Variation can be managed by taking action as soon as a process is out of statistical control. Catching problems quickly prevents larger problems. The width of the control limits reflects the degree of variation of the process, which you can strive to lessen. As a variation is reduced, the control limits become narrower and the product becomes more consistent. Actions taken to reduce variation can be the result of

quality improvements derived from control chart analysis or from process management.

VISION - a picture of an ideal future for an organization or a process. A vision for a strategic process is conceived by the executive or strategic teams. It is something a team can get excited about; it is more inspiring and less specific than an improvement objective.

VITAL FEW, USEFUL MANY - a term used by J. M. Juran to describe his use of the Pareto principle, which he first defined in 1950. (The principle was used much earlier in economics and inventory control methodologies.) The principle suggests that most effects come from relatively few causes; that is, 80 percent of the effects come from 20 percent of the possible causes. The 20 percent of the possible causes are referred to as the "vital few", the remaining causes are referred to as the "useful many." When Juran first defined this principle, he referred to the remaining causes as the "trivial many," but realizing that no problems are trivial in quality assurance, he changed it to "useful many."

VOTE - technique used to determine majority opinion.

WALK-THE-TALK - putting words into actions which can be seen. Management must take on the responsibility of "role model" and demonstrate by their own actions (not just words); that they support and will use the Quality Management process tools, and practice the underlying philosophy required to bring about the culture change in the work place. Quality, on an organizational, long-term basis, will not happen if the leaders do not walk-the-talk. (People in an organization usually "listen to the actions" of the leaders.)

WASTE - resources expended that do not add value to the final product.

WEIGHTED VOTING - method for group voting on several selections. It is a way to quantify the positions and preferences of the team members. It uses no decision criteria, discussion, or effort to reach agreement on a single option.

WORK PROCESS - defined by how work flows through an organization. Customer and business requirements serve as controlling factors for any work process. Events occurring at key points during the work flow can be measured, and this information can be used to monitor and to control the work process. People committed to process improvement see their organization made up of hundreds of related work processes; for example, filling a customer's order. (The customer can be a customer in the traditional sense of an internal customer - someone within your organization who uses the product or service turned out by your team.)

WORK STEP - consists of several related work processes. A work system for this ex-

ample might be: customer service system, in which filling a customer's order is one of several work processes.

WORLD-CLASS QUALITY - a term used to indicate a standard of excellence: the best of the best.

X-BAR CHART - average chart.

ZERO DEFECTS - a performance standard developed by Philip B. Crosby to address a dual attitude in the workplace: people are willing to accept imperfection in some areas, while, in other areas, they expect the number of defects to be zero. This dual attitude developed because of the conditioning that people are human and humans make mistakes. However, the zero defects methodology states that, if people commit themselves to watching details and avoiding errors, they can move closer to the goal of zero defects. The performance standard that must be set is "zero defects," not "close enough."

APPENDIX

A



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DSMC-SPMD

27 April 1995

MEMORANDUM FOR ALL DSMC

SUBJECT: GUIDED SELF-DIRECTED LEARNING

As most of you know, the DSMC Corporate Plan for 1995 identifies as one of our basic premises that:

"We will move toward the educational philosophy that emphasizes that: (a) learners are in charge of their learning; and (b) learners must be afforded opportunities to learn within a situation relevant to them."

On 1 November of last year, I issued a memo that explained the intent of this thrust under the name, "learner-driven learning". That was followed on 22 November by a faculty forum which included presentation of the concept and discussion of the planned DSMC approach.

Since then, about 45 faculty members have participated in six separate workshops to discuss the concept, exchange experiences with using various facets of the concept in different DSMC courses, and plan continuing efforts to incorporate facets of the concept into even more classes and courses. One recurring theme was that we should select a "better" name and then we should expand the description of the concept beyond that given in the Corporate Plan. A group of faculty who attended the workshops volunteered to do that, and the results of their discussions are:

- We have changed the name to Guided Self-Directed Learning. This name reflects the long-standing and recognized terminology used by Malcom Knowles and others. It also indicates to our more traditional customers and faculty that we WILL provide guidance to students - more to some than to others. GSDL does NOT mean anarchy on campus.

- The enclosed matrix of characteristics describes, in capsule form, the kinds of things that indicate the presence of at least some facets of GSDL. This matrix is in no way the be-all and end-all of GSDL. It is a living compilation of characteristics to provide a baseline for discussion and development. It will continue to evolve as we gain experience and expertise across DSMC.

To date, including for some time before the establishment of GSDL as a corporate objective, various aspects of self-directed learning have been used by a significant number of our faculty in a variety of DSMC courses. Much of this has been aided and encouraged by the series of David Langford seminars on campus. Notably, the Individual Learning Program in PMC, the experiments with the senior sections (and others) in PMC, the weekly learning plans in ISAC (pre-ACQ-201), the old Program Managers' Workshop, and a number of other efforts in various short courses set the stage for this initiative. Most recently, the new Executive Program Managers' Course and the embryonic ACAT III Program Managers' Course have been designed from the start using the GSDL approach. Additionally, even though specifically not a current target for GSDL, due to the time crunch in getting the pilot ready, the new APMC includes significant attempts to incorporate self-direction into the curriculum. This is totally at the initiative of the course managers and the development team.

Additionally, in January, the DAU put out a Student Assessment Process Guide which includes an emphasis on "learner-centered" learning techniques. We avoided using this same name to avoid having to keep our definitions synchronized. However, there is significant overlap; and GSDL is fully supportive of the competency-based, learner-centered thrust of DAU.

So what's next? Glad you asked!

- Larry Lerer and Fred Ayer will be visiting each faculty department to discuss GSDL within the context of generally improving our ability to help learning happen for each DSMC student. FD-ED will continue to include GSDL as one of the key approaches for study in their work with faculty on improving our educational abilities.
- Andrea Garcia and the ACQ-101 team will be looking at incorporating facets of GSDL into that course at the same time they are looking at distance learning opportunities.
- We will be looking at ways to improve our abilities to conduct and facilitate self-assessments and process assessments. We will conduct a number of faculty forums to share experiences among faculty members.
- I will be soliciting course directors to volunteer to specifically target their courses for incorporation of more facets of GSDL as they conduct their continuous improvement efforts.
- Fred Ayer will work with Bob Ainsley and the distance learning group to seek all possible synergy between these two corporate thrusts.
- Dan Simek and the APMC team will be looking for opportunities to incorporate more GSDL characteristics in APMC as expeditiously as it makes sense to do.
- SPMD will assess ACQ-201 for GSDL potential.

- And, of course, all of the individual and small group efforts to experiment with GSDL ideas will continue.

I encourage all to actively share ideas and lessons learned. We have the capability to make DSMC even a greater center of acquisition education, and GSDL will play a vital role in that process.

Enclosure



EDWARD HIRSCH

Provost and Deputy Commandant

DESCRIPTION OF GUIDED SELF-DIRECTED LEARNING

(The presence of any of these characteristics indicates some degree of GSDL is being used.
The DSMC goal is to design, develop and execute all DSMC courses so that most of these characteristics are present.)
THE PURPOSE OF GSDL IS TO HELP EACH DSMC STUDENT BECOME A MORE COMPETENT DEFENSE ACQUISITION MANAGER!

ENVIRONMENT	LEARNER	FACILITATOR	COMPETENCIES	ASSESSMENT
• A lot of prep time is devoted to providing the "right" environment and guidance for the learner. • A personal learning plan, often called a learning contract, is negotiated between learner and faculty member. • Learning is "situated" (issue-driven). Learning situations are selected for relevancy to the learner. • Faculty approach changed from "tell them" to help them assess, and then to plan learning activities, and then to conduct learning activities. Faculty learn along with students. Flexibility is evident in all. • Learning is process-focused (in reference to content and context). • Learning takes place in many different activities, in and out of classroom. Learners learn from many resources, including each other. • Learner decides which "classes" to attend. • Learners have "offices" or "home rooms" from which they operate while on campus. • Involvement with real world issues and problems involves a variety of strategies, e.g., small groups, cooperative student projects, simulations, and case studies. • Faculty teams become even more important. May not have mandatory classrooms. - Teaching team (PT) offices. Ideally, are located together and in close proximity to their assigned students. • Telelearning, and other educational technology is available to learners wherever and whenever it might be useful to them. • Learning is enhanced to the extent that threats, coercion, manipulation, direction and control by others do <i>not</i> characterize the learning situation(s). • Learning is enhanced to the extent that openness, equality, respect and constructive dialogue <i>do</i> characterize the learning situation.	• The learner is in charge within the competency expectations set by the applicable functional board(s); is responsible for own learning; directly participates in course planning and execution. • Faculty "mentors" (with appropriate facilitator and coaching skills) assist the learner with structuring and carrying out a personalized plan. • Learner "Learns how to Learn". Takes active role. • Students learn more; work smarter - devote more time on their own.	• Faculty role is a facilitating/consulting/coaching role. • Faculty have responsibility to guide learners in the preparation of their personal learning plans. • It is the responsibility of the faculty member and DSMC to "create" an environment in which the material to be learned is most readily learned by the learner. • Faculty may also participate as a resource. • Faculty gives intro to GSDL, including providing a clear understanding of learner's responsibilities, and then begins implementing. (Some students will not understand until they experience it. So move from explaining to doing should be expeditious.)	• Competencies are useful as standards of what "the field" thinks are things the learners need to know. They serve as a starting point for course design and learner self-assessment of learning needs. • Core set of competencies is recognized (must be addressed - not necessarily "taught" - in some fashion). • Competencies should be understood in the learner's context and may be supplemented by "what else" the learner will drive the process to provide in order to make the learning meaningful. • Learner needs rather than instructional needs are paramount.	• Assessment is critical. Pre-assessment/diagnostic extremely important. Continuous assessment during execution is required. • Learner does "front-end" self-assessment (guided by faculty using a designed process.) • Assessment of the success of a learning activity is determined by designing in a closure/reflection/discussion period (few minutes) at the end of each activity. Don't wait until the end of a module and give a test, that won't tell us what we really need to know. Also, ask the students whether the readings assigned were useful to them. • Traditional tests for traditional purposes (i.e., evaluating the student) are not used. • Evaluations of process effectiveness and accumulation of evidence, by the learner, of his/her accomplishments in learning are mandatory. • Testing is a useful "tool" to help decide what the learner and the faculty member are going to do next. • The learning process is evaluated rather than the learner. • Learning mastery is continuous (e.g., learning journal; self-assessment; group assessment).

Updated 23 April 1995

APPENDIX

B

What to Measure and How

Information is not knowledge. Just as copy machines fill shelves with unused documents, information technology provides the capability to inundate overwhelmed employees with irrelevant facts. We need to examine our management information systems for utility, and discard measurements that are not used for decision making. When measurement is used as a means to acquire knowledge, rather than as an end in itself, the result is sound decisions that improve the quality of organizational processes.

Introduction

Improvement emanates from change, but not all change produces improvement. If a change is introduced into a process, what guarantees that the new way will be better than the old? Best efforts will not suffice, best efforts must be guided by knowledge. W. Edwards Deming often warned:

*"An unstudied solution to a problem may yield immediate results in the right direction, yet in time bring disaster."*¹

Solutions should address the underlying causes of performance. Without understanding of cause, change is trial and error. It is irresponsible to disrupt an organization with unstudied change.

Measurement is a requisite for beneficial change. The soundness of our decisions is directly related to our knowledge of the dynamics of the process in question. Measurement develops the knowledge that enables us to create beneficial change.

Determining what to measure

Measurement develops knowledge when it provides the information we need. The right information is generated by posing questions, and collecting *only* the data needed to answer the questions. The type of data required is a function of the question. Some questions require system level measures of outcome, for example, *How are we doing versus our competitors?* Other questions require process level measures to locate causes, for example, *Why are we not meeting delivery schedules?* System and process level measures are differentiated as indicated below.

System level measures

- Organizational objective
- Interaction of several processes

¹ Deming, W. E. (1993, March 30). Remarks during seminar 'Instituting Dr. Deming's Methods of Productivity and Quality. Arlington, VA.

- Outcome measure
- Focus on results rather than cause

Process Level Measure

- Operational objective
- Related to specific process
- Provides feedback for causal analysis

Tom Nolan provides a model for improvement comprised of three questions.²

MODEL FOR IMPROVEMENT

AIM	What are we trying to accomplish?
MEASURE	How will we know that a change is an improvement?
CHANGE	What changes can we make that will lead to improvement?

The first question establishes an objective to be accomplished. The second question requires a system level measure to determine whether the change produced the desired result. The third question usually requires a process measure to predict what changes will lead to improvement.

What do we want to accomplish?

This question sets the focus of an improvement effort. At the system level, the aim is the mission of the organization. At the operational level, the aim is a specific objective aligned with the mission.

The boundaries of the core system are defined by the aim. Many health care systems have changed their aim from "improve patient's health status" to "optimize health status of the community". The new aim promotes more outreach preventative services designed to reduce the number of hospital inpatients.

Deming defined a system as *"a network of interdependent components that work together to try to accomplish the aim of the system."* The simplified model below depicts the system as a series of strategic and support processes.

² Nolan, T. W. (1993, August). *Making Changes that Result in Improvement*. International Deming Users' Group Conference Proceedings.

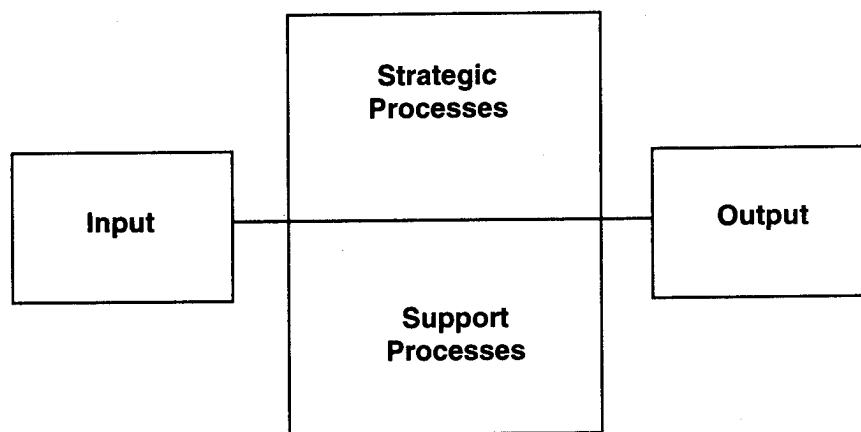
Strategic processes are a handful of core processes that define an organizations reason for existence in terms of what it is trying to accomplish. The aim of strategic processes is to meet the needs of external customers. DSMC's strategic processes are:

- Education and training
- Research
- Consulting
- Information Dissemination

Support processes enhance the efficiency and effectiveness of strategic processes. For example, the Lionheart system for on-demand printing enables faculty to incorporate the latest policy and procedural changes into course materials, thereby improving the education process. The primary customers of support processes are internal. DSMC's support processes include:

- Financial management
- Procurement and contracting
- Facilities maintenance
- Printing and duplicating
- Audio visual services

DSMC SYSTEM MODEL



How will we know that a change is an improvement?

Goals and objectives derived by answering the first question are often too ambiguous to serve as a basis for action. The second question impels us to translate the objective into an explicit indicator that everyone can understand.

DSMC's mission is "...to promote and support the adoption and practice of sound systems management principles by the acquisition workforce....".³ If the method of delivering education

³ Defense Systems Management College 1995-1996 Catalog. Fort Belvoir, VA: DSMC Press.

is changed to a more learner driven approach, how will we know that the change produced the desired result?

Graduate performance scores in required competencies indicate the extent to which systems management knowledge has been gained. However, the mission transcends beyond accumulation of knowledge. The mission is to ensure that the knowledge acquired is put into practice to improve the efficiency and effectiveness of weapon systems acquisition. Therefore, an answer to the second question requires a measure of the job performance of acquisition managers.

If possible, a change is pilot tested on a small scale, and incorporated system wide once it has been confirmed that the change is indeed an improvement.

Data collected prior to the change are charted to establish a baseline for process performance. Once the change is introduced, a comparison of before and after quantifies its impact.

What changes can we make that will lead to improvement?

Any change introduced into a process is a prediction that the new way will be an improvement over the old. The prediction should be based on knowledge of process performance causes. Such knowledge is attained through the scientific method of investigation. Subject matter expertise guides the investigator to ask questions of the process and target data collection and analysis accordingly.

Deming categorized process causes into two types:

Special Causes: Variation caused by special circumstances that can be pinpointed to a specific time or location.

Common Causes: Net effect of numerous sources of variation inherent in the current system.

Ascertaining the cause is essential to beneficial change, because the type cause dictates the type of intervention needed. Special causes are correctable through local action by personnel who execute the process. Common causes can only be corrected by those with the authority to change the system.

In his study of successful interventions, Peter Drucker observed that the most profitable source of innovation is discovering and exploiting successes within an organization. Boundless innovations are overlooked in most organizations. Drucker attributes this blindness to the format of existing reporting systems. Data must be analyzed to pinpoint successes.

An educational institution exploited success by isolating exceptional instructors through comparative analysis of student evaluations. The exceptional instructors became mentors to the rest of the faculty, resulting in an improvement in quality of all the courses.

A keen understanding of cause and effect is needed to implement a change that addresses the process drivers. Development processes are driven by schedule. When milestones are not met, managers compensate by assigning additional people to the project or increasing overtime. Both solutions increase error rates, thereby increasing the backlog.

The system level measure of the timeliness of a development effort is the extent to which delivery milestones are met. A useful process level measure is cycle time relative to plan. Cycle times, significantly greater than plan, indicate that prompt investigation is needed. The investigation may disclose unclear requirements or overly optimistic schedules. Program managers who monitor cycle time circumvent schedule overruns by discovering problems at their onset and responding with the appropriate intervention.

How to measure

Data that serve as a basis for decision making must be valid and reliable. Valid and reliable data are the products of a consistent methodology to collect and record the data.

An example will demonstrate the point. If we wish to measure employee absenteeism, what do we count as an absence? Do we count scheduled doctor's appointments for a portion of the day, or only unscheduled full days missed? The data are not comparable unless everyone counts the same way.

An *Operational Definition* transforms a measure into a metric. A metric has an explicit procedure for observing and recording the data. The following table depicts some examples of measures and their corresponding metrics.

MEASURE	METRIC
Throughput	# DSMC graduates per fiscal year
Data Reliability	# Mismatched records
Absenteeism	Absent days/total workdays
Response Time to Information Requests	# Workdays between request for and delivery of information
Operating Efficiency	Cost per student week
Student Achievement	% Improvement in post-test scores
Systems Management Excellence	Job performance ratings by supervisors of DSMC graduates

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Author:

Barba B. Affourtit, Vice President, Interaction Research Institute, Inc. (Paper originated as a handout for DSMC CLT work with measurement.)

APPENDIX C



DSMC QUAL SHEET

DSMC QUALITY IMPROVEMENT PLAN

"Failures result from implementing a quality approach to solve a problem instead of mobilizing a workforce to solve the problem and in the process discovering a quality approach that a mobilized workforce can use to meet the problem."

-- Richard Tabor Greene
Global Quality

Background

In October 1992, Admiral William E. Vincent asked Mary-jo Hall to chair a work group to develop an implementation guide to show us "how to do" quality. The Quality Work Group (QWG) consisted of Norm McDaniel, Chris Royer, Jack Frost, Carol Jeffrey, Dennis Van Liere, Jim Jadryev, Lyn Dellinger and Damond Osterhus. Forrest Gale and Dan Robinson served as facilitators.

