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TOTAL QUALITY MANAGEMENT: A RECIPE FOR SUCCESS

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BY

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It was concluded that the DoD must embrace the TQM philosophy and proliferate it's principles in order to maximize the return on defense budget dollars. This will require an enormous investment in education, training and time and an equally positive commitment by the DoD leadership to create a DoD wide organizational climate that will stimulate and perpetuate individual productivity enhancing contributions.

USAWC MILITARY STUDIES PROGRAM PAPER



TOTAL QUALITY MANAGEMENT: A RECIPE FOR SUCCESS
AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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Total Quality Management (TQM) is a high level Department of Defense (DOD) initiative that is being touted as the primary management tool to force the fundamental cultural change in the way the DOD conducts business in the systems age. What is TQM? Where did it come from? What are its guiding principles? How has it been used? What successes can be attributed to TQM? How can it best be implemented? These questions along with many others are addressed and answered in this work. In addition, an appendix of popular quality improvement models for organizations, their processes, and their individuals is provided. It was concluded that the DOD must embrace the TQM philosophy and proliferate its principles in order to maximize the return on defense budget dollars. This will require an enormous investment in education, training and time and an equally positive commitment by the DOD leadership to create a DOD wide organizational climate that will stimulate and perpetuate individual productivity enhancing contributions.

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TOTAL QUALITY MANAGEMENT: A RECIPE FOR SUCCESS

CHAPTER I

INTRODUCTION

Total Quality Management (TQM) is a high level Department of Defense (DOD) initiative that is being touted as the primary management tool to force the fundamental cultural change in the way the DOD conducts business. This cultural change is necessary because the traditional management principles and reductionist theories fostered by the likes of Taylor, Skinner and Galbraith which served the DOD well in the "Machine Age", simply cannot accommodate the management complexities of the emerging "Systems Age".

These management complexities are fueled by constrained budgets that force the necessity to consolidate, streamline, coordinate and combine management information, logistics, transportation and numerous other systems that can serve numerous customers. Designing, operating, maintaining and proliferating these types of systems require new management principles. "Systems Age" management principles are based on the theories of Deming, Juran, and Ishikawa and focus on customer satisfaction, continuous improvement, and the application of quantitative methods and human resources. They

allow us to synthesize and understand information in sufficient breadth to comprehend and maximize the relationship of performance among various parts in order to permit the system to be effectively optimum.

The implementation of TQM and the embracing and proliferation of it's philosophy will allow the DOD and the U.S. Army to meet the challenge of providing and sustaining our service members with the best possible equipment at the lowest possible cost to the taxpayer in the least amount of time.

This paper will provide:

(a) Background information on TQM

(b) A working definition of TQM

(c) An identification of the guiding principles that are required to implement TQM and how they can be applied to achieve organizational success.

(d) Examples of TQM success stories within the government.

(e) An appendix of popular quality improvement models for organizations, their processes, and their individuals.

Analysis of the above will provide conclusions and recommendations that can be used by the DOD and the U.S. Army to better understand TQM and significantly enhance it's implementation and application throughout our organizations.

WHAT IS TOTAL QUALITY MANAGEMENT (TQM)

CHAPTER II

DEFINITION

TQM is defined by the Department of Defense (DOD) as,

"both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the materials and services supplied to an organization, all the processes within the organization, and the degree to which the needs of the customer are met now and in the future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement".¹

Understanding this broad yet focused definition is essential because TQM is a marked departure from the traditional management style. The following table provides a comparative illustration:²

TQM addresses the quality of management as well as the management of quality.³ It involves everyone in the organization in a systematic, long-term commitment, a never-ending journey to develop products that are customer oriented, flexible, responsive, and, most of all, constantly improving. TQM is the means through which the DOD is attempting to create and sustain a culture committed to continuous improvement in everything it does.

Table 1-1

MANAGEMENT STYLE COMPARISON

<u>Traditional</u>	<u>TQM</u>
Authoritarian	Participative
Fear of Knowledge	Open discussion
Fear of Job Loss	Job Security
Status Quo	Continuous Improvement
Systems, policies, procedures Rigid, extensive	Policies that Inspire people to want con- tinuous improvement
"Beat On" Suppliers	Work with Suppliers
Distant from Market	Close to Customers
Specialists in Statistics, Industrial Engineering	All people Trained in basic Tools
Work on Results	Work on Causes of Problems

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CHAPTER III

ORIGIN

Now that a working definition of TQM has been established, a discussion of its origin and principal architects will further enhance an understanding of TQM. In 1931 Dr. Walter Shewhart's book, "Economic Control of Quality of Manufactured Product" established criteria for determining when numerical data are in statistical control.¹ Shewhart demonstrated that each industrial process generated all sorts of potential information.² He also developed simple methods to measure and chart process outputs. When the outputs are analyzed and not found to be consistent, i.e. too much variation, the process was deemed out-of-control and in need of adjustment.³ This was the beginning of Statistical Process Control (SPC).

Dr. W. Edwards Deming is generally accepted as the father of TQM and credited with establishing Japan as the most successful economic power since 1950. Dr. Deming began his association with Dr. Shewhart in 1938 and became convinced that Dr. Shewhart's SPC had tremendous potential not only in traditional production processes but also in banks, department stores, railways and numerous other service industries.

Dr. Deming successfully implemented SPC into the operations of the U.S. Bureau of Census in 1940 and saved the Bureau several hundred thousand dollars.⁴

World War II afforded Dr. Deming additional opportunities to further demonstrate the benefits of statistically controlling manufacturing operations. Throughout the war years, Dr. Deming working with the U.S. Office of Education, taught over 31,000 persons from industries holding war contracts and government production facilities the basics of Statistical Process Controls. This program had an enormous impact on the quality and volume of wartime production and significantly reduced the amount of scrap and rework that had plagued wartime production processes.⁵

After World War II, Dr. Deming preoccupied himself with assisting Japan in it's rebuilding effort. The Japanese were ready and willing to listen and apply Deming's quality oriented practices and once Deming received the total commitment of Japan's leading industrialists, Japan was effectively producing and competing in world markets by producing quality products that met customer requirements within four years.⁶

The Japanese experience and it's unquestionable success based on the Deming approach of productivity through quality is being analyzed and applied worldwide. This approach is based on the following fourteen points and will be referenced and elaborated upon throughout the remainder of this paper:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive, stay in business, and provide jobs.⁷

2. Adopt the new philosophy. We are in a new economic age, created by Japan. Western Management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.⁸

3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.⁹

4. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.¹⁰

5. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from stressing sheer numbers to quality. Remove barriers that rob people in management and engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual merit rating and management by objective.¹¹

6. Drive out fear, so that everyone may work effectively for the company.¹²

7. Break down barriers between departments. People in research, design, sales, and production must work as a team

to foresee problems of production and in use that may be encountered with the product or service.¹³

8. Eliminate slogans, exhortations, and targets that ask for zero defects and new levels of productivity.¹⁴

9. Eliminate quotas on the factory floor. Substitute leadership. Eliminate management by objective, eliminate management by numbers, numerical goals. Substitute leadership.¹⁵

10. Institute leadership. The aim of leadership should be to help people, machines and gadgets do a better job. Supervision of management is in need of overhaul as well as supervision of production workers.¹⁶

11. Institute training on the job.¹⁷

12. Institute a vigorous program of education and self-improvement.¹⁸

13. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item on a long term relationship of loyalty and trust.¹⁹

14. Put everyone in the organization to work to accomplish the transformation. The transformation is everyone's job.²⁰

Dr. Deming is by no means the only advocate of TQM. Dr. J. M. Juran has championed the concept that organizations must respond to competitive challenges by becoming more competitive.²¹ He further theorizes that the best source of competitive advance is through quality improvement.²² The "Juran Trilogy" of quality planning, quality control, and quality improvement demonstrates how the System's Age manager utilizes these tools to achieve success.²³

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CHAPTER IV

GUIDING PRINCIPLES

Deming's fourteen points and Juran's "Trilogy" form the foundation for DODs TQM implementation strategy. This strategy is embodied in the following principles:¹

1. Demonstrate Leadership
2. Build Awareness
3. Open and Maintain Lines of Communication
4. Create a Constancy of Purpose
5. Focus on Customer
6. Choose Early Efforts in Visible Areas Critical to Success.
7. Develop Teamwork
8. Provide Support, Training, and Education.
9. Build Trust and Respect.
10. Create an Environment in Which Continuous Improvement is a Way of Life.
11. Continuously Improve All Process.
12. Expand Culture to Suppliers.