Using the quality management tools, the group developed a framework for DSMC as a quality organization. This framework consisted of constituent elements that must be present: customer focus, systems perspective, process management, continual improvement, teamwork, individual involvement, leadership commitment and constancy of purpose. There were also supporting elements: training and education, infrastructure, reward system, effective communication, principles or values, tools and techniques, quality in the classroom, and quality of life programs.

During February 1993, the QWG held focus groups with all seven divisions at the College to get customer feedback on how the elements would be operationalized. The QWG integrated the responses from across DSMC in tree diagrams for each element. A plan based on this input was staffed to all divisions in May 1993.

In April 1993, COL Claude M. Bolton became Commandant. During the first weeks on campus he reviewed the direction of the Quality Journey, and working with Dr. Hall, decided to use a more strategic, structured approach to quality. His goal was to institutionalize quality concepts and practices.

At the June offsite, the Leadership Team reviewed the DSMC quality strategy using facilitators from Zenger-Miller-Achieve. The vision was rewritten. Values were also developed. The mission and long-range goals were reconfirmed. Five strategic imperatives were identified and assigned to members of the team.

Revised 3/94

In August, an "Academy" was held at DSMC to facilitate writing the Improvement Plan in line with the revised strategy and the organizational architecture espoused as the Service Quality System™ in Firing On All Cylinders by Jim Clemmer. Day one of the academy was a training session for all QWG members as well as division quality coordinators. Days two and three were used to develop the plan. Those working on the final plan included Jim Jadryev, Dennis Van Liere, Chris Royer, Norm McDaniel, Myrna Bass and Mary-jo Hall. Facilitators were Tim Miller and Gini Pitkin of Zenger-Miller-Achieve.

Quality Improvement Plan Development

The Work Group used brainstorming to do a Systems Progress Chart for each of the 8 constituent elements. The System Progress Charts look at DSMC now, in 12-18 months and 5 years.

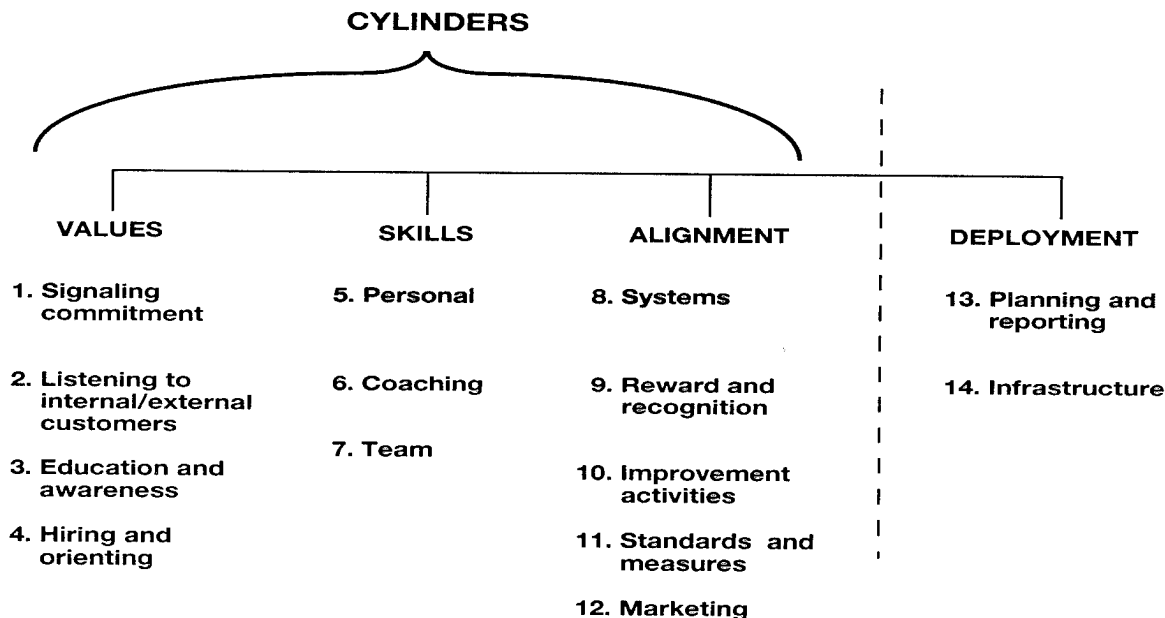
Using the System Progress Charts and the May version of the Implementation Plan, the elements of quality were overlaid on the cylinders of the architecture. All of the elements from the original plan were covered with the cylinders. The QWG brainstormed specific activities, responsible agents and target dates for each of the cylinders based on information from the System Progress Charts and the tree diagram.

The Improvement Plan was developed in August as a draft for the Leadership Team. It was discussed, modified, changed, etc., by the Leadership Team during four separate meetings in September and October. Ratification was completed in November.

Summary

The focus of the Quality Improvement Plan is the activities in the action plan. They are the activities we will complete in order to make quality principles and practices our way of doing business. It is the transition architecture we will use to accomplish our mission to get to our long-range goals and ultimately to our vision.

DSMC architecture for change:





DSMC QUAL SHEET

RICOCHETS, RECOVERIES AND BRIDGES

"For want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost; being overtaken and slain by the enemy, all for the want of care about a horseshoe nail."

-- Benjamin Franklin

"It's good enough for government work" is a saying that underlies a belief that little errors, a mistake here and there, and 90% success is acceptable. It is a belief that innocent mistakes are common and to be expected.

Ricochets

Every organization is full of many different types of errors with varying degrees of severity. Some errors are glaring, are easy to spot and get noticed. However, it is the seemingly innocent, common, everyday errors that do the most damage to an organization because of the insidious tendency of most errors to multiply and spread unnoticed. Even worse, the symptoms of the errors are misleading or appear innocent.

In the service/quality paradigm these errors, defects, mistakes and failures are called "ricochets" because of the way they rebound throughout the organization like stray bullets.

Ricochets are annoying experiences for the customers. They are a result of a breakdown or deficiency in the organizational processes that produce the inner ring product and/or service or a break-down from second-ring support efforts. Often the ricochets are caused by a combination of process problems from both rings. Once a ricochet is fired, it is either caught (and has minimum damage) or it hits somebody inside or outside of the organization.

When a ricochet hits a customer, the resulting reduction is that the customer's perception of value will be in proportion to the frequency and degree of the ricochet and the tolerance level of the customer.

Only about 15 percent of ricochets can be traced to someone who didn't care or wasn't conscientious. The root cause of 85 percent of ricochets can be traced to "system" problems. Systems problems include not knowing the customer, unrewarded and unrecognized efforts, lack of training, shoddy supplies, lack of information, etc.

Recoveries

Recoveries are successful attempts to intercept or change ricochets. A recovery is any action an organization takes to prevent a ricochet from hitting the customer. A post-impact recovery is an action an organization takes to do it right the second time. This includes acting on customer complaints and dissatisfaction to reverse the customer's shrinking perception of value. Handling complaints effectively can build customer loyalty.

Responsive complaint resolution systems are necessary to help make improvements in processes. These systems require that all employees, but especially front-line servers, are empowered to recover from ricochets. This empowerment includes the ability to identify and solve the customer's problem by making decisions and breaking rules. For example, at the Olive Garden Restaurant chain, food servers are authorized to give customers an instant cash payment for dry cleaning if anything is spilled on a customer's clothing.

Another type of recovery is the pre-impact recovery. This is any action the organization takes to prevent a ricochet from hitting customers. Pre-impact recoveries are even more important than post-impact recoveries because research shows that customers do not "fully recover" from service problems. Pre-impact recoveries are based on problem prevention, not problem resolution.

The theoretical basis of quality management is grounded in improving systems and processes continually in order to eliminate ricochets. Curt Reimana, Associate Director of the National Institute of Standards states:

"The excellent companies use all avenues to put together services that minimize the cost of a product and are not merely intended to do a customer good when you've done them bad. Many companies need to put a major emphasis on monitoring services in such a way that they go to the root causes of problems in order to eliminate customer dissatisfaction."

Cost of Quality

Ricochet recoveries, especially pre-impact, are expensive. The costs include rework, scrap, time, energy, etc. A concept coined by Xerox is "Cost of Quality" (COQ). Cost of Quality is either cost of good quality or bad cost of quality.

Joseph Juran in *Juran on Leadership for Quality: An Executive Handbook* states:

"We define cost of poor quality (bad COQ) as those costs that would disappear if our products and processes were perfect. Those costs are huge.

As of the 1980s, about a third of the work in the United States economy consisted of redoing prior work because products and processes were not perfect." (1989, p. 199).

Examples of Good and Bad Cost of Quality

Bad COQ

Rework
Redesign
Scrap
Back orders
Absenteeism
Staff turnover
Safety and health costs
Excess receivables
Excess inventory
Excess overtime
Excess managerial and professional staff
Excess services or product features
Heroic recoveries
Lawsuits
Lost customers and market share

Good COQ

Inspection and testing (could also be bad COQ)
Training
Market research
Standardizing procedures
Preventive maintenance
Quality and process audits
Clarifying customer expectations
Supplier management programs
Reward and recognition programs
System and process redesign
Hiring and orienting programs
Competitive and key process benchmarking
Strategic quality planning
Measurement and feedback systems

The cost of quality helps measure what it costs your organization to achieve its current level of quality performance.

Research and experience show that well-planned implementation of good COQ efforts can reduce bad COQ. The result is a sharp reduction in total cost of quality and an increase in customer satisfaction and employee morale. Quality is not free. It requires huge investments, particularly of time. But the returns of those investments are measured in three and four digits.

Bridge

A bridge is a systematic investigation into the root cause of a ricochet to determine how processes or systems can be improved to prevent future ricochets. This means investigating standardization of processes, looking at consistency in process implementation and looking at variation in the system. This is a long-term approach.

A bridge is a defined improvement process which continually seeks to increase all rings of perceived value to the customer. Continual improvement only comes from organizations that are continually learning about their people, their customers and their processes.

1-10-100 Rule

The 1-10-100 Rule originated at the Bell Labs years ago. The 1-10-100 concept is a rule of thumb for estimating costs for catching errors. The 1, 10 and 100 are multiples. For example, problems caught where they originate cost far less to fix in terms of time, energy and money than problems that leave the work area and are discovered and fixed downstream. The 1 multiple represents catching and fixing problems in your work area. The 10 multiple represents catching and fixing problems after they have left your work area but before they get to the external customer. The multiple 100 represents repairing the damage caught by external customers. A problem that leaves the organization and is caught by an external customer costs at least 100 times more to fix than at the origination point. The time when a problem is fixed greatly affects the cost of quality.

This excerpt is primarily taken from *Firing On All Cylinders* by Jim Clemmer, 1992, Achieve International (with permission).

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POC for this sheet is Meg Weaver, (703) 805-3361.

APPENDIX

D

REENGINEERING OVERVIEW

This paper was written by Russell M. Linden, facilitator at the Federal Executive Institute, Charlottesville, VA; as part of the student handout. He is also the author of Seamless Government: A Practical Guide to Re-Engineering in the Public Section (1994, Jossey Bass).

What is it? Reengineering is about fundamental organizational change.

Why is it important? Because rigid, bureaucratic organizations cannot deliver what today's consumer society demands: speed, customization and variety, convenience, responsiveness.

What's driving it? Consumer demands for speed, customization, convenience; need to become customer focused; budgetary constraints; advanced technology; National Performance Review, Government Performance and Results Act.

When should it be used? When an organization is feeling considerable pain (big gap between where it is and where it needs to be); when there is strong leadership support, and a strategy or plan for the future.

What does it seek to change? Reengineering focuses on core processes, not functions. Once those are designed in the leanest, most seamless manner possible, information technology is used to support and enable the work.

For whom is it done? Reengineering adds value for end users. It creates closer relationships with suppliers and customers. It gives staff broader latitude to do the whole job.

What are the key reengineering steps? Once assessment is completed: map the current process; start at the end (with customer needs) and work backward; set a "stretch objective"; and begin with a clean sheet.

What is the role of information technology (IT)? IT is an enabler, not a controller of redesigned processes. First, reengineer the process, then apply IT.

How long does it take? The design phase lasts 3-9 months. Initial changes can be made in months; longer-term efforts take 1-3 years.

What are the major barriers? Turf battles by functional managers, lack of senior management commitment, poor planning up front, selection of processes customers don't care about, lack of attention to implementation.

What are the payoffs? Improved customer satisfaction; cost reductions; ability to respond to change quickly; elimination of wasted staff time and steps.

THE CONTEXT FOR REENGINEERING

The "Sea Change" in Organizational Life

Public and private organizations are undergoing fundamental changes today, in response to massive changes in society, in our ways of thinking and our ways of conceptualizing the world. Organizational leaders are faced with demands and challenges that cannot be met by hierarchical, rigid, top-down bureaucracies:

<i>From:</i>	<i>To:</i>
Tangibles (producing things)	Intangibles (managing information, relationships)
Producer-oriented society	Consumer-oriented society
Walls	Networks

And from . . .

Craft production (personal, high quality, slow, costly) . . . to

Mass production (impersonal, medium quality, fast, cheap) . . . to

Mass customization (personal, high quality, fast, variety, value)

According to a study funded by the Labor Department, organizations that succeed in the 1990s will have to meet tough, new standards*—

- Quality
- Productivity
- Variety
- Customization
- Convenience
- Timeliness

To meet these standards, organizations must find ways to become increasingly agile. In a word, they must reengineer themselves.

**America and the New Economy*, by Anthony Carnevale. San Francisco: Jossey Bass, 1991.

WHAT'S DRIVING REENGINEERING?

In addition to the competitive changes noted above, reengineering is driven by several factors. These include:

Reengineering Drivers:

- Budgetary constraints, demands to do more with less
- The demands to become more customer driven, more agile, more innovative
- Advances in information technology (IT)

Factors Driving Reengineering in Government Include:

- The national interest in reinventing government
- The National Performance Review (NPR)
- The Government Performance and Results Act of 1993 (GPRA)
- The Chief Financial Officers Act

Most of these drivers have one element in common: they emphasize the need to focus on *outcomes*.

Like the demands and changes listed on the previous page, these drivers will require fundamental change in the way work is done. They force us to reexamine basic assumptions about our roles in government, about who does the work, about our relationships with end users and suppliers, about our very purposes. Reengineering is a methodology that helps managers do this kind of reexamination.

What's the Relationship of Reengineering and Total Quality Management

Commonalities — They are both methodologies for improving organizational performance. They both focus on organizational processes. They use teams to accomplish the improvement efforts. And they both emphasize meeting customer needs.

Differences — There are several but the two most important are these:

1. TQM seeks ongoing, incremental improvement; reengineering aims at occasional, quantum leaps in performance. And,
2. TQM usually takes the existing structure as a given and works within it to improve customer-supplier relationships; reengineering questions existing structures and systems, and forces us to take a "clean sheet" approach.

Comparing TQM and Process Reengineering

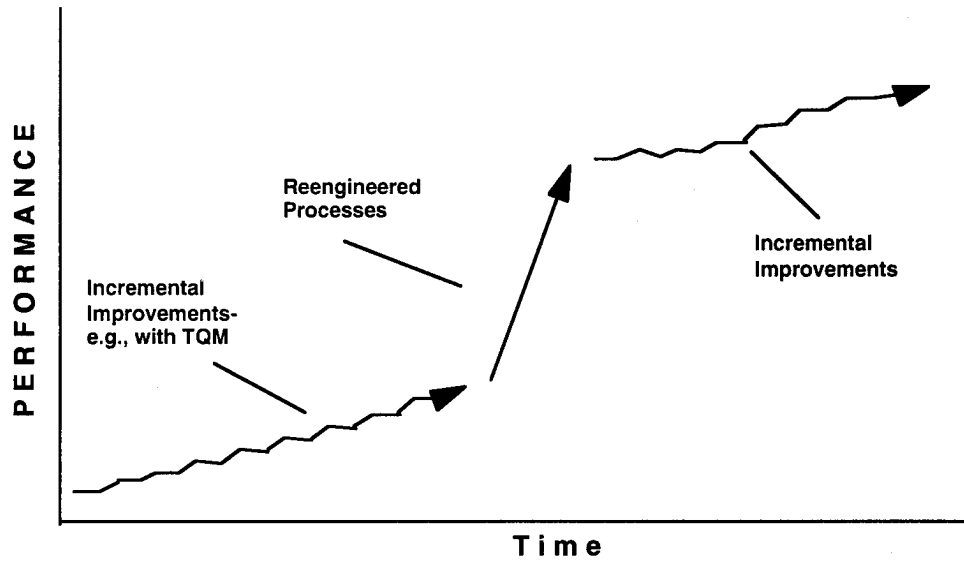
Key Similarities

<u>TQM</u>	<u>CRITERION</u>	<u>REENGINEERING</u>
Systems Approach	View of Org.	Systems Approach
Work Processes And Customers	Focus Is On	Work Processes And Customers
Teams	Change Agent	Teams
Essential	Top-Level Support	Essential

Major Differences

Incremental Improvement	Goal	Quantum Improvement
A Way of Life	Scope	A Project, Used Selectively On Cross-Functional Processes
Takes Structure, Systems As Given	Assumptions	Challenges Assumptions, Starts With "Clean Sheet"
Used If Needed	Information Technology	Essential In Large Projects; Applied <i>After</i> Process Is Redesigned

TQM and Reengineering Can Complement Each Other



INTRODUCTION

What This Workbook Is, and Isn't About

This workbook is about transforming your organization. It is for those who need to radically change the way they organize their work. It isn't for people who prefer the status quo, nor is it for organizations that are doing well and feel no need to change.

Reengineering is about: assumptions, processes, outcomes, the design of the work itself.

Process reengineering forces staff to challenge their fundamental assumptions about the way work is organized. By focusing on processes (not functions and departments), and by emphasizing outcomes (not inputs and outputs), reengineering frees staff to think in fresh, new ways. It discards the 19th century pyramidal structures and models we have come to take for granted. They may have made sense then; they make no sense now.

Reengineering is *not* about: recent management trends or inverted pyramids.

Reengineering is *not* primarily about the trends that have dominated the popular management literature over the past 15 years — empowerment, leadership, self-managing teams, customer service, organizational culture, or total quality management, although it is consistent with them. It is based on this assumption:

The most empowered, customer-oriented staff, led by visionary leaders, cannot succeed if they work in an organization designed along rigid, industrial, bureaucratic lines.

They cannot succeed because such organizations are not designed to produce what today's consumer-oriented society demands: *speed, variety, customization, convenience*. Industrial bureaucracies are designed to offer predictability, control, accountability — what the society needed when these models were created.

The challenge today is not to "invert the pyramid" and tell senior managers that their job is to support middle managers, whose job is to support first-level supervisors, who support the front-line staff. No, the challenge facing most bureaucratic organizations is to *abolish* the pyramid (whether right side up or upside down), and replace it with a horizontal design based on customer-oriented processes.

Organization of This Workbook:

This workbook provides you with the principles, steps, and tools to reengineer-your organization. It is organized according to a three-phase model for reengineering, offered on the next page. The first phase, Assessment, prepares you and your team to determine if and how to get ready for reengineering. The second phase, Design, provides specific re-engineering steps and techniques. And the third phase, Implementation, provides information, guidance and resources on making the new design a reality.

BY WAY OF DEFINITIONS

"Process reengineering" is an awkward term, and it's misleading in at least one respect. The word "reengineer" suggests that our bureaucratic organizations were "engineered" in the first place. That wasn't the case. They developed as specific responses to important needs, such as the need for safety, accountability, and information management (in the private sector), and the need to prevent corruption and fraud (in government). They were crafted to meet the demands of the times, and given the available technology and mindset during the Industrial Revolution, the functional bureaucracy may have been the only practical model. However, there was nothing precise about their development, as the word "engineer" suggests.