Demonstrate Leadership

TQM will not succeed without the total support of the people in the organization, it depends on people.² TQM

implementation needs leadership at every organizational level but especially at the highest organizational level. The DOD is receiving this type of leadership and is probably best expressed in the opening paragraphs of a recent Presidential Proclamation where the President of the United States, George Bush proclaimed October 1989 as, "National Quality Month" by saying.³

"Producing quality goods and services is crucial not only to the continued economic growth of the United States, but also to our national security and the well-being of each American family. Our Nation has long been recognized for its leadership in producing quality products. However, in recent years, the position of the United States as a quality leader has been challenged by foreign competition in domestic and overseas markets. Reasserting our leadership position will require a firm commitment to total quality management and the principles of continuous improvement . . ."

In addition to the President's awareness and demonstrated support for TQM the Secretary of Defense on 30 March 1988 approved TQM for DOD wide application and designated it "Top Priority".⁴ Other DOD actions have included the development of a DOD Master Plan highlighting short, mid and long range goals.⁵ The publication of a brochure describing TQM principles for broad DOD and Industry distribution.⁶ The

current Secretary of Defense, Honorable Richard Cheney, has also expressed his support for TQM.⁷

Building Awareness

Building Awareness of TQM means increasing personal awareness through readings, viewing videotapes, and attending workshops, seminars and TQM training classes. By sharing these experiences with subordinates, peers, superiors, and customers and discussing how they apply to organizational processes a TQM mentality will evolve.⁸

Open and Maintain Lines of Communication

Allied closely with building awareness of TQM is the principle of opening and maintaining lines of communication. Communication must be established both horizontally and vertically throughout the organization. Communications between and among the various functional areas is time-consuming. However, since all functional areas contribute to the product or service that is produced it is absolutely essential to listen, coordinate, and enlist the support of all organizational elements in order to work through problems, overcome barriers, and find encouragement and support.⁹

Create Constancy of Purpose

Creating a Constancy of Purpose requires an extra-careful

reevaluation of the organizations mission. Dr. Deming says "Do you know that doing your best is not good enough? You have to know what to do. Then do your best."¹⁰ When the organizations goals and objectives are coordinated, aligned and consistent with the organization's mission an environment for continuous improvement is fostered.¹¹ When policy and new initiatives reflect the TQM philosophy and are inherently supportive of the organization's mission the people, the ones who effect continuous improvement, visualize that there is a planned method to the changes taking place. Leaders at all organizational levels must be cognizant of the fact that everything that they do or say, either formally or informally, must not contradict the TQM focus. The key to constancy of purpose is reinforced through the continued and consistent dedication and commitment to the TQM effort that is embodied in the organizations mission.¹²

Focus on Customer

Awareness of customer needs is critical if an organization is to produce a useful product.¹³ Therefore, the organization must identify its customers and their needs as a prelude to focussing on them because every continuous improvement effort should be aimed at better satisfying a recognized customer need.

A fundamental tenet of the TQM philosophy is that organizations have both internal and external customers. A customer is anyone who receives or is affected by the product or process.¹⁴ An external customer is affected by the product but is not a member of the organization that produces the product.¹⁵ An internal customer is affected by the product and is also part of the organization that produces the product.¹⁶

Choose Early Efforts in Visible Areas Critical to Success

The next principle, choosing early efforts in visible areas that are critical to success, is necessary so that the organization can readily identify with the TQM philosophy. Implementation of this principle should accommodate these objectives:¹⁷

- Have a good chance of success
- Be visible throughout the organization, and preferably, to important external customers.
- Will significantly improve the lives of workers and management alike.

An early success will have a contagious effect especially if it involves or affects each organizational level.

Develop Teamwork

Developing true teamwork within a complex, multi-

functional organization is a monumental task. The TQM philosophy recognizes this reality and does not treat teamwork as "employee involvement" but rather as the management of participation.²⁰ The benefits of teamwork or participation are numerous, not only will all facets of a problem or situation be aired and truly optimal solutions developed and tabled, but also, this participation will foster and require an atmosphere of mutual trust.²¹

Provide Training and Support

Providing training, support, and education will dramatically accelerate the TQM implementation effort. The Japanese are fond of saying that quality "begins with education and ends with education."²² This training must be planned to accommodate specific job skills, coupled with a systems orientation and new technical and maintenance skills.²³ The goal is to elevate everyone's level of technical competence.²⁴

Build Trust and Respect

Building trust and respect begins with coming to grips with the irrefutable fact that people are the most important element in the organization and that the TQM process is utterly dependent upon them. Deming says "People are not an asset, not a resource. They are a treasure to be protected."²⁵ In an organization, the people are your experience base, your

knowledge base and your memory.²⁶ Therefore, in order to maximize their creative contribution they must work in an atmosphere devoid of fear.

Create an Environment in Which Continuous Improvement is a Way of Life

Creating an environment in which continuous improvement is a way of life requires a fundamental, about-face, in traditional thinking. Problems must be viewed as vehicles to improve processes and not as an obstacle to be overcome as quickly as possible. A problem is an opportunity to improve, by determining its root causes and systematically eliminating them and continuously improving.²⁷

Continuously Improve All Processes

Continuous process improvement, as the basis of TQM, is a never-ending task.²⁸ TQM is based on the premise that everything an organization does should be described in terms of a process.²⁹ By definition, a process is a transformation of inputs into outputs.³⁰ However, before a process can be improved it must be defined and standardized. Once the process is defined and standardized it can be measured. This measured standard provides the baseline from which to continuously improve the process.³¹ Processes are defined and their

capabilities assessed through a myriad of statistical tools that will be addressed later in this work.

Expand Culture to Suppliers

The final guideline seeks to expand the TQM culture to the organizations supplier base. By ensuring that your suppliers are utilizing TQM methods you can reduce or eliminate inspecting their incoming products and directly move them into manufacturing processes.

There is nothing magical or mystical about these guiding principles. They are a combination of tried-and-true management techniques and common sense. However, when they are consciously applied in the correct context, dosage, and order they become an extremely powerful force.

The next chapter introduces a medley of management models that will assist organizations, their processes, and their personnel in making the TQM transition. The chapter also presents three TQM success stories.

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CHAPTER V

Models and Examples

In order to successfully introduce and integrate TQM methodology into an organization it is useful to have points of reference that have been carefully structured and proven. The following Quality Improvement Models fall into three general categories: (1) organization transformation models; (2) process improvement or problem solving models and; (3) individual improvement models. A brief explanation of the general categories and models within each category follows. Detailed guidance on each model can be found in the appendix.

The organizational transformation model addresses the process of organizational change. It is concerned with management structures, environmental factors and a broad array of issues relevant to the overall organization. The five basic transformation models in the Appendix A are: The Defense Systems Management Colleges (DSMC) Quality and Productivity Management Practices Model;¹ the DSMC 1 Advanced Technology, Inc. Performance Improvement Model;² The Process Management Institute (PMI) Improving the Quality Management Process (IQMP) Model;³ The Joiner Associates' Streams of Activity Model;⁴

and the Logistics Management Institute's (LMI) Continuous Improvement Process (CIP) Model⁵.

Process-Improvement models address the creation of positive change in the way work is accomplished. They address the defining of work flows, strengthening of suppliers, customer relationships, eliminations of non-value-added effort, reduction of variation, and controlling of processes. The five basic process improvement models are: The Moen and Nolan Strategy for Process Improvement;⁶ the Naval Personnel Research and Development Center Total Quality Management Process Improvement Model;⁷ the Florida Power and Light Improvement Opportunity Process;⁸ the Joiner Associates Model of Progress;⁹ and the LMI CIP Model.¹⁰

The individual improvement models are techniques for individual self-improvement, both internal and external to formal TQM efforts. They provide techniques by which any person may apply TQM-style, structure and discipline to their everyday activities. These models also address the delicate subject of the individuals interaction with superiors and subordinates and with formal organizational systems. The models are: the PMI Leadership Expectation Setting (LES) Model;¹¹ the PMI Quality Journal;¹² and the LMI CIP Model.¹³

Examples of organizations improving and becoming more efficient, quality conscious, and productive because they implemented TQM abound. The following are three such cases:

CHERRY POINT

The first is a Department of the Navy activity, the Naval Aviation Depot (NAVAVNDEPOT) Cherry Point, North Carolina. NAVAVNDEPOT at Cherry Point is one of six NAVY aviation depots of the Naval Air Systems Command. The six aviation depots and the Naval Aviation Depot Operations Center comprise an organization of more than 24,000 people with an annual operating budget of approximately \$2 billion.¹⁴ the Operations Center is the Naval Air Systems Command's principal agent for providing commercial maintenance and related engineering and logistics support essential to the naval operating forces.¹⁵ It is also responsible for providing technical and support services to the aviation depots, fleet operations and other government agencies. The six depots repair sophisticated aircraft engines and their associated aeronautical components.¹⁶ The depots also provide an array of support services, manufacturing, engineering, and field technical assistance. Their customers include the naval fleet, other military services, other federal agencies (Coast Guard, Federal Aviation Administration, NASA), allied forces and some non-

governmental customers.¹⁷ It is important to understand that the Operations Center and the six depots function as a corporation similar to many companies in the private sector.¹⁸