Nor is the word "reengineer" an appropriate description for what it offers us today, which is more art than science. However, this is the word of choice today, and we use it in this handbook. More important than the word is its meaning.

Reengineering is used here to mean:

Challenging the underlying *assumptions* on which the organization is built, and fundamentally redesigning the systems, *processes*, and structure around desired *outcomes*, not functions/departments, inputs/outputs.

The other word that requires a definition at this point is "process." Employees are more familiar with "functions" and "departments" than "processes." Public works is a local government department, responsible for several functions (engineering, traffic signals, sanitation, etc.). What customers care about, and what reengineering focuses on, are *processes* (such as fixing pot holes, picking up garbage, planning a park), which cut across departments and functions.

Process is used here to mean:

A set of inter-related steps that begins with an input or trigger, and produces an outcome that satisfies the end user.

For example: "purchasing" is a department, but it is also a process that begins with an identified need, and ends when a good or service is bought to fill that need. Purchasing produces an outcome that internal customers (staff) care about. Other processes focused on internal needs include hiring, policy-making, budgeting, planning, performance appraisal. Processes that focus on external customers include customer service, new program/product development, program delivery, billing, responding to complaints, providing information.

It has been said that all organizations, public and private, consist of five or six key processes, and that the people who "own" those processes will lead the organization of the future.

Outcomes

- Organizations Typically Organize Around *Inputs* ...
 - # of Requests For Service
 - # of Orders for Products/Permits/ Licenses
 - # of Problems/Needs Requiring Action
- *Resources* ...
 - Size of Budget
 - Size of Staff
- And *Outputs* ...
 - # of Bridges Repaired
 - # of Managers Who Took The Class
 - % of Kids Receiving Shots

... Because Inputs, Resources, and Outputs Can Be Counted, And
That's How Organizations Are Rewarded And Held Accountable
- Reengineering Organizes Around *Outcomes*
 - How Safe Are The Bridges?
 - How Much Improvement Did The Managers Demonstrate After the Class?
 - What % Of The Kids Stayed Healthy?

Processes

In Order To Organize Around Outcomes, Organizations Must Focus On Their Work Processes, Not Functions

- **Functions Perform A Specific Type Of Work, Usually Done By People With Similar Training and Skills**
- **Functions Have Played An Important Role In Organizational Life; We Understand Them, We Like Being With Others Who Have The Same Training and Skills, We Find Our Career Paths Within Them**

But

- **Functions Can Produce Only *Outputs*, Not *Outcomes***
- **Functions Aren't Responsible For Satisfying The End User**
- **Functions Often Achieve Their Goals At The Expense Of Other Functions, Leading To Suboptimization For The Organization**

Example:

A program or operations function may be measured by (and rewarded for) numbers of units produced (an output). In order to meet their targets, the functional managers want as much *flexibility* as possible — in their budget, staff levels, in the policies and regulations that govern their work.

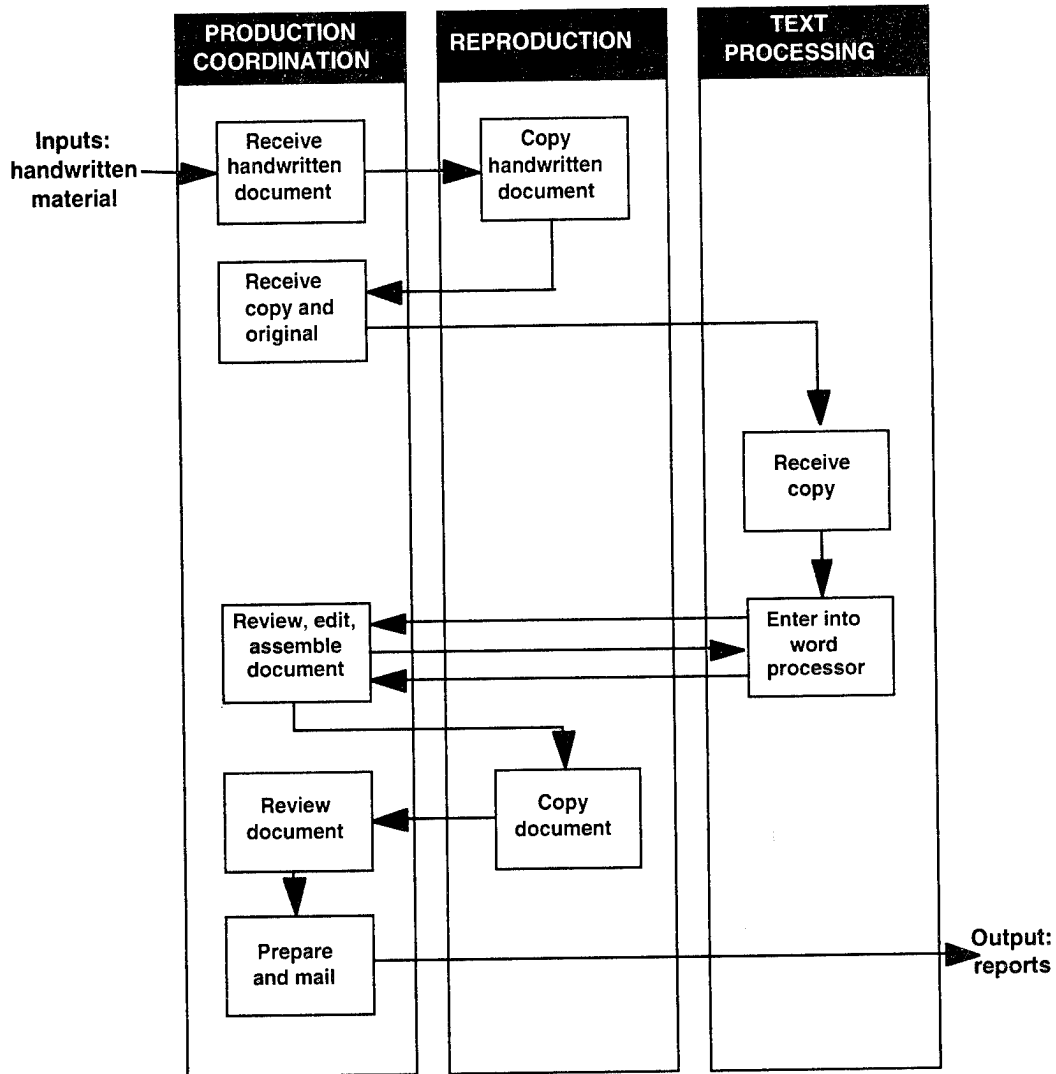
But the staff and oversight functions (human resources, accounting, budgeting, information systems, etc.) responsible for monitoring the program/operations unit don't want to give it flexibility, they want it to perform with *uniformity*. To meet *their* performance targets, these oversight functions need the line managers to work in a standardized fashion, which facilitates the needs of the information systems, budget, and other staff functions.

What one needs to achieve its goals makes it harder for the other to achieve its own goals...
And Nobody Is Managing The Process.

Handoffs and Cross-Functional Interfaces

Handoffs—Create Opportunities for Delays, Errors

*Cross-Functional Handoffs—Create More Delays and Errors;
Opportunities for Turf Battles*

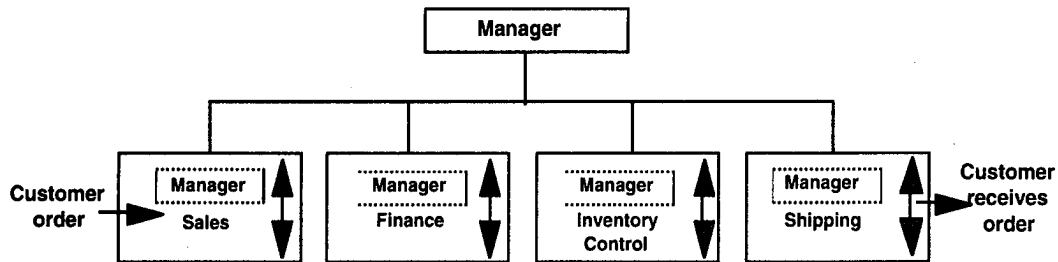


How many handoffs?
How long will it take?
Where are the delays?

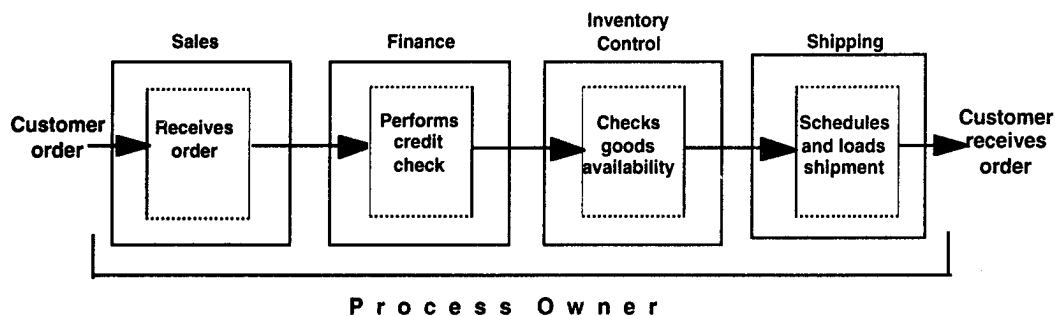
Who owns this process?

How Work Gets Done: One Example (Order Fulfillment)

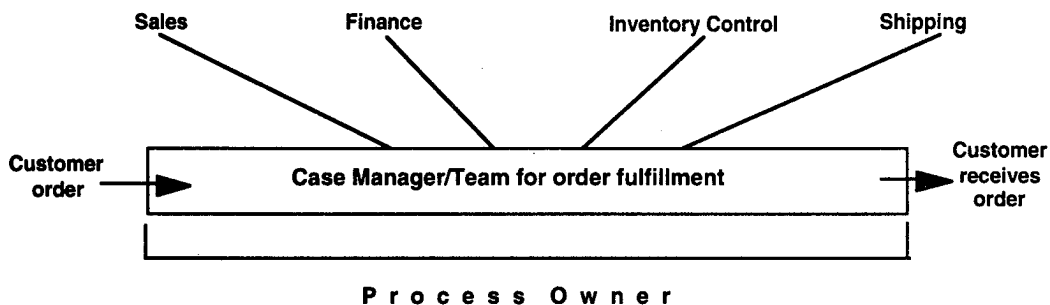
I. Function/Department Focus



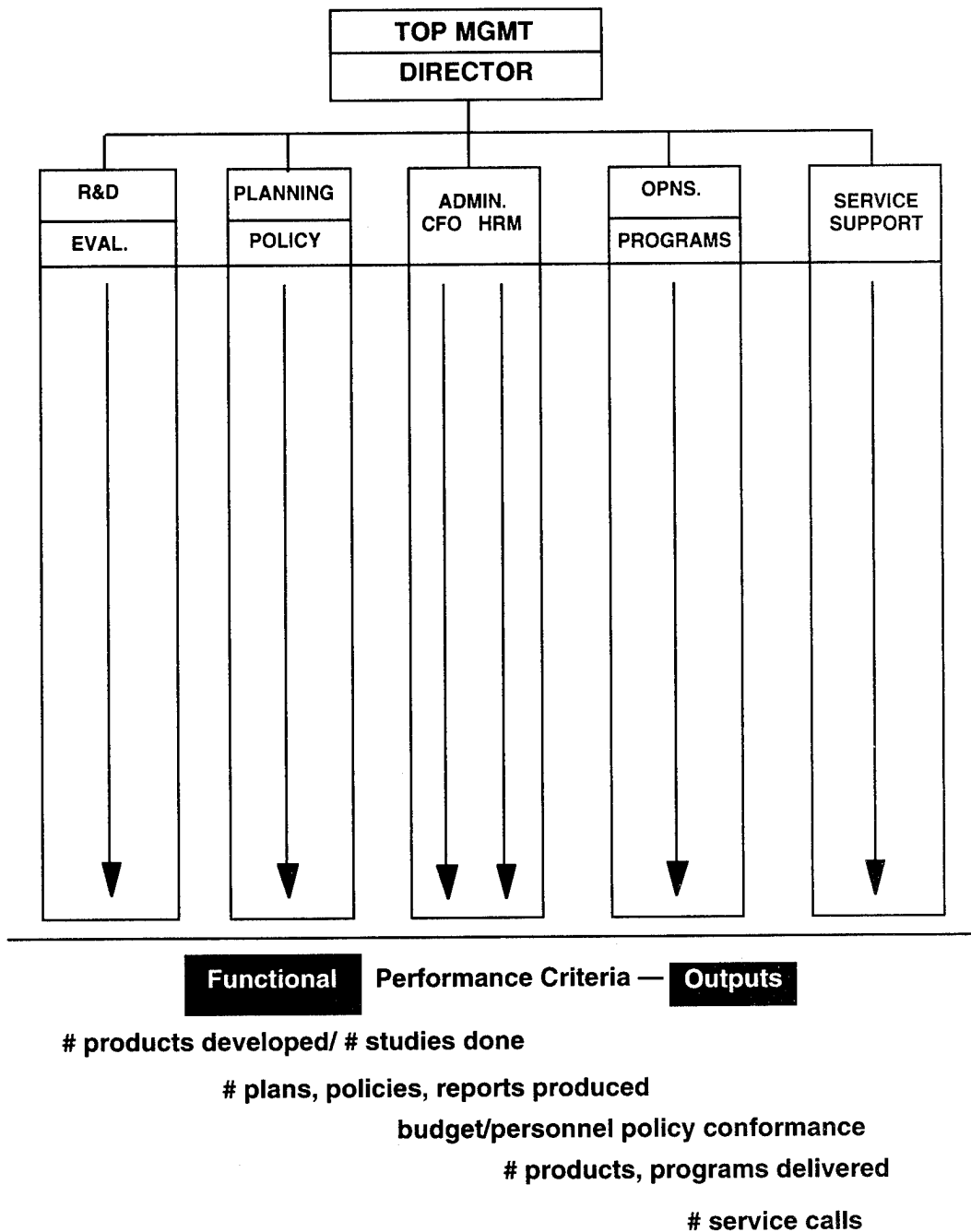
II. Process Focus



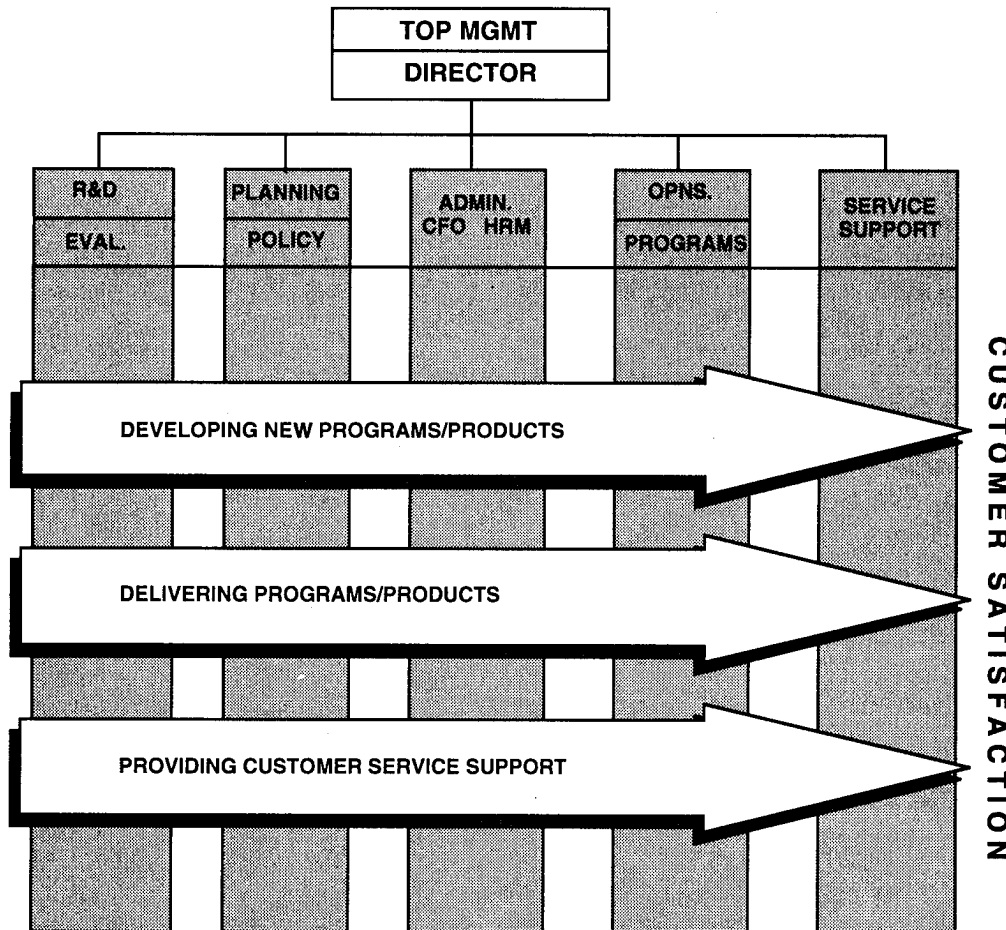
III. Case Management Focus



A Functional View of the Organization



A Process View of the Organization



Process Performance Criteria — **Outcomes**

Service Integration — is it seamless?

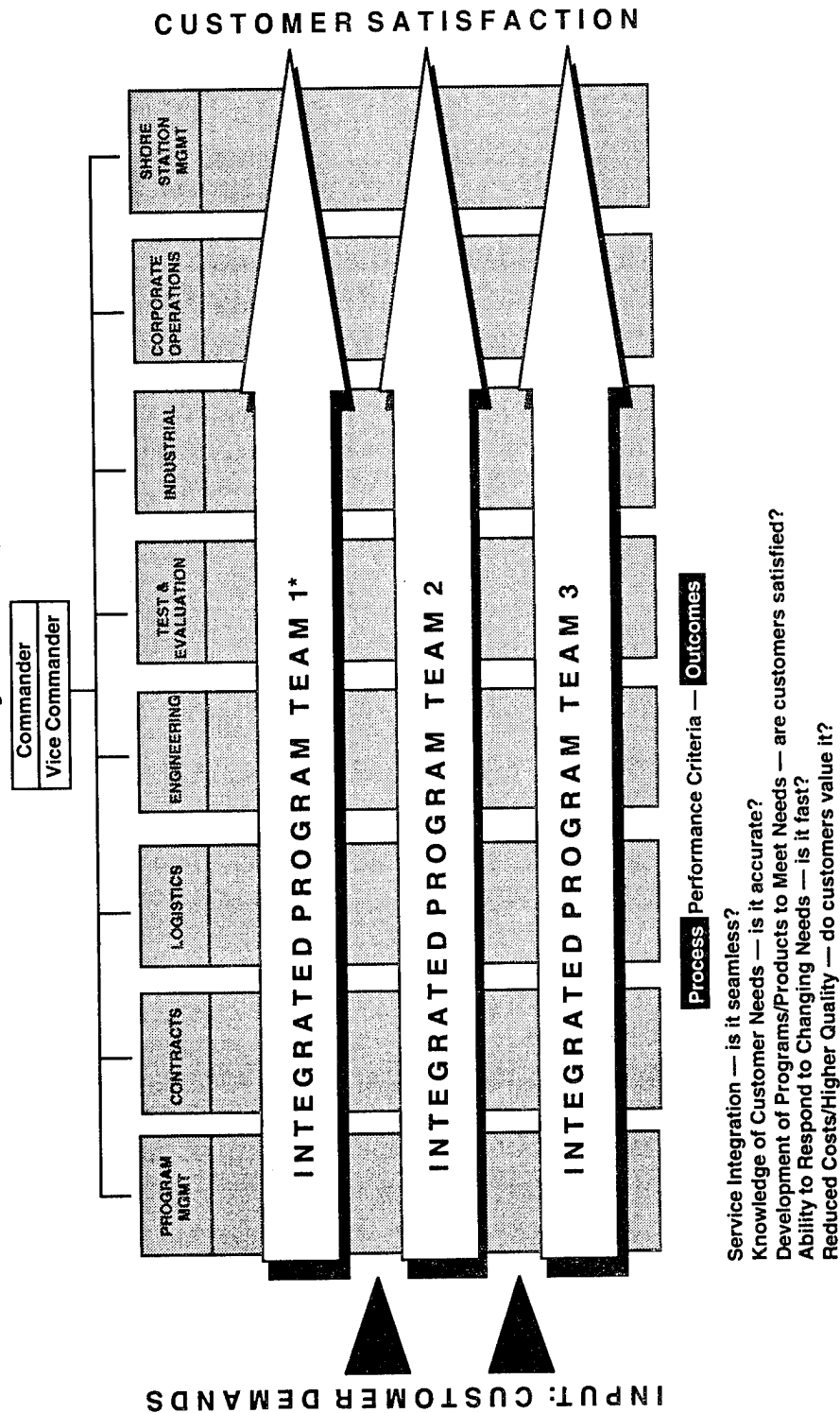
Knowledge of Customer Needs — is it accurate?