The FY87 Appropriations Act contained language that required the NAVY to compete its aviation maintenance workload between the NAVAVNDEPOTS and commercial contractors.¹⁹ The purpose being to utilize competition as a tool to reduce aviation maintenance costs. Faced with this challenge, The NAVAL Air Systems Command decided that the only way to remain competitive, work more efficiently, and reduce costs was to entirely rethink their goals and method of operation.²⁰

Cherry Point's, Corporate Board of Directors, which was comprised of key organizational personnel decided that the only way to meet this challenge was to constantly focus on three fundamental areas: quality, productivity, and cost.²¹ This meant getting work done right the first time, on-schedule, and at the lowest possible cost.²² Given this goal, Cherry Point consciously chose to implement the TQM philosophy advocated by Dr. Deming and developed a Depot Business Plan that provided the direction for the effort.²³

The Business Plan recognized TQM implementation as a long term management commitment and that is attempting to improve

quality on several fronts.²⁴ The most important being a combination of leadership, communication and team interaction between managers. Realizing that management drives the systems and processes that make the depot operate, supervisors and managers accepted the responsibility for change.²⁵ They learned to interact better, to trust decisions of others and to select courses of action that benefitted the depot as a whole and not their individual area.²⁶ Communication barriers were also broken down between departments and work groups. This was being accomplished by forming Quality Management Boards (QMBs).²⁷ QMBs are made up of managers from all departments that are affected by a problem or a process improvement effort and tasked to solve it.

QMB members were provided special training on structural problem solving, statistical process control (SPC), and TQM theory. QMBs were also provided specially trained TQM facilitators, they advised members and provided additional training as needed. Each board included representatives at the same level from different departments as well as a representative from the next higher and next lower level.²⁸ QMBs permitted managers to work as teams, facilitating communication up and down the chain of command and providing structural management support for all TQM initiatives within the depot.

Lower level employee participation in work decisions was another area that Cherry Point tapped to the maximum in implementing TQM.²⁹ They believed, as Deming did, that an organizations human resources are it's most valued possession. Who better to suggest and effect improvements than the people who perform the work. To this end, Cherry Point organized Process Action Teams (PATs) which were made up of knowledgeable employees who had a good understanding of their respective work processes. PATs worked with the QMBs to deal with specific process problems and eliminate their causes permanently. PATs were formed and then dissolved once the causes of problems were permanently eliminated and controlled. For example, PATs made enormous contributions to productivity improvements through the TQM methodology. Excessive rework in the plating and machine shop was being experienced. The PAT analyzed and improved the Grind Plate Grind process and also set up a tracking system, ensured operators had proper training, improved maintenance procedures, and updated the equipment. The result being that rework was reduced by 79%.³⁰ A problem of excessive retesting of the 100-54 Gas Turbine Compressor was being experienced. The PAT thoroughly analyzed the 100-54 production process and identified 3 critical processes that were causing the problem. Once corrected and continually controlled, retesting was reduced by 90%.³¹.

Cherry Point's efforts in continually improving their performance through TQM earned the depot the designation as a Quality Improvement Prototype as part of President Bush's Productivity Improvement Program. Most noteworthy was the reduction in the average unit overhaul cost of the F-14 program from \$1.6 million per copy in 1986 to \$1.2 million in 1988.³² Additionally, as a result of these savings and Cherry Point's unique Gainsharing Program, each employee at Cherry Point earned an additional \$265.14 in the 1st quarter of FY88³³. The fundamental principles of TQM that Cherry Point exemplified were:

- Dynamic, Consistent Leadership
- Long Range Planning coupled to cultural change
- Employee involvement - participation in problem solving groups.
- Customer involvement - continuous feedback for problem identification and correction.
- Measurement - use of statistical methods for assessing improvement in processes.
- Training - skills enhancement and specialized quality improvement training.
- Employee rewards and recognition.

CORPS OF ENGINEERS

The second example involves the European Division of the U.S. Army Corps of Engineers (ECOE). This technical and administrative organization is responsible for the design and construction in Western Europe and Turkey from aircraft runways, to family housing, to post exchanges, service clubs, and craft shops.³⁴

New directives allowed the ECOE customers greater discretion in choosing design and construction services. This forced the ECOE into a new competitive environment. To remain competitive, and be the construction agency of choice and not of last resort, the ECOE had to reevaluate its approach to accomplishing its mission.³⁵

The ECOE reviewed every aspect of their operation and discovered that no matter how good they thought they were doing their job, if their customers did not agree, they had a major problem.³⁶ Further study made the point of providing quality service to the customer even clearer. The ECOE utilized a study by the Canadian Management Association that focused on the reasons consumers quit buying a certain product. The reasons were quite revealing:³⁷

- A few died or moved away
- Only 14% quit because they were unhappy with the product.