Development of Programs/Products to Meet Needs — are customers satisfied?

Ability to Respond to Changing Needs — is it fast?

Reduced Costs/Higher Quality — do customers value it?

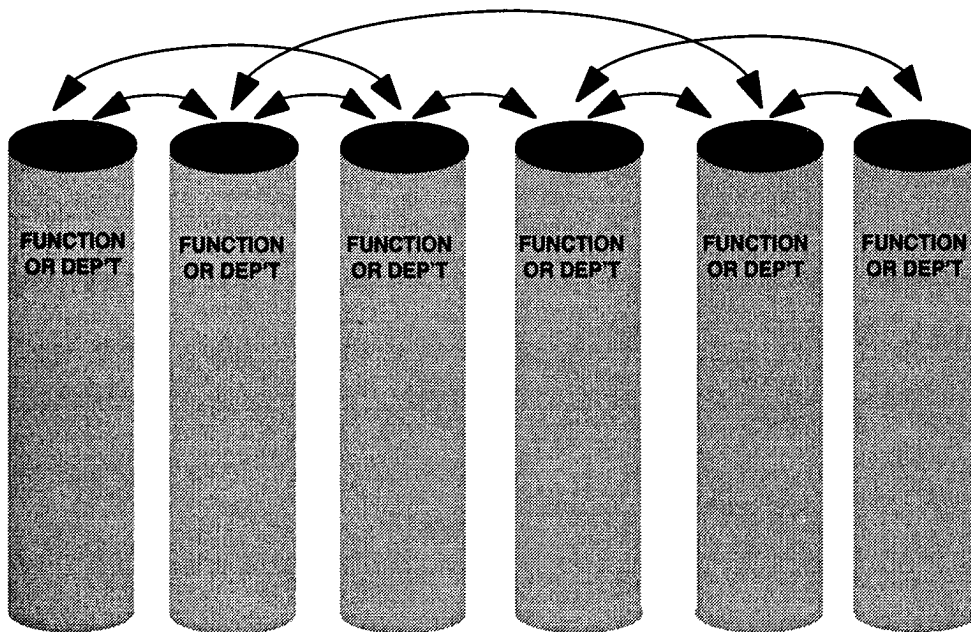
A Process View of the Organization: Naval Aviation Systems (NAVAIR)



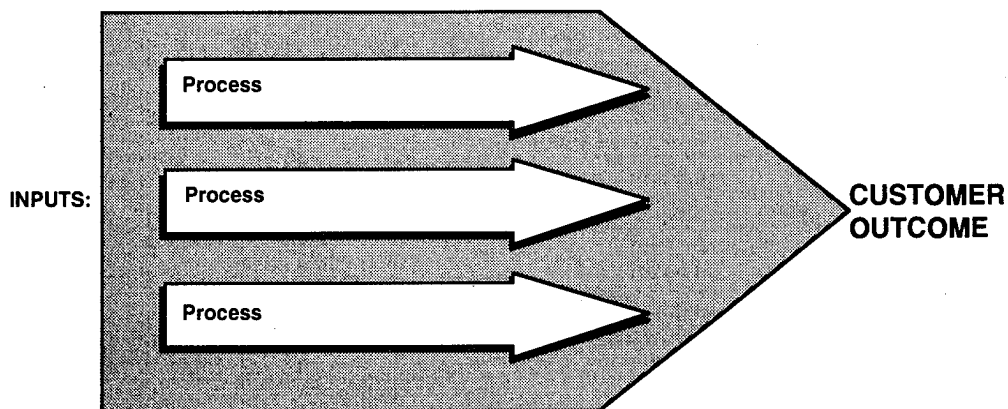
*IPT's are multidisciplined teams which provide products and services that satisfy customer demands over the entire product life cycle.

Reengineering Around Processes Turns Organizations on Their Sides

From Vertical "Stovepipes"—Functional Departments:



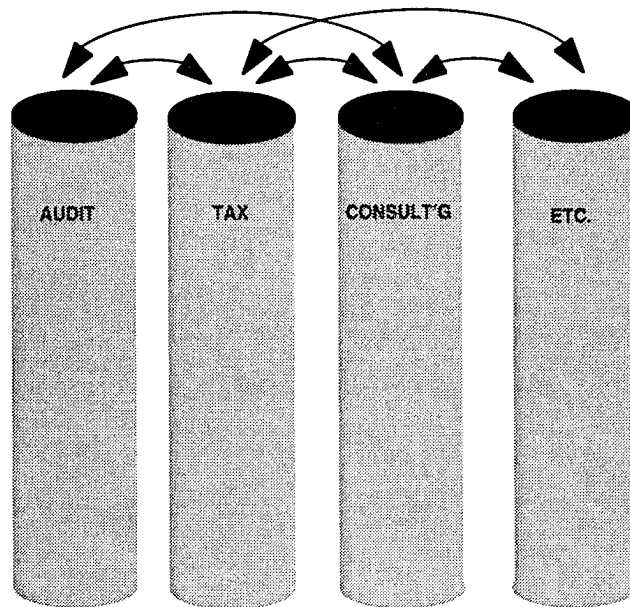
To Horizontal Process Teams:



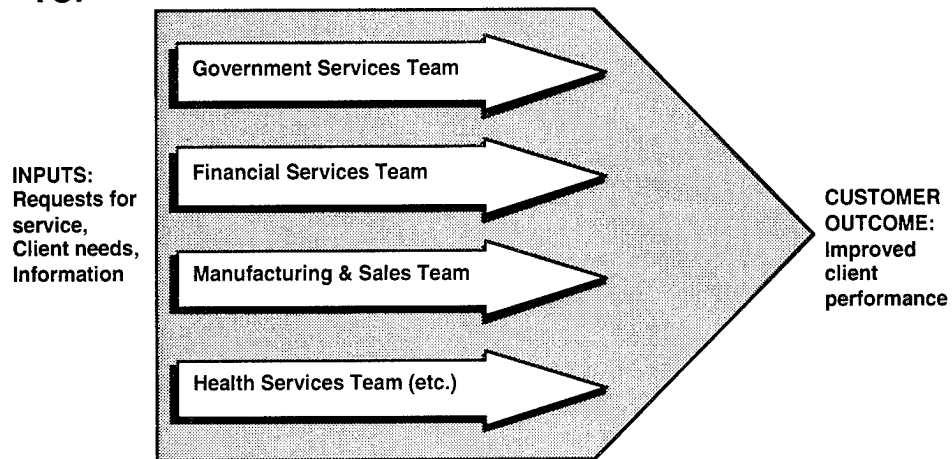
All Functions Represented on Most Process Teams

From Functional to Process Orientation: Peat Marwick

FROM:



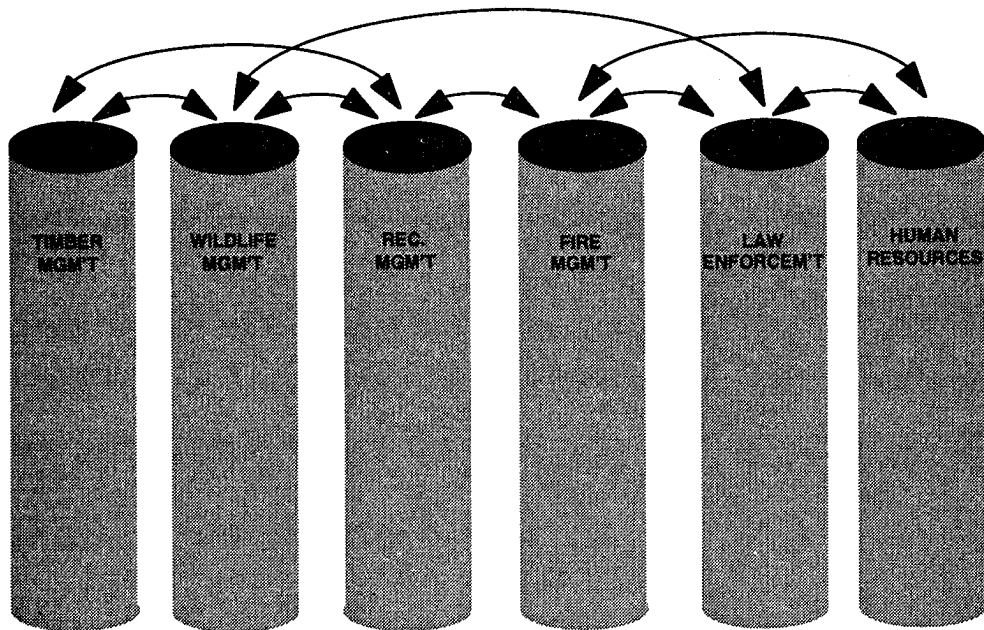
TO:



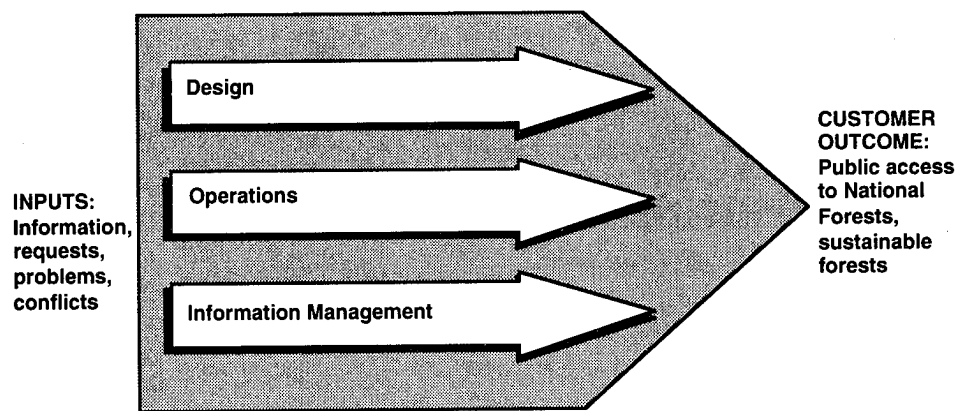
All Functions Represented on Most Process Teams

From Functional to Process Orientation: Sheffield Ranger District

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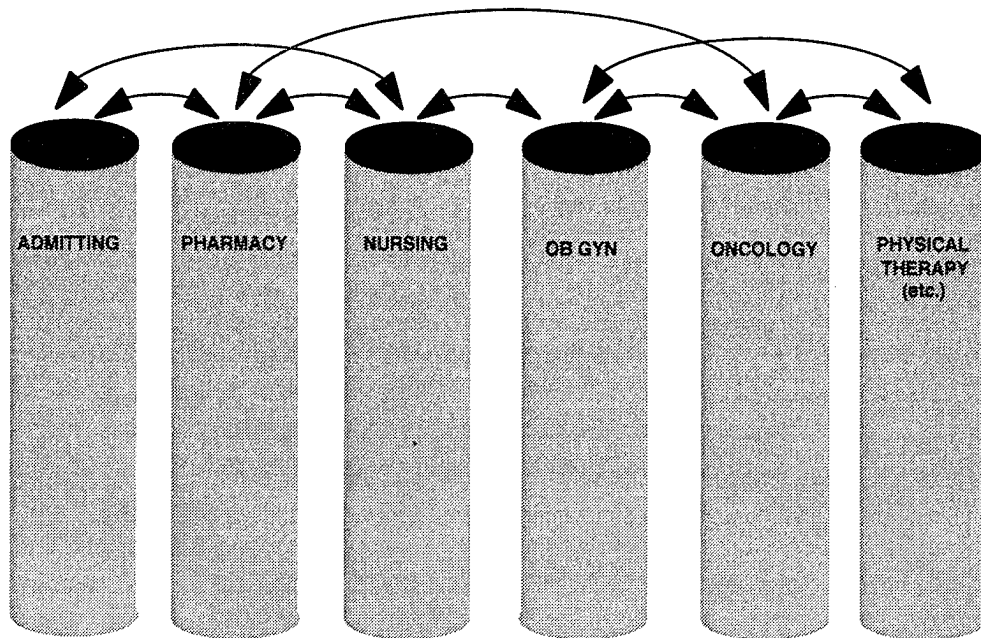
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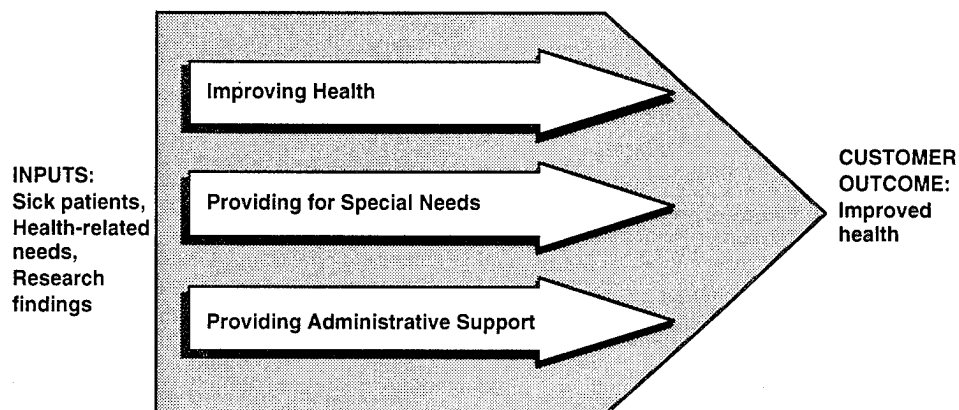
All Functions Represented on Each Process Team

From Functional to Process Orientation: Lakeland (FL) Regional Medical Center

FROM:



TO:



Assumptions

Most bureaucratic organizations are designed around several assumptions. These assumptions are usually unstated, but they have a powerful effect on the staff and on the organization's performance.

For example ...

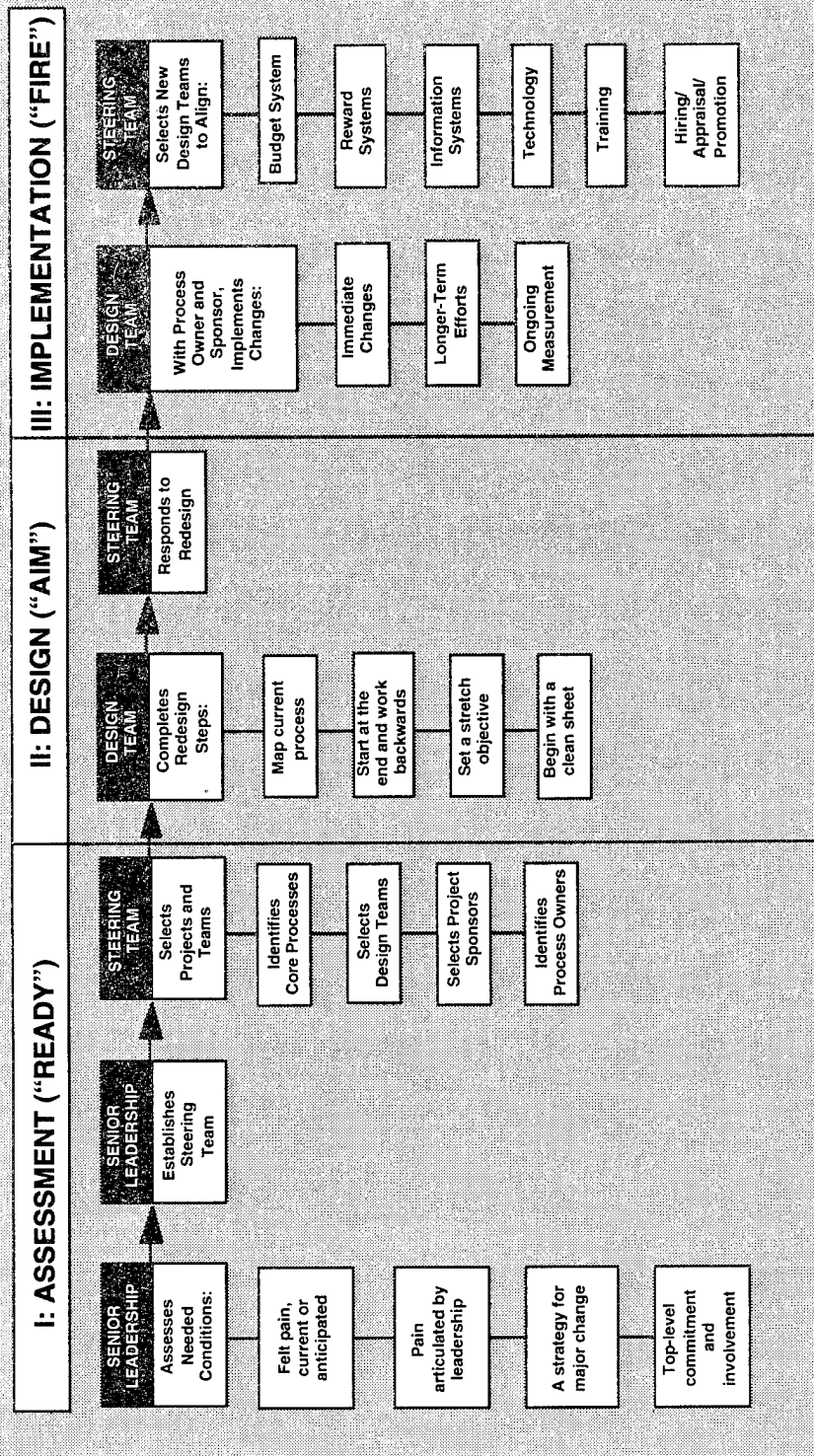
Bureaucracies are typically run on the assumptions that:

- Time sheets and vouchers provide accountability and control
- Vendors will be paid when they submit an invoice
- Accountability and efficiency require that all cases be treated in an identical manner

Today, leading organizations are challenging these assumptions, and turning certain organizational "truths" on their heads:

- In an era of empowered employees and telecommuting, innovative managers are learning to trust employees, hold them accountable for their time and production, and manage problems by exception
- Some organizations today don't accept invoices; they pay when they receive what they ordered
- Triage (sorting) often provides far greater efficiency than one-size-fits-all processes, with no loss of accountability or equity

A MODEL FOR PROCESS REENGINEERING



Source: *Seamless Government: A Practical Guide to Re-Engineering in the Public Sector*, by Russell M. Linden, Jossey-Bass, 1994. Used with permission.

Thoughts On Change Management

- Plans are nothing, planning is everything.
— Dwight D. Eisenhower
- There is no constituency for change; you have to create it.
— Jack Welch, CEO, General Electric
- The reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order.
— Machiavelli, *The Prince*
- You must be what you would like to see happen
— Mahatma Ghandi
- Progress is a nice word. But change is its motivator, and change has its enemies.
— Robert F. Kennedy
- The most gifted members of the human species are at their creative best when they cannot have their way.
— Eric Hoffer
- Creativity and adaptation are born of tension, passion, and conflict.
— Richard Tanner Pascale, *Managing on the Edge*
- One of the difficulties in bringing about changes in an organization is that you must do so through the persons who have been most successful in the organization, no matter how faulty an organization is. To such persons ... it is the best of all possible organizations ... Yet those are the very people through whom we must bring about improvements.
— George Washington, Second Inaugural Address

Some Rules For Change Management

1. First of all, **there are no rules**. No one-size-fits-all formula. No guarantees. Change in a complex human organization does happen, but not because a leader or group follows a 4-step model.
2. Therefore, **listen and learn** from those who have useful (positive and negative) experiences at change. Especially helpful — what are the “lessons learned” from your own organization’s experience at attempting changes?
3. Any organization is good at “waiting ‘em out” and “wearing ‘em down.” That is, organizations, like all organisms, strive for stability. Thus, your **persistence** is as important as anything else you have going for you.

4. "WIIFM" is a good acronym for trainers. It stands for "**what's in it for me?**" which is the first question most people ask themselves when they attend a training session. That's also what people ask when faced with a major change. The implications for change agents:

Let people know, as clearly as possible, what this change may mean for them.

5. If persistence is one of your most powerful allies, your **credibility** will make it or break it for the change effort. It is imperative to tell people what you know, often, without ever shading the truth. Most people can handle bad news better than you would imagine, if told straight, with care.

6. Which leads to this thought: **telling people the truth is treating them with integrity.** As Mark Twain said, "Tell the truth and you don't have to have nearly as good a memory."

7. Allow for the fact that **people will treat change as a loss.** And losses must be mourned — sooner or later. Support people as they mourn the loss of the organization that they knew. Many people's reaction to major change resembles the stages people go through when they learn they have a terminal illness. As Dr. Elisabeth Kubler-Ross* learned in her work with dying patients, the stages they go through are fairly predictable:

- Shock, denial ("it can't be me")
- Anger ("why the hell is it me?")
- Bargaining ("if only I could live to see such-and-such happen...")
- Depression
- Acceptance

Remember this: the mourning process is natural, and *necessary*. Don't compromise on the need for change, but don't insist that everyone run around with a huge smile on their faces. Their attitudes are their own — respect that.

8. Since change involves loss, which is painful, it is critical to **show people the cost of doing business in the current way.** *Most change is pain driven.* People must understand, in clear terms, why the current process or approach is no longer acceptable. Once that is clear, supporting a new approach is far easier.

9. People in the midst of major change experience a good deal of stress. When people feel great amounts of stress, they have two overriding needs: *information* and *control*. Implications: **1. Communicate:** the reasons for the change, expected results, and how the new approach will affect people, over and over and over. The best mechanism for your communications: small group, face-to-face discussions. **2. Offer people specific roles in the change effort.** Whether they agree with the change or not, most people cope better if they have something concrete to offer during the transition. There are many important roles to play during a major change: ask for people's help in filling those roles.

**On Death And Dying*, by Elisabeth Kubler-Ross. Macmillan Publishing Co., 1969.

10. Change is as much about unlearning as it is about learning. The CEO of NCR said "I have spent 38 years learning a lot. Today, most of it is irrelevant." The implications are both painful and exciting: the new economy will reward those who continually expand their skills. **Managers must support the continual learning of their employees.**

Three Change Strategies

I. Shock Therapy

This is the approach Jack Welch used at GE. Nothing was sacred, everything was challenged. If your business wasn't #1 or #2 in the world, you were at great risk; if you couldn't supervise 20 people or more, accomplish huge stretch goals, empower your people and be fully accountable for your unit, you were in trouble. "Speed, simplicity, and self confidence" were the values that Welch stressed, as he pushed his corporation toward becoming what he called a boundaryless organization. Because the changes were so huge, came so fast, and involved so many aspects of the business, people realized they faced two stark choices: support the change effort enthusiastically, or hire another boss (for more on Welch, see below).

While this "shock therapy" is used more often in the business world, some in government have used it as well. FBI Director Louis Freeh is making major changes in the way the Bureau does business, with an emphasis on moving agents out of headquarters and to the field. One example: he reduced the faculty at the prestigious FBI Academy from over 110 to under 60, and did so in a matter of a few months. The faculty weren't fired, they were reassigned to the field, which is where Freeh has decided the Bureau adds value.

II. Leverage Core Competencies

Whereas "shock therapy" assumes that the organization's culture and practices need major surgery, and uses a top-down method of forcing the change, leveraging core competencies assumes that the organization has the capacity to change itself. "Core competencies" are those skills and technologies that the organization performs at a truly high level. By expanding the concept of core competencies somewhat, leaders can use the strategy of using the organization's strengths to change itself. For example:

- Identify the informal leaders who have an excellent track record of implementing change in their own units. Involve them in planning the overall change effort, and give them the major roles in leading the change.
- Use the organization's core competencies at appropriate times during the change process. When first getting started, identify units with excellent analytical skills and ask them to help in the assessment phase of the change. Ask those with first-rate interviewing skills to help do the benchmarking studies and focus groups of stakeholders. When design teams are needed to come up with new process designs, involve the most creative "out-of-the-box" thinkers in the organization. During implementation, get those individuals and

units that excel at project management, and have them take leadership roles in overseeing implementation. And ask the staff members with the very best "people skills" to form a communications team; give them the task of maintaining an ongoing dialogue with the whole organization throughout the change effort.

III. *Begin with Behavioral Change* (see following pages)

NOTE: For an excellent, short, and reader-friendly manual on change from the employee's point of view, see *The Employees Handbook For Organizational Change*, by Price Pritchett and Ron Pound (available from Pritchett & Associates: 1-800-992-5922).

Begin With Attitudes? Begin With Behaviors? Where Does Change Start?

I. Begin By Changing Attitudes: Seek Buy-In

Many management and change models are based on this theory: that to make significant change in people's behavior, their attitudes must change first. This assumption usually leads to extensive investment in training programs in an attempt to get senior and middle managers to begin modelling the behavior they desire of others. It also leads to considerable time spent developing corporate vision, mission and values statements.

This approach can work, and when it does it leads to powerful change, because people have begun to develop a common "mental model" (to use Peter Senge's term) about how the organization should operate. There are two significant problems with this approach: attitudinal change takes a very long time, and this approach often emphasizes philosophy and activities, not results. Success is sometimes measured in the number of people who attend the training classes, the extent to which employees seem happy with the new philosophy, and the like.

As Schaffer and Thomson wrote in "Successful Change Programs Begin With Results" (*Harvard Business Review*, Jan. - Feb., 1992), "Most improvement efforts have as much impact on company performance as a rain dance has on the weather." Why? Because, they argue, most change efforts focus on activities (e.g. training, % of employees in quality circles, etc.), not on results. They note dozens of organizations that brag about the percentage of the workforce that has attended quality training classes, the number of improvement teams in operation with little or no improvement in performance to show.

II. Begin By Expecting Different Behaviors: Seek Results

This approach turns accepted wisdom on its head. It says to staff, Your attitudes are your own. You may think the new approach makes sense, or you may think it is absolutely crazy. That's your right. What we need is to adopt some new behaviors, to do the work in different ways, ways that we believe lead directly to improved results. If we're correct, we'll know soon enough. If not, we'll know that, too.

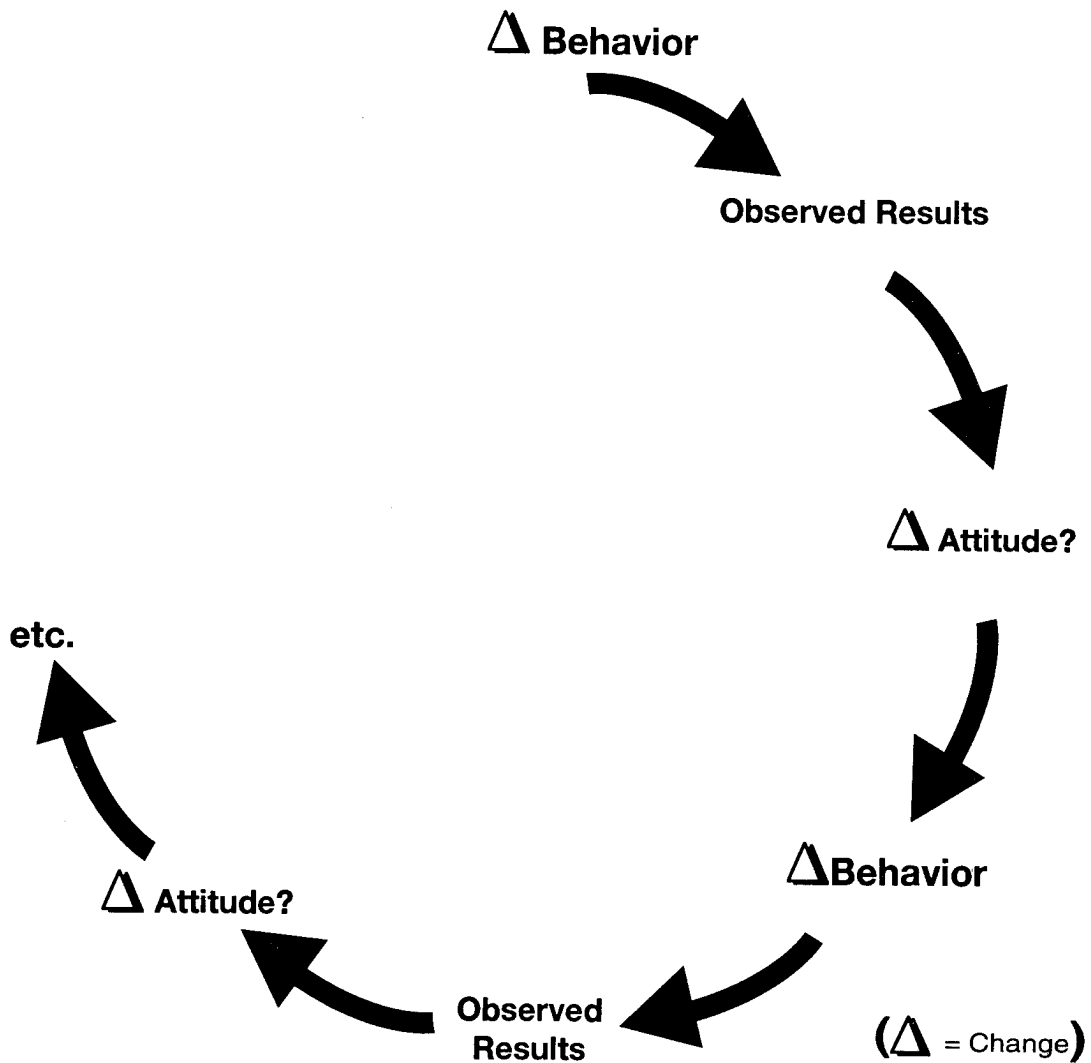
Schaffer and Thomson note in their article that "There is no motivator more powerful than frequent successes." This second approach assumes that attitudes are, indeed, important to a change effort, but that attitudes can be best affected by demonstrating actual results — improved organizational performance. Thus, rather than beginning with mission and vision statements and hundreds of hours of training, this approach says that the way to begin a change effort is with a concrete change in behavior. Explain the need for change and the costs of not changing. Then ask for a specific change in behavior, one linked to an organizational performance goal — e.g., move to self-managing teams, in order to reduce cycle times and improve quality. As results come in, attitudes will take care of themselves.

Two Views of Change

I. Begin by Changing Attitudes

Δ Attitude (Change in Attitude) $\rightarrow$ Δ Behavior (Change in Behavior)

II. Begin by Expecting Different Behaviors



Examples of Starting By Changing Behaviors and Emphasizing Results:

- **Integrating the military.** When Harry Truman decided to integrate the armed forces in 1948 he started with an order to integrate, not with classes on diversity. Over time the military created the training, appraisal and promotion mechanisms to internalize the expectation that all races will be treated equally, and to reward people for doing so.
- **Transforming GE.** Jack Welch took over a company of 404,000 in 1981, and forged change that nobody believed possible, or necessary. He issued a policy: every one of GE's businesses would be #1 or #2 in the world, or GE would get out of it (and he acted on that policy). He reduced costs, largely by downsizing (the company has about 220,000 employees today). He began Work Out, a program designed to eliminate unnecessary bureaucracy, push authority down, and give managers direct feedback from their staff. And he gave managers large jobs and demanding goals, to eliminate micro managing and force managers to lead. Several years into this effort, the company articulated a values statement, but it began with a change in behaviors. As those behaviors produced positive results, attitudes followed.
- **Changing habits.** Most of us adopt new habits through trial and error — we begin behaving differently, and if it works we are likely to continue. Examples: getting into fitness programs, changing our eating habits, letting go of workaholic patterns.
- **Development of teams.** Many managers try to move to a team approach through training, team-building activities, team-based incentives, and talking about the importance of teamwork. But as Katzenbach and Smith found in their powerful study of teams the *Wisdom of Teams*, HarperBusiness, 1993), the factor most likely to lead to strong teams is the existence of a big "performance challenge," a very important project that can only be done well by a strong team. When people feel the need to collaborate in order to get important work done, teamwork is more likely to occur (and team dynamics training is most appreciated under such conditions). As team-oriented behavior produces results, as it is rewarded, positive attitudes toward teams usually follows.
- **Learning New Technology.** For those who didn't grow up playing with computers, the first experience on a computer or other new technology can be hair-raising. Most of us don't overcome our fears by sitting through workshops designed to get us to "buy in" to using computers. No, we get comfortable by sitting down at a keyboard, having someone show us how to perform a few functions, and trying them out. As we experiment, as we see what it can do for us, *then* our attitudes have time to adjust to our new behaviors.

As Richard Pascale writes, *"It is easier to act ourselves into a better mode of thinking than to think ourselves into a better mode of acting."* (*Managing On The Edge*, p. 264).

APPENDIX

E

Hoshin Planning

This paper is one of a series, written by David W. Hutton for Achieve International, which surveys important quality management strategies and advanced methodologies.

Hoshin Planning - in a Nutshell

Hoshin Planning is one of the titles commonly used in the Western world to describe Hoshin Kanri. This is a system of planning and deployment which evolved in Japan from Management by Objectives (MBO).

Hoshin Kanri involves every part of an organization: first in selecting and defining a small number of key corporate goals; and then in contributing to the accomplishment of these. It is one of the pillars of Total Quality Control¹ as practised in Japan, and similar approaches have been developed by a number of the Western companies which are pioneers in the field of quality management.

Hoshin Kanri differs from other systems of planning in that it makes extensive use of quality management principles and techniques. It may be thought of as quality management applied to the process of corporate planning.

History

The development of Hoshin Kanri is inextricably entwined with the spread of quality management principles and practices within Japanese industry. These principles were first introduced by the Japanese Union of Scientists and Engineers in 1950, in an eight day course with Dr. Deming as the guest lecturer. This led to the widespread use of the PDCA cycle (plan-do-check-act) and the 'seven QC tools' for the management of virtually any operation. This phase might be called Statistical Quality Control (SQC).

The idea of an integrated company-wide management system, bound together by a planning system, began to develop in Japan during the 1950's and 1960's. This was heavily influenced by:

- the Deming Prize, established in Japan in 1951, which from the outset called for a system of planning
- Peter Drucker's book *The Practice of Management*, which proposed Management By Objectives (MBO). This was published in Japanese in 1954
- General Motors' divisional system, which was a novel concept at that time

¹The term 'Total Quality Control' as used in Japan is synonymous with 'Total Quality Management' in the Western world.

- Dr. Juran's lectures on general management.

By the late 1960's many Japanese companies had implemented MBO, and a number of leading companies - Bridgestone Tire, Toyota, Komatsu Manufacturing, and Matsushita - had developed their own innovative approaches, going far beyond the original concept. These innovations, which would form the basis for Hoshin Kanri, sprang from the formidable expertise in SQC which these companies had established, which at that time existed only in Japan.

The term 'Hoshin Kanri', referring to this new approach, became widely accepted in Japan in the mid-1970's. By the late 1970's the experience accumulated in industry had been distilled into a formalization of the principles, and the first books on the subject appeared. The first symposium on Hoshin Kanri was held in Japan in 1981, and in 1988 the Japanese Association of Standards published a series of works dealing with Hoshin Kanri practices.

In the USA, a few leading companies began to implement their own versions of Hoshin Kanri during the late 1980's, including Hewlett-Packard, Procter & Gamble, Florida Power & Light, Intel, and Xerox. Many of these companies have shared their experiences in the public domain, but Western literature on this subject started to become available only in the early 1990's.

Various names for this approach have been used in the West such as 'Hoshin Planning', 'Management by Planning', and 'Policy Deployment'. These are approximate translations of the Japanese phrase. None of them captures the subtleties of the original meaning, and all are slightly misleading in some way. However, none of these terms is in very wide circulation, even in those companies implementing Hoshin Planning. Most employees are simply aware of the workings of the system in use, and only a few specialists need to know more than this. The common English name Hoshin Planning' is used in this paper.

Benefits of Hoshin Planning

The benefits of Hoshin Planning include:

- communicating the organization's vision as the starting point for all planning; as well as communicating business goals, major shifts in direction, and important new initiatives
- emphasis on a thorough analysis and understanding of problems which occurred during the previous cycle of planning/deployment. This helps ensure that new goals are based upon a sound understanding of the organization's current capabilities and opportunities for improvement
- involvement in planning of those who will carry out the implementation. This helps ensure that the goals are understood, achievable and 'owned' by those who have to achieve them

- alignment of departmental and individual efforts throughout the organization, all in support of the vision and the business goals. In this way many small achievements can complement each other in key areas of performance - to sustain improvement trends, or to create a step improvement (a 'break through')
- a built-in continuous improvement cycle - to refine each annual iteration of the plans, as well as to improve the planning/deployment process itself.

What is Hoshin Planning

One way of understanding Hoshin Planning is to picture a typical well implemented MBO system, and then to explore the possible differences between this and a Hoshin Planning system.

The MBO system might include the following elements:

1. a review by top management of information about: the company, including past financial results, market share trends, product margins and costs; the activities and performance of competitors; trends in the economy and in the chosen marketplace; technological developments; and so on
2. examination of various strategies and prediction of outcomes; selection of a few key strategies; and quantification of the goals - the corporate outcomes sought, both long-term and short-term
3. deployment of the chosen goals and strategies throughout the organization, so that each department undertakes to achieve some portion of the whole (for example a certain reduction in costs), and the sum of these individual goals equals the total goal. Each department will have a plan for achievements of these goals on (say) a monthly basis
4. a thorough system of review and follow-up so that the performance of each department is reviewed (say) on a monthly basis against its plan, any shortcomings can be identified and investigated immediately, and corrective action can be instigated.

A mature Hoshin Planning system has, in addition, the following characteristics. Some or all of these may represent significant differences from the MBO system just described.

1. the system encompasses both control and break through. It is founded upon a system for control, often called the 'daily management system'. This is the day-to-day management of processes throughout the organization, with measurements reviewed frequently, and reported upwards and consolidated to show overall performance related to business objectives. This system also indicates where the current capabilities fall short of the needs of the organization, and this is one of the important inputs to the selection of the top-priority goals (Hoshin items). Once Hoshin items are chosen, additional resources and attention may be devoted to these, and the accomplishment of these these goals is monitored by the

Hoshin system. This can be pictured as a set of improvement projects, chosen to achieve a few top-priority goals, overlaid on the routine management of the organization.

2. the system makes effective 'connections' all the way from the organization's long-term vision and business objectives to the day-to-day activities of supervisors and front-line employees. From the long-term plan flows the annual plan, with the priority goals for the coming year. This in turn is supported by many lower-level plans which are progressively more detailed and more short-term. And with these different planning horizons go different review cycles. Routine or detailed activities are reviewed daily or weekly, while overall progress is reviewed by different levels of management monthly and/or quarterly.

3. the system is conceived as a PDCA cycle, but with the sequence changed to CAPD – i.e., the 'check-act' phases comes first. The first phase is a thorough review of the previous year's plans and outcomes, and a thorough analysis of where, how and why the outcomes differed from expectations. Standard quality techniques are used, such as the 'seven QC tools', and root cause analysis, to identify the fundamental causes of problems. Over-achievements are analyzed in the same way, since these are also unexpected results which may contain some valuable nugget of learning.

4. most of the items in the plans are related to process improvements of some sort. Since process improvement is a continuing activity, and since the gains are cumulative, a thorough analysis of last year's efforts provides a lengthy list of possible activities, any of which will yield further gains. Analysis of failures will reveal the root causes, and thus a course of action more certain to succeed next time. Analysis of successes highlights courses of action which proved successful, and which can be reinforced, repeated and standardized. Even external events completely beyond the control of the organization are scrutinized during the review, to determine whether the planning process could have enabled the event to be foreseen, or the risk hedged in some way. With this type of information available, much of the groundwork for planning is already done, and the remaining task is to select and prioritize actions.

5. the planning/deployment process itself is subject to the same type of thorough review and analysis, so that it can be improved. This built in improvement cycle is one of the reasons that Hoshin Planning, although sprung from MBO, is now very different.

6. the process by which the corporate goals are arrived at is a participative one. Discussions of possible targets (and means of accomplishing them) take place at every level in the organization. The intent is to give everyone the opportunity to provide input before the goals which affect them are finalized. This process is known as 'catchball' - for the game in which a ball is thrown repeatedly from one person to another in a group. The outcome is that everyone in the organization can understand how their own efforts contribute to the grand scheme of things, and no individual or group has imposed on them goals which they do not feel able to achieve.

7. the various aspects of the plan (goals, the components of the goals, the relationships between them, responsibilities, milestones, etc.) are captured and documented in consider-

able detail, using formats which are standardized throughout the organization. These formats also show how senior management goals are translated into more specific goals at the next level, and so on.

8. the goals deployed are of two types - quantified targets, and the actions required to achieve these - and these are closely intertwined. No target will be adopted unless the means of achieving it have been agreed, and both then become part of the plan. A series of matrices is often used to capture both of these dimensions of the plan. This matrix also helps to verify consistency - all targets should be supported by appropriate courses of action, and no course of action should be adopted unless it supports one or more of the targets. Annual targets are translated into trends or anticipated periodic results which can be tracked during the year, and actions are assigned milestones for tracking completion of intermediate tasks. The final plan is therefore a complete interlocking fabric: of scheduled activities which can be pursued to completion; and of the quantified outcomes which should flow from these actions during the year.

9. when a unit is not meeting its targets, then help is provided. This is not the type of so-called 'help' provided in many organizations: in which senior management interfere or take over, reverse local decisions, and leave local management tarnished with blame. The aim is to gain an understanding the underlying causes and to deal with these.

Relationship to Achieve's Service/Quality System

Hoshin Planning is squarely within the 'Plan' component of the Service/Quality system, with links to 'Systems', 'Measurement', and 'Reward' and Recognition'. Some basic system of planning and deploying goals is essential to the successful launch of a Service/Quality initiative. However, Hoshin Planning is unlikely to be on the agenda of most organizations during the first iteration of the Service/Quality Plan. Changes leading towards this type of planning system may be worth considering during later iterations.

Relationship to Other Methodologies

No TQM process can be complete or fully effective unless it embodies an effective planning and deployment system. Without such a system there is a tenuous connection between business goals and employees' daily activities, many corporate management decisions lose their force, and purposeful change of any sort becomes difficult. This system is also the 'glue' which helps bind together all kinds of activities in an organization, including the various other quality management methodologies and techniques which may be in use.

Application of Hoshin Planning

Hoshin Planning cannot be simply 'installed' in an organization. The potential benefits can only be won by trying to understand and apply the principles to the organization's particular situation, and by progressively learning from this experience.

The following considerations should be taken into account in deciding when and how to apply Hoshin ideas and methods to improve your planning system.

- Virtually every organization already has some kind of planning and review system. This cannot be scrapped or replaced overnight - it must be evolved from what exists today. This evolution may be in large or small steps, but it should be purposeful re-engineering, rather than tinkering.

- Since introducing TQM into an organization involves change, a planning and review system which works is essential from the outset. Without planned action and persistent follow-through, sheer inertia will usually maintain the status quo.

- Even a fairly rudimentary planning and review system - if diligently applied - can suffice to deploy the start-up phases of a TQM initiative. (Such a basic system will not, however, support the achievement of ambitious business objectives.)

- Improving the annual planning system is an inherently slow process, compared with improving a system which repeats on a daily or hourly basis. There are fewer opportunities to make adjustments to the system, to observe the effects, and for the people involved to gain experience of the modifications. The time required to develop a mature Hoshin Planning system is generally five years or more, starting from the base of a sound, fully deployed (MBO) system.

- Some of the concepts of Hoshin Planning cannot be applied until other elements of TQM have been learned. For example, in a mature Hoshin Planning system, plans are based upon a thorough understanding (and measurement) of current capabilities, and an analysis (with root causes) of current problem areas. This type of information is simply not available until the organization has developed some competence in process management. Another example is the use of matrices to record targets and means, to check consistency, and to deploy goals to lower levels in the organization. Much of this will seem strange and unwieldy to management teams which do not have experience with some of the 'seven planning tools'.

Together, these considerations suggest the following logic:

- If the current planning and review system is simply 'broken', then this needs to be addressed as soon as possible. For example, if corporate management decisions often go unrecorded, or if there is not enough follow-through to ensure that decisions are translated into action, then there is an urgent need to improve the system. Since only a few changes can be made in any one year, only the most serious shortcoming(s) should be tackled at first.

- Since improvement has to be evolutionary, each revision of the system must be workable, and each change must be perceived as a step forward by those who use the system. Feedback from users can help identify those changes which will make the system more effective *and* improve it in the eyes of users.

- Because it takes a substantial amount of time to develop an effective planning system for your organization, this system it should not be ignored until it becomes a problem. It may be better to start work early on a long-term improvement strategy, and thus have adequate time to implement this in small, easily managed stages.

Implementation Hints

- Make sure that the planning system is designed to help achieve the organization's business goals.
- Do not copy slavishly another organization's system.
- Start with the system that exists now. Do not introduce a new system in parallel with the existing one.
- Introduce change progressively, in easily assimilated steps.
- Strive to ensure that each change is seen as a step forward by users, and that each set of changes results in a practical and workable system.

Units of Change

In planning this evolution, the following are typical 'units' of change which might be made each year, perhaps a few at a time. The list below is not comprehensive, nor in any particular sequence:

- Ensure that plans are documented and linked to the review process in such a way that every item is pursued to 'closure' (i.e. plans completed and commitments met, or the reasons understood and changes accepted).
- Ensure that financial planning is coordinated with the planning cycle for improvement (e.g. budgets are not fixed before other forms of planning begin).
- Introduce mechanisms to capture feedback on the planning system itself- from users of the system at various levels.
- Broaden the scope of inputs, to include relevant information about customers, employees, suppliers, performance of competitors, trends in technology, etc.
- Introduce a requirement for some quality improvement goals (e.g. for achievement of some kind of process improvement), to complement financial goals, output goals, personal development goals, etc.
- Reinforce the distinction between quantified outcomes (targets) and actions required to achieve these (means). Provide a process for developing and recording goals of both types.
- Introduce a self-assessment process to analyze historic data (e.g. to identify the root causes of past variances from plan) and to recommend actions.

- Broaden participation in the process, to obtain the input, involvement, and 'buy-in' of everyone involved before the plans are finalized.

References

This paper provides only a brief overview of a complex topic. The following materials provide starting points for further study and investigation:

1. **"Hoshin Kanri - Policy Deployment for Successful TQM."* Yoji Akao, Author and Editor-in-Chief. 1991, Productivity Press, Cambridge, MA 02140.
2. *"Hoshin Planning - The Developmental Approach."* Bob King. 1989. GOAL/QPC, Methuen, MA 01844.

*Highly recommended.

Acknowledgments

Thanks are due to the following people who reviewed this paper for accuracy, and provided valuable comment and suggestions:

Jan Case, Quality Manager, North American Distribution Organization, Hewlett-Packard Company, Santa Clara, California.

Chunllm Chan, Manager, Quality Strategy, Xerox Canada Ltd., Toronto, Ontario.

Craig Walter, Senior Vice President, Quality Resources, American Electronics Association, San Jose, California.

Gregory H. Watson, Vice-President, Quality Office, ODP Division, Xerox Corporation, Rochester, New York.

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Quality Function Deployment

This paper is one of a series, written by David W. Hutton for Achieve International, which surveys important quality management strategies and advanced methodologies.

Quality Function Deployment - in a Nutshell

Quality Function Deployment (QFD) is a way of making the 'voice of the customer' heard throughout an organization. It is a systematic process for capturing customer requirements and translating these into requirements that must be met throughout the 'supply chain'. The result is a new set of target values for designers, production people, and even suppliers to aim at in order to produce the output desired by customers.

QFD is particularly valuable when design trade-offs are necessary to achieve the best overall solution, e.g. because some requirements conflict with others. QFD also enables a great deal of information to be summarized in the form of one or more charts. These charts capture customer and product data gleaned from many sources, as well as the design parameters chosen for the new product. In this way they provide a solid foundation for further improvement in subsequent design cycles.

QFD is sometimes referred to by other 'nicknames' - *the voice of the customer* (from its use as a way of communicating customer needs), or the *house of quality* (from the characteristic house shape of a QFD chart).

History

The creation of QFD is generally attributed to Mitsubishi's Kobe shipyard in Japan. The original approach, conceived in the late 1960's, was adopted and developed by other Japanese companies, notably Toyota and its suppliers. In 1986 a study by the Japanese Union of Scientists and Engineers (JUSE) revealed that 54% of 148 member companies surveyed were using QFD. The sectors with the highest penetration of QFD were transportation (86%), construction (82%), electronics (63%), and precision machinery (66%). Many of the service companies surveyed (32%) were also using QFD. Specific design applications in Japan range from home appliances and clothing to retail outlets and apartment layouts.

In the USA the first serious exponents of QFD were the 'big three' automotive manufacturers in the 1980's, and a few leading companies in other sectors such as electronics. However, the uptake of QFD in the Western world appears to have been fairly slow. There has been no survey comparable to the JUSE study regarding the spread of QFD in North America, and there are relatively few sources of literature and case studies, compared with other methodologies such as Benchmarking.

There is also some reluctance among users of QFD to publish and share information - much more so than with other quality-related methodologies. This may be because the data

captured and the decisions made using QFD usually relate to future product plans, and are therefore sensitive, proprietary, and valuable to competitors.

The benefits of using QFD

The main 'process' benefits of using QFD are:

- improved communication and sharing of information within a cross-functional team charged with developing a new product. This team will typically include people from a variety of functional groups, such as marketing, sales, service, distribution, product engineering, process engineering, procurement, and production

- the identification of 'holes' in the current knowledge of the design team
- the capture and display of a wide variety of important design information in one place in a compact form

- support for understanding, consensus, and decision making, especially when complex relationships and trade-offs are involved

- the creation of an informational base which is valuable for repeated cycles of product improvement

The main 'bottom line' benefits of using QFD are:

- greater likelihood of product success in the marketplace, due to the precise targeting of key customer requirements

- reduced overall design cycle time, mainly due to a reduction in time-consuming design changes. This is a powerful benefit: customer requirements are less likely to have changed since the beginning of the design project; and more frequent design cycles mean that products can be improved more rapidly than the competition

- reduced overall cost due to reducing design changes, which are not only time consuming but very costly, especially those which occur at a late stage.

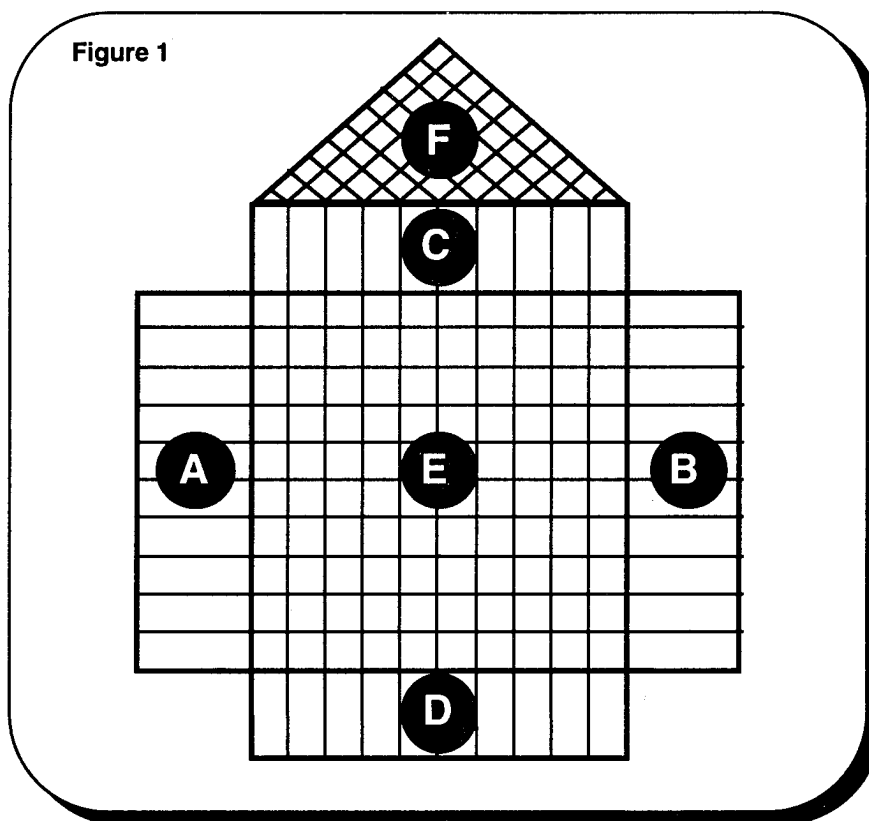
As an example of some of these benefits, Toyota auto body reported a 61% reduction in start-up costs for four van models between 1977 and 1984 through the use of QFD. Pre-production costs (for operator training) were increased slightly, but the major costs - losses incurred after first starting the production line - were slashed by more than 80%. At the same time, the product development cycle was shortened by one third, and product quality was improved.

What is QFD

At the core of QFD are 'charts' - diagrams that are used to capture, summarize and display information. However this charting technique is just one visible component of a design philosophy in which:

- product characteristics are derived primarily from identified customer requirements, rather than being driven by technology or inspired by 'hunches'
- a mass of relevant information - such as customer requirements, the characteristics which the producer can control, product performance, the performance of competitive product - is captured and analyzed in order to arrive at sound design decisions
- the various disciplines involved in the supply chain - e.g. marketing, design, process engineering, production, distribution, service - all participate in the process. In this way different perspectives and information from different sources can be taken into account.

Figure 1 shows a typical QFD chart. This contains the following information in the areas indicated:



The key customer requirements, often called 'customer attributes'. These are expressed in the customers' language. The relative importance to the customer of each requirement may also be shown in this area.

Descriptive information corresponding to the customer requirements in A. These might include customer perceptions of the current product and of competitive products.

The key product characteristics that the producer can control, often called 'engineering characteristics'. These are expressed in the technical terms used within the organization.

Descriptive information corresponding to the product characteristics in C. These might include relative importance, degree of technical difficulty, units of measurement and numerical values (perhaps for the current product and competitive products, as well as the desired product).

The relationship between customer requirements and product characteristics. This matrix is used to indicate which items in the rows are most strongly influenced by the items in the columns. Symbols are chosen to indicate strong, weak, or negative relationships. Once completed, this matrix reveals at a glance which product characteristics need to be given attention in order to meet a given customer requirement.

The relationship between different product characteristics. This 'roof matrix uses similar symbols to indicate which product characteristics tend to go together (positive relationships) and which tend to oppose each other (negative relationships). This matrix shows at a glance which product characteristics tend to have undesirable side effects on other characteristics, and therefore require careful trade-offs in order to achieve a good design solution.

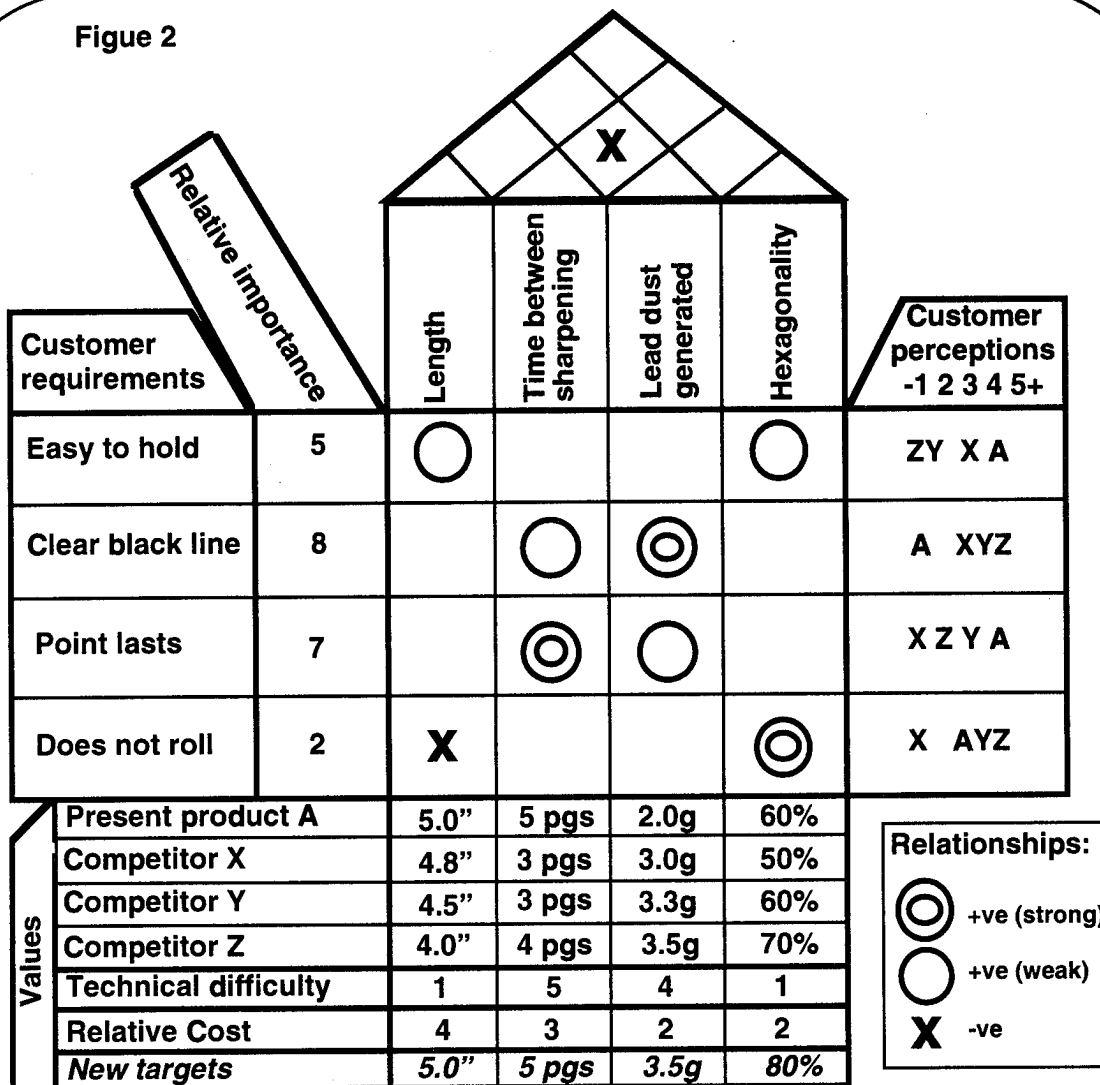
Most of the data in the diagram are *inputs* - information gleaned from various sources. However, the purpose of the diagram is to enable sound decisions to be made regarding target product characteristics. These *outputs* - new values for the key engineering characteristics - are usually shown as the last row in area D. They are chosen to achieve the best fit with key customer requirements, taking into account what is technically possible, the performance of competitive products, and the other relevant information gathered.

Figure 2 gives an example of a QFD chart, illustrating the design of a pencil. This is a tutorial example, not a real one, and is much simpler than a typical real-life chart.

This shows that the two most important requirements to the customer are a clear black line and a point that lasts. In one of these areas (a point that lasts) the current product is perceived to be better than competitive products (X, Y and Z). However, the current product does badly in the other area (clear black line).

Of the four product characteristics examined, two have a strong *positive* influence on the two most important customer requirements. These are: time between sharpening, and lead

Figure 2



Source: adapted from 'Better Designs in Half the Time' GOAL/QPC

dust generated. This is shown by the double-circle symbols in the central matrix. However, these two product characteristics have a *negative* influence on each other: a lead that generates more dust tends to need sharpening more often. This is shown by the 'X' symbol in the roof of the chart.

The values in the bottom part of the chart correlate well with customer perceptions, given the relationships assigned. For example, the competitive product that generates the most lead dust is rated best by customers for giving a clear black line.

The new targets in the last row of the chart reflect the chosen strategy: to match the best competitor in the most important customer requirement where the current product lags

producing a clear black line. To achieve this, the lead dust generated will be increased substantially. This is a cheap solution from a unit cost point of view, but will present some design challenges: it is known to be technically difficult in itself; and in addition the negative relationship shown in the roof of the chart indicates that it may be hard to increase lead dust generated without compromising another important characteristic - time between sharpening.

The flow of logic follows approximately the following sequence:

1. Determine all the customer requirements, and select those which are key- only the vital few will be charted. Rank these by importance, taking into account the relative importance of each to the customer, the performance of competitive products, and other factors such as the potential for gaining market share by excelling in a particular area. Points systems are often used to rank overall importance by creating a weighted composite score based upon various factors.

2. Establish the relative importance of product characteristics based upon which have the greatest influence upon the most important customer requirements. The relationships between customer requirements and engineering characteristics often need to be confirmed, and proven methods do exist for quantifying subjective relationships like these. Estimates arrived at by employees through judgement or intuition may create an illusion of understanding, but may be wildly inaccurate.

3. Select a strategy for each product characteristic, based upon factors such as its relative importance, technical difficulty of making improvements, and estimated cost of changes. Typical strategies might be: to improve the characteristic to surpass competitors in this area; to maintain the status quo; or (occasionally) to accept some degradation in order to achieve more important gains elsewhere. These strategies are not independent, and a number of iterations may be required to arrive at a combination of strategies which will yield the best overall result.

4. Select precise values for the target product characteristics.

5. Start work on the detailed design for achieving these target values.

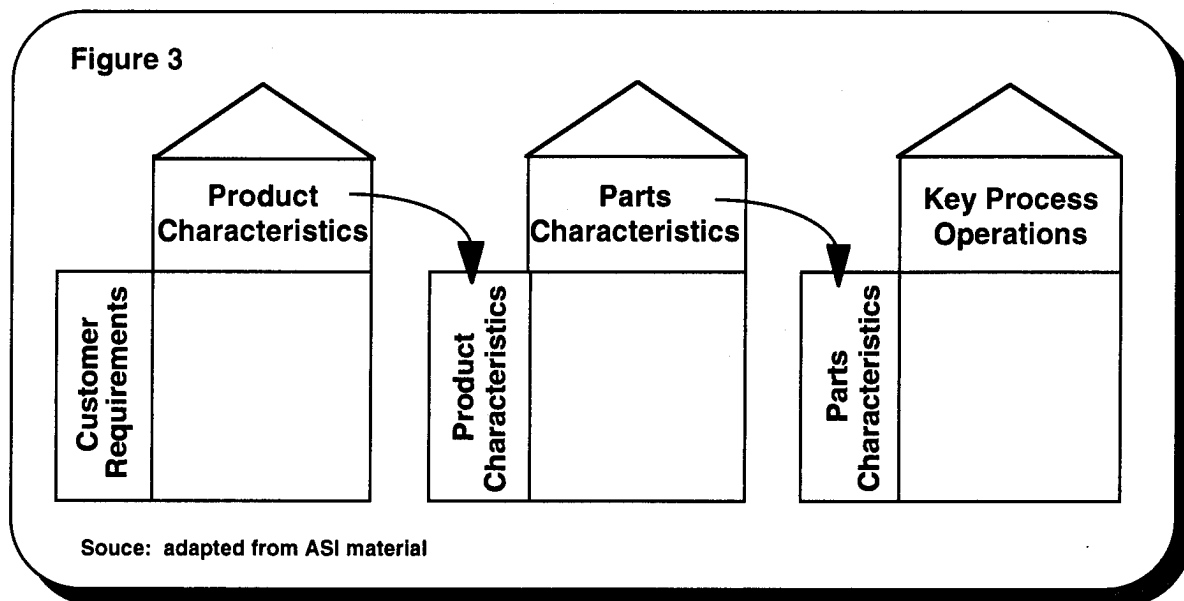
There is no standard 'textbook' formula for the information to be included on a chart, or for the way in which a chart should be laid out. Each application may call for something slightly different. Indeed the two principal Western sources of QFD information (ASI and GOAL/QPC) propose different approaches.

The guiding principle should be to do what seems useful in the situation. QFD is in effect a special-purpose combination of some of the 'seven planning tools' (see references). Aspiring QFD practitioners will find these tools helpful in adapting the basic QFD approach to suit the situation.

Repeated Deployment using QFD

Most applications of QFD use only the first chart already described. However, additional charts can be produced, and the same sequence of logic can be repeated in order to develop requirements for other stages in the supply chain. For example, the chosen product requirements can be translated into component characteristics, these may in turn be translated into requirements for key process operations, and so on.

Figure 3 illustrates how a series of charts may be used in this way to deploy the voice of the customer further and in more detail.



Relationship to other Methodologies

QFD is closely linked with other methodologies such as Taguchi methods or Design of Experiments (DOE) and Statistical Process Control (SPC).

QFD is used to establish product and component characteristics which need to be controlled in order for the outputs to meet customer requirements.

DOE may then be used to explore the complex relationships between physical process parameters (such as temperature, speed, composition of ingredients) and these component characteristics. These relationships may be shown in the central matrix in the third chart in Figure 3. In this way those process characteristics that need to be closely controlled are identified, and SPC techniques can then be used to monitor these and minimize variation.

Relationship to Achieve's Service/Quality System

Quality Function Deployment lies primarily within the 'systems' cylinder. It also has strong linkages to Measurement, Team Tactics, and Listening to External Customers.

Like most other advanced or specialized approaches, QFD has no fixed place in a 'generic' rollout plan. It may not figure at all in the organization's plans, and if it does appear it may be tackled early or late, depending upon urgency. The following considerations should guide planning decisions.

When and how to use QFD

Consider using QFD when:

- current design methods are considered too slow, error-prone, costly, or unpredictable
- current design methods do not facilitate predictions of performance with respect to competitive products, or prediction of customer satisfaction with the product
- there is scope for significant improvement in the customers' eyes through refinement or 'fine tuning' of the current product or service
- there are complex interrelationships - synergies and trade-offs - between different design characteristics

Do not use QFD in the following situations:

- as a substitute for a properly organized and structured design process. QFD is a valuable technique for use within a sound design process. It is not in itself a complete design system, nor is it a cure for an ailing design system
- where functional barriers make it difficult to involve people from different disciplines in a team effort. If such barriers are acknowledged, and serious efforts are being made by management to move towards a more co-operative, cross-functional approach, then QFD will greatly facilitate this change. However, the use of QFD alone will not bring about this new style of working, and QFD cannot be used effectively without good cross-functional teamwork

Implementation hints

- ensure that there is adequate motivation and resource available to ensure proper completion of the first demonstration project(s)
- ensure that management understand the 'front-loading' of the design cycle when QFD is used - the additional time required to gather and analyze information *before* taking major design decisions and starting detailed design
- select an initial project which is not too large or complex, which is fairly important to the organization, and which has a well defined, measurable objective for the improvement of a product or service

- select a project where there is already substantial knowledge and experience within the organization, such as a variant of an existing product, aimed at the current customer base. The existing expertise can be tapped merely by accessing the appropriate documents and people, rather than conducting lengthy research. Once the QFD approach has been mastered, it can be used successfully in more challenging situations

- do not overload the team by assuming that the charts must be completely filled out before they can be used. Identify the areas of the charts most relevant to the project objectives, focus the information gathering on these areas, and start using the charts in earnest as early as possible, to support consensus and decision making

- integrate QFD into the overall quality management system, especially the systems for gathering data about customers requirements, and the systems for understanding and monitoring the production process.

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Organizations

- American Supplier Institute, 15041 Commerce Dr. S., Dearborn, MI 48120. Phone: (313) 336-8877 Fax: (313) 336-3187

- GOAL/QPC, 13 Branch Street, Methuen, MA 01844. Phone: (508) 685-3900 Fax: (508) 685-6151

Acknowledgments

Thanks are due to the following people who reviewed this paper for accuracy, and provided valuable comment and suggestions:

Gilles Pilon, Manager, Advanced Quality Tools and Methods, Bell Northern Research, Ottawa, Ontario.

Herman Sahrman, Senior Quality Specialist, 3M, London, Ontario.

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David W. Hutton, President,
David Hutton & Associates, Ottawa

APPENDIX

F



DSMC QUAL SHEET

NATIONAL PERFORMANCE REVIEW

"Our goal is to make the entire federal government both less expensive and more efficient, and to change the culture of our national bureaucracy away from complacency and entitlement toward initiative and empowerment. We intend to redesign, to reinvent, to reinvigorate the entire national government."

-- President Clinton

The National Performance Review (NPR) began on March 3, 1993, when President Clinton announced a six-month review of the federal government. The goal was to identify problems and offer solutions. The effort was led by Vice President Al Gore and used experienced federal workers organized in various teams to examine issues across agencies. The recommendations of the NPR were published in the report From Red Tape to Results: Creating a Government That Works Better and Costs Less.

The NPR was driven by four principles:

1. **Cut red tape** - Present system is focused on following rules; system needs focus on achieving results.
2. **Put the customer first** - Listen to the voice of the customer, then organize and develop processes to meet the needs of the customer.
3. **Empower employees** - Enable those who interact with the customer to have the information and resources available to make decisions and to solve problems.
4. **Cut back to basics** - Get rid of the obsolete and eliminate duplication, special interests.

Some of the recommendations from the review include:

- Accountability for results - The use of measurable objectives and reporting reviews.

Revised 8/95

- Clarify the goals and objectives of federal programs.
- Baldrige award for federal government - Recognize quality initiatives and ideas based on program performance, cost savings, innovation and customer satisfaction.
- Quality of work life - Update and expand family-friendly workplace options.
- Leadership - The President will issue a directive detailing his vision, plan and commitment.

Federal departments and agencies will designate a senior official responsible for implementing national performance review recommendations.

Movement is from control to collaboration. Federal workers must have the best information, analysis capability and tools. Results must be measured.

- Greater productivity - Create innovation funds; eliminate the extensive number of accounts presently used.
- Personnel policy - Simplify to provide greater flexibility on classifying and paying employees; allow agencies to design their own performance management and reward systems.
- Streamlining procurement - Buy more commercial products; streamline acquisition.
- Put customers first - Identify customers and survey to get their input.
- Concurrent with the NPR, the Department of DoD created the Defense Performance Review (DPR). The DPR was created to implement the recommendations of the NPR by:

Delegating authority and responsibility
to the lowest level

Measuring success by customer
satisfaction

Replacing regulations with incentive

Developing budgets based on
outcomes

Injecting competition onto everything
we do

The DPR also established "Reinvention Laboratories" or "LABs" to serve as pilot activities to explore new and innovative ways to address the objectives identified by the NPR, and to challenge the rules and regulations in the current system that impede us from performing at our best.

The Government Performance and Results Act: Strategic Planning of the Future in Executive Agencies

by Beryl Harman

The Government Performance and Results Act (GPRA) was signed into law on 3 August 1993. In the view of the Office of Management and Budget (OMB), it is intended to shift the focus of government officials from program inputs to program execution. The goal is to obtain visibility into what is being achieved and how well government programs meet intended objectives, rather than accepting the old adage of expanded expectations. This paper will explore the tenets of the GPRA; particularly those associated with strategic planning. It will address the history of the Act, the implementation of the Act and the potential consequences of the Act.

The tenets of GPRA

The Act's objective is "to provide for the establishment of strategic planning and performance measurement in the Federal Government, and for other purposes." It bases this aim on the findings that :

"1. waste and inefficiency in Federal programs undermines the confidence of the American people in the Government and reduces the Federal Government's ability to address adequately vital needs;

2. Federal managers are seriously disadvantaged in their efforts to improve program efficiency and effectiveness, because of insufficient articulation of program goals and inadequate information on program performance; and

3. congressional policy making, spending decisions and program oversight are seriously handicapped by insufficient attention to program performance and results."

The purposes of GPRA are therefore to:

1. improve the confidence of the American people in the capability of the Federal Government, by systematically holding Federal agencies accountable for achieving program results;

2. initiate program performance reform with a series of pilot projects in setting program goals, measuring program performance against those goals, and reporting publicly on their progress;

3. improve Federal program effectiveness and public accountability by promoting a new focus on results, service quality, and customer satisfaction;

4. help Federal managers improve service delivery, by requiring that they plan for meeting program objectives and by providing them with information about program results and service quality;
5. improve congressional decision-making by providing more objective information on achieving statutory objectives, and on the relative effectiveness and efficiency of Federal programs and spending; and
6. improve internal management of the Federal Government."

With these findings and purposes in mind each agency must now submit a strategic plan to the Director of OMB and to Congress by 30 September 1997. This plan must include a comprehensive mission statement, outcome related goals and objectives, a description of the operational processes and resources required to meet these goals, an identification of key external factors that could effect achievement, and a description of program evaluations used to establish and/or revise goals and objectives, along with a schedule for future program evaluations. The initial plan must cover a period of not less than five years and is slated to be updated every three years. The agency must consult with Congress on its formulation and must consider the views of those affected by or interested in the plan; i.e., the customer or stakeholder in the process. In addition, the functions covered must be inherently governmental, which means they cannot be performed by private enterprise. Only the Central Intelligence Agency (CIA), the General Accounting Office(GAO), the Panama Canal Commission, the United States Postal Service, and the Postal Rate Commission are exempted from the provisions of the Act.

Consequently, all Executive agencies except as stated above are required to establish strategic plans. These will result in the establishment of annual performance plans based on measurable goals that will define effective or successful programs. To accomplish these plans the agencies have been given the flexibility to aggregate, disaggregate, or consolidate program activities, providing nothing is lost in the process. They are also being introduced to a new language. The language of "outcome measures," "output measures," "performance goals," "performance indicators," "program activities," and "program evaluation." By the year 2000, agencies will be required to submit reports on actual program performance to Congress and the President. These reports will discuss performance indicators, results (success or failure), and problems with performance goals. Considering this information, Congress and the President will then decide whether to continue the program, revise the program, or cancel the program totally as an ineffective use of government funding. In theory, this will allow them to construct a budget that is meaningful, based on projected performance, and produce a budget that the populace can accept.

Interestingly enough, it is not until 1999 that waivers on administrative procedural requirements can be made; i.e., staffing, remuneration, funding transfers, etc., to allow more managerial flexibility and accountability. Therefore, the plans will have been in effect for two years before the participants to the plans can receive any real benefits for their contributions. In addition, there are 73 pilot projects currently authorized pursuant to the

Act which are intended to provide each participating agency with lessons learned that they can build upon for future activities. However, none of these authorized projects address the issues of managerial accountability and flexibility. It is not until 1998, that issues in this area can be addressed and then they must be couched in terms of performance budgeting issues.

Furthermore, Congress has not limited their ability to establish, amend, suspend, or annul a performance goal if they perceive it in their best interest, or to reduce the oversight activities of the GAO. In fact, the GAO is required to report on the prospects for compliance with the Act by 1997. It has already completed eight reports since the enactment of GPRA that specifically address the issue of strategic planning. These include activities associated with environmental protection, the national archives, social security, border management, special operations forces, financial management in the Bureau of Indian Affairs, Housing and Urban Development information resources, and Judiciary funding. Based on these activities, it appears that strategic planning for the federal government will be in the forefront of every agency decision for many years to come.

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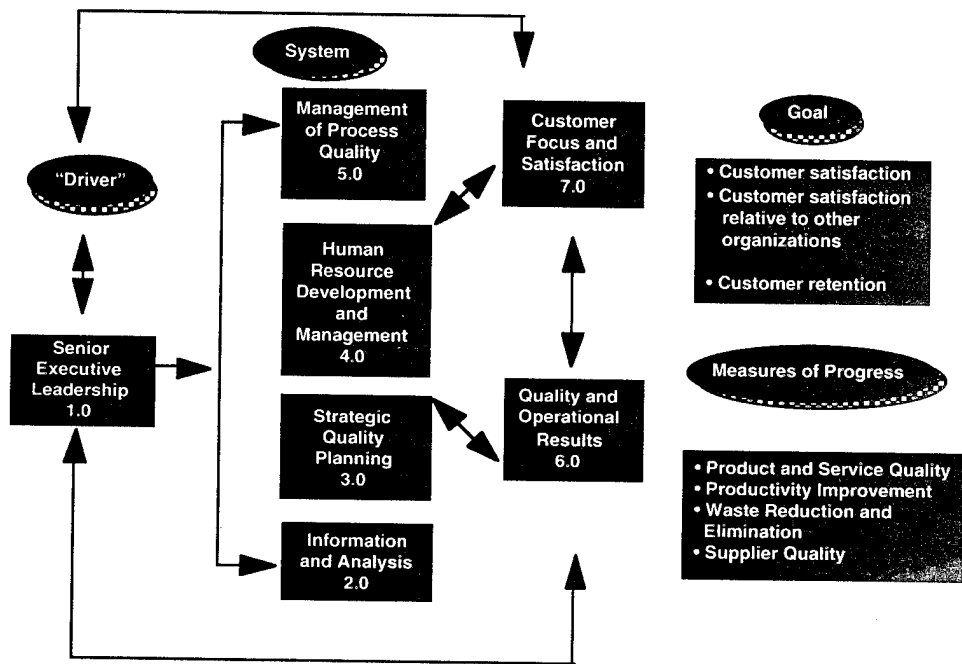
Baldrige Criteria for Transformation

Transforming an organization through Quality leadership and management is a systems change approach. It involves alignment of our mindset, our structures, and our systems and policies to enable federal workers to provide world class service to the American people at the best value.

This approach integrates the National Performance Review recommendations, the Government Performance and Results Act, and the President's Executive Orders and Memoranda (customer service, streamlining bureaucracy, reduction of regulations, labor management partnerships, community empowerment). Quality Management is the how to achieve these goals.

Quality Management principles are set forth in the Malcolm Baldrige Award and the President's Quality Award criteria. They are:

- **Leadership:** Are your top leaders and managers personally committed to creating and sustaining your organization's vision and customer focus? Does your effort extend to the management system, labor relations, external partnerships, and the fulfillment of public responsibilities?
- **Information and Analysis:** Do your data, information, and analysis systems help you measure and improve customer satisfaction, products, services, and processes?
- **Strategic Quality Planning:** Do you have short-term and long-term plans that address customer requirements; the capabilities necessary to meet key requirements or technological opportunities; the capacities of external suppliers; and changing work processes to improve performance, productivity improvement, and waste reduction?
- **Human Resource Development and Management:** Is your agency's entire workforce enabled to develop its full potential and to pursue performance goals? Are you building and maintaining an environment for workforce excellence that increases worker involvement, education and training, employee performance and recognition system, and employee well-being and satisfaction?
- **Management of Process Quality:** Does your agency systematically and continually improve quality and performance? Is every work unit redesigning its process to improve quality? Are internal and external customer-supplier relationships managed better?
- **Quality and Operational Results:** Are you measuring and continuously improving the trends and quality of your products and services, your business processes and support services, and the goods and services of your suppliers? Are you comparing your data against competitors and world-class standards?
- **Customer Focus and Satisfaction:** Do you know what your customers need? Do you relate well to your customers? Do you have a method to determine customer satisfaction?



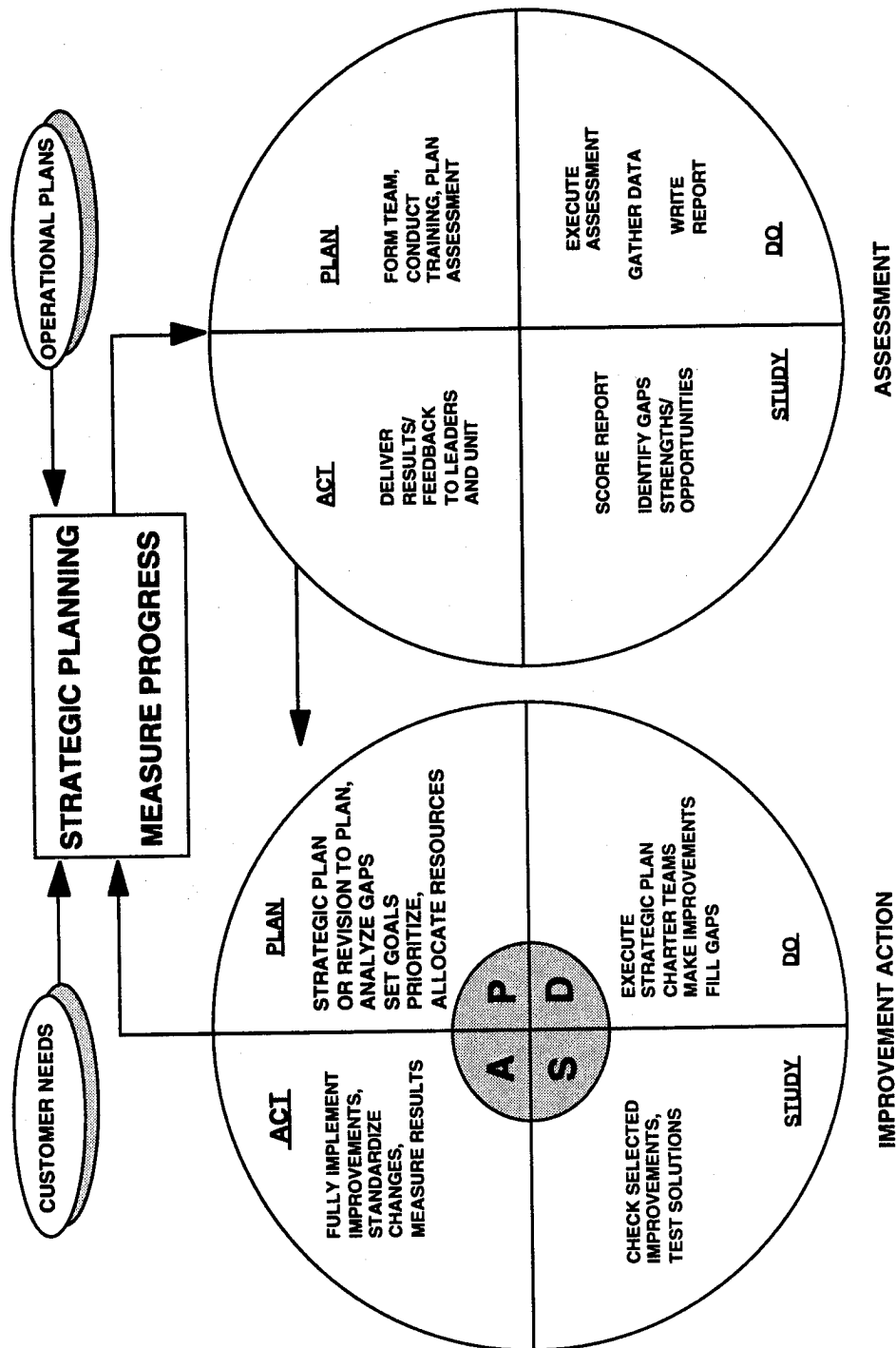
Driver: Senior leaders create the values, vision, and goals that sustain the pursuit of customer satisfaction and continuous organizational improvement.

System: Comprises the key processes, information, planning documents and human resources of the organization. The system looks at how these elements are monitored, managed and continuously improved.

Measures of Progress: Relates directly to the system elements and provides a results oriented basis for channeling action to deliver ever-improving products and services to the customer.

Goal: The basic aim of any quality system is the delivery of superb and ever-improving products and services to its customers.

SELF ASSESSMENT



APPENDIX

G

QUESTIONS ALL LEADERS NEED TO ASK

- 1. What are the important problems?**
- 2. Have the goals been deployed to all employees?**
- 3. Are the employees making progress toward improvement?**
- 4. Can management help them?**
- 5. Has PDSA (Plan, Do, Study, Act) been practiced throughout the procedures?**
- 6. Are the team leaders checking monthly with employees?**
- 7. How are they progressing on individual action items?**
- 8. Are processes being revised?**
- 9. Are we capturing some of the inputs so we can improve the system?**
- 10. Are the methods standardized throughout the organization?**
- 11. Are we using data?**
- 12. Are records being kept?**
- 13. Are plans being revised, if necessary?**
- 14. Is there a better way to achieve the goals?**
- 15. Are we keeping information/communication channels open?**
- 16. Are people throughout the organization aware of what's going on and helping to apply the new knowledge?**
- 17. Have we looked at the cost - are we really making time and money available to accomplish these action items?**
- 18. Are the plans specific, not vague and lofty?**
- 19. Have the team leaders made a thorough study of the problems carried over from last year? Have they made any changes?**
- 20. Do we have agreement throughout the College on what is important?**

From *Profiles in Quality*, Louis E. Schultz, pp. 211-212.

QUESTIONS TO ASK DIRECT REPORTS

- 1. What have you chosen as the improvement project you are pushing as your first priority?**

What was the second priority you set aside for this project?

What determined your choice?

- 2. What does it mean to complete this project with high quality? What will constitute "excellence" in improving this process? Who is the customer for the result?**

If I ask the customer, will he or she define "high quality" the same way?

How do I know?

- 3. What will I measure about your processes as we go along to be sure that when we get to the end we are going to achieve a high quality result?**

Why did you pick these measures?

- 4. How do you intend to keep me informed?**

How will progress be checked and communicated?

How will we both know when there are barriers that need to be removed?

These questions are suggested by Dr. Myron Tribus on visits to DSMC. He recommends that every meeting with direct reports use these questions as the standard for discussing work activities.

QUESTIONS TO ASK YOURSELF

1. What is my job?

Who are my customers?

What are their requirements?

2. How is my job related to the Strategic Directions? (Vision, Mission, Goals, Values, Objectives, Processes, Measurements)

3. What is the level of quality of my job?

How do I know?

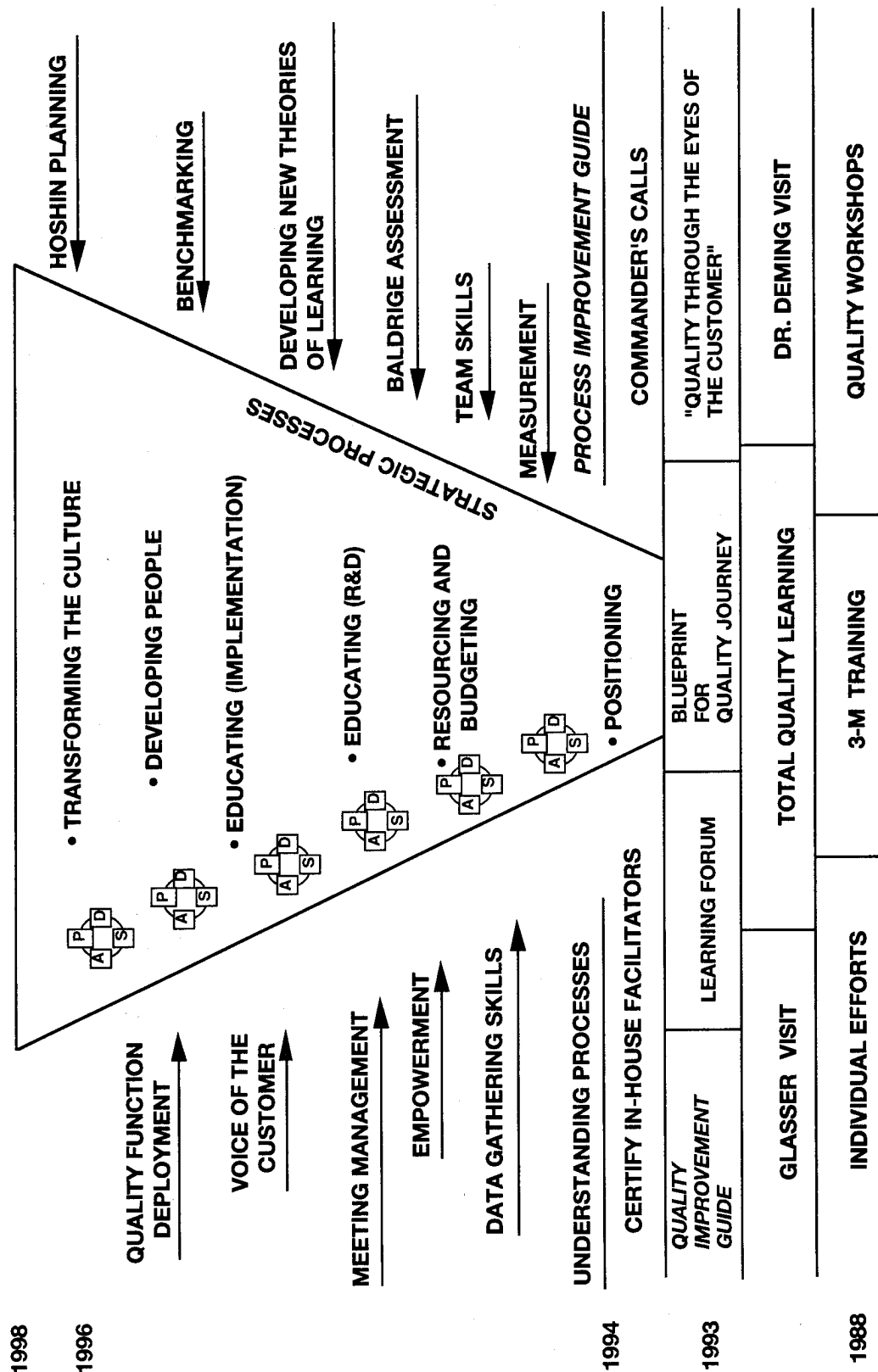
4. Do I want to improve the level of quality?

QUESTIONS FOR DEPARTMENTS TO ANSWER

- 1. Who do we see as our primary customers?**
- 2. What are our basic products?**
- 3. What systems are needed to support our basic product?**
- 4. What enhancements do we add to our basic product?**
- 5. How do we know if our product meets our customer's expectations?**
- 6. How have we improved our product or service in the last 6 months?**
- 7. How have our customers' expectations changed during the last year?**
- 8. How have we adjusted to meet this change?**
- 9. How do we deal with ricochets?**
- 10. What is our cost of quality?**

TRANSFORMATION - A JOURNEY NOT A DESTINATION

DSMC Quality Journey - Process Management



The Team Charter

The purpose of a team charter is to provide direction for the activities and authority to accomplish them. The charter is developed by the team and approved by the Commandant.

As a minimum the charter should include the following:

- Purpose
- Team members
- Objective and scope of the team
- Authority - who chartered
- Direction and control
- General
 - Methodology
 - Milestones
- Reporting progress

The charter can indicate how the team will use the 8-step improvement problem-solving. The charter enables the team to have the responsibility for the project and to be accountable for its completion.

A sample charter is attached.

The following is a sample format for a team charter. The charter provides the guidelines for operation.

Workforce Interaction Team Charter

PURPOSE: The Workforce Interaction Team (WIT), through effective and increased participation, will: enhance the DSMC workforce by promoting professional development, mentoring, cross-training, teambuilding, and information sharing; and recommend, support, and promote the improvement of DSMC products and processes.

MEMBERSHIP: The WIT is open to all employees of DSMC. The only requirements for membership are interest and enthusiasm.

MARKETING: The WIT will prepare a marketing plan that will advertise its purpose, membership policy, process improvement capabilities, and personal development opportunities to every DSMC employee. The plan will be continually updated and implemented an average of twice a year to ensure all DSMC employees are aware of the WIT.

BUDGET: The WIT will submit an annual budget request to the Corporate Leadership Team for training and materials, guest speakers, attendance at WIT-related conferences, and an annual offsite. Once the request is approved, the funds will be assigned to an APC which will be managed by the WIT.

When a specific product or process is selected for improvement, the WIT will identify the product or process owner. Then the WIT will identify the appropriate project team members who will meet with the owner to prepare a cost estimate based on the owner's requirements. Following this, the product/process owner and project team members will convert the estimate into a budget request and present it to the Corporate Leadership Team for approval. Once approved, the funds will be assigned an APC and will be managed by the product/process owner with support from the project team members.

METRICS: All WIT supported product/process improvement projects will have metrics to measure the value-added contribution of the improvement effort.

OFFICERS: The WIT Officers will consist of:

Chair - Responsible for guiding and coordinating the efforts of the WIT members.

Co-Chair - Assistant to the Chair and fills in for Chair when necessary.

Recorder - Takes minutes at all meetings and publishes the minutes on the WIT Bulletin Board.

Co-Recorder - Assistant to the Recorder and fills in for Recorder when necessary.

Corporate Leadership Team Liaison - Acts as liaison between WIT and Corporate Leadership Team when necessary.

Public Relations Representative - Advertises monthly meetings and all other events sponsored by the WIT.

Department Liaison - Acts as liaison between WIT and Departments when necessary.

WIT Officers are responsible for maintaining continuity within the WIT, planning meetings and publishing agendas. Elections for Officers will be held annually during the November meeting. New Officers will take over responsibilities on January 1. The transition period will be used for experienced Officers to train new Officers in their duties.

LIAISON: The WIT will have a representative on the Corporate Leadership Team (CLT) to advise the CLT of WIT activities and to inform the WIT members of CLT decisions that have an impact on WIT activities.

REPORTING:

1. The Recorder will post the monthly minutes on the WIT Bulletin Board within two working days after each meeting.
2. Major WIT success stories will be published in the DSMC Scene, LAN, and other mediums.
3. When requested, status reports will be given by the product/process improvement team to the process owner.
4. When an improvement project is completed, the team will give a final report to the Corporate Leadership Team. This decision will be made by the product/process owner.
5. During the DSMC Quarterly Reviews, the WIT will inform the DSMC Corporate Leadership Team of its activities and accomplishments.

MEETINGS: Meetings will be held on the fourth Thursday of each month, beginning at 0900 hours, and last not more than two hours.

Approved/Disapproved

CLAUDE M. BOLTON, JR.
Brigadier General, USAF
Commandant

MEGAN WEAVER
WIT Chair

A Generic Model for Measuring Value-Added

The following steps provide a generic framework for measuring the value-added to the organization advocacy groups, such as a Human Relations Council. It is assumed that each group assesses their own value-added by using a standard methodology and the use of metrics.

Steps in measuring value-added (assume an approved charter).

1. Determine the purpose or aim of the activity based on input from customers.
2. Develop yearly goals. Break the goals into quarterly milestones. Ensure goals are tied to customer requirements.
3. Develop exit criteria for each phase of the group's purpose or mission.
4. Have a quarterly report on goals, milestones, and other metrics stated in the charter.
5. Determine indicators for value-added.

a. Quantitative Indicators

- 1) Customer feedback on specific services (formal and informal) related to both requirements/expectations and satisfaction.

- Surveys
- Interviews
- Anecdotal

- 2) Metrics directly tied to purpose, goals, milestones, exit criteria, and the intent of the charter.

3) Records

- Determine investment by tracking time, resources, and costs.
- Determine benefit by tracking: number of issues reported; number of "hot topics" submitted; number of people requesting advice; number of meetings; and number of issues settled before going to a higher level.
- Contact users after settlement of issue and get feedback on benefit to them personally (customer satisfaction index).

4) Complete a cost-benefit analysis to the extent possible.

- Comparisons can be made to the time and money involved in a standard EEO investigation, lawsuits, and SF1506 based on research and literature.
- Use available data such as turnover rates, demographics, and absenteeism.
- Collect data and other numbers associated with "climate" issues such as diversity, quality of work, life, etc. from surveys such as Campbell and other assessments.

5) Determine a "gain to strain" ratio (Is the cost of time, administration, and other resources worth the return on the investment?)

b. Qualitative

1) Customer feedback on climate and culture issues (formal and informal)

- surveys
- interviews
- focus groups
- anecdotal

2) Benchmark excellent organizations on their use of advocacy groups that have a similar purpose.

3) Have the group perform a yearly "lessons learned" which lists accomplishments, results, and challenges.

NOTE: It should always be recognized as "difficult" to get specific "value-added" on attitudes, culture, education, and the "soft" aspects of the organization. Even with continual assessment the true costs and the true value are in fact, probably unknown. However, to the extent possible, each group should monitor their investments and benefits. Additionally, the organization should determine what a reasonable return of investment would be.

Customer Feedback

We need your input to improve this guide. Please let us know how to improve this product by commenting on the following:

Address all inquiries to CM-SAQ

Use this scale to answer question 1, 2, and 3:

E=Excellent G=Good P=Poor

1. Clarity of the guide? ☐ ☐

2. Detail of the guide? ☐ ☐

3. Examples used in the guide? ☐ ☐

4. Are you on a DSMC team?

☐ ☐ Yes ☐ ☐ No

5. How often do you use this guide?

☐ ☐ (1 2 3 4 5)
Never Frequently

6. Comments on the guide?