- 68% quit because of an attitude of indifference by employees of the organization, i.e. were not happy with the service, even though the product was fine. Consequently, the ECOE came to the realization that the concept of quality that they would pursue was satisfying customer expectations.³⁸

This was accomplished through a combination of dynamic leadership, education, and a customer oriented perspective that everyone in the organization supports.³⁹ The idea of identifying and satisfying the internal customer, the one down hall or sitting at the next desk, resulted in numerous organizational efficiencies. Sending a core group of the most motivated and spirited employees to attend a program on the basic concepts of TQM also proved extremely beneficial. Upon returning from the training, they developed a process to teach every member of the 1200 person organization this new brand of quality management that first emphasizes personal quality and the second, small work unit quality improvement process, (or QUIP).⁴⁰

A QUIP is defined as two or more employees and a supervisor who produce a product or service. The QUIP received special quality training, conducted off-site by a quality

specialist and initially teaches the team basic communications, group development, functional analysis and problem solving.⁴¹ The next step focused on helping the QUIP work out specific problems that may be hampering the delivery of a quality product or service. The interest being to continually improve the ability to understand and meet the customers' expectations.⁴²

It is important to note that although the supervisor is a member of the QUIP, he or she does not lead the group. In fact, at one point the QUIP, without the supervisor, sets priorities on problems that require immediate action. Finally - and this is key - the QUIP decides together, and accepts together, the best solutions to the problem.⁴³ There are over 300 QUIP in the ECOE.

The ECOE harbors no illusions when it comes to TQM. Meaningful change does not come easily and quality, as a way of life, involves a cultural adjustment that takes years to absorb.⁴⁴ They further assert that their TQM effort is not a program because programs have beginnings and ends, rather, TQM is continuous and fast becoming a way of life.⁴⁵

VARIABILITY REDUCTION PROCESS

The third example demonstrates how the application of TQMs quantitative techniques through the Variability Reduction Process (VRP) increases productivity.

Improving combat capability in the face of constrained manpower and fiscal resources is a major challenge for the DOD. One solution is through more reliable and maintainable weapon systems that can complete missions with less spare parts, support equipment, and maintenance personnel.

Weapon systems fail or function at less than optimal for many reasons but most fail because of poor design, the use of defective materials, or poor workmanship.⁴⁶ The cause of these problems is variability in the design and manufacturing process.⁴⁷ Variability exists in just about every process and results in marginal or non-conforming products. This variability exists because of changes in the conditions under which the process is used.⁴⁸ For example, operators change, the materials used in the process can come from different vendors, and the machine itself can demonstrate change due to age, lack of maintenance, etc. There are two ways to reduce variability. The traditional approach has been to tighten the design tolerances and increase inspections. Costs escalate as a result because scrap and rework increase and productivity decreases. Inspections and tighter tolerances only treat symptoms and do not resolve the real problem.⁴⁹

The preferred method is to reduce the variability by improving the process. This can be accomplished by

systematically eliminating the causes of variation through statistical techniques and by developing products that insensitive to the causes of variation. The methods that are used to reduce variability is called the Variability Reduction Process⁵⁰ (VRP).

VRP is a proven set of practices and techniques that, if planned and implemented properly, will yield more reliable and nearly defect free products at lower cost.⁵¹ The objectives of VRP are to design robust products which are insensitive to the causes of failure; to achieve capable manufacturing processes that produce nearly defect free products; and adopt the managerial attitude of continuously improving all processes. The basic VRP tools are teamwork, Statistical Process Control (SPC), design of experiment (DOE), parameter design, and quality function deployment (QFD).

SPC is highly effective because it tracks and trends variations in a process and allows the operator to objectively determine if the process is producing within acceptable ranges. If it isn't, the operator can make timely decisions to either correct his process through adjustments or shut down the process before defective products are produced.⁵² When implemented correctly, the results can be impressive. For PARIEX NEVADA INC, a circuit card manufacturer, SPC was used to

cut scrap cost by 90% in one year, and the company's losses into profits.⁵³ Boeing used SPC to resolve a rivet flushness problem on the nose section of 737 aircraft and saved a half million dollars a year.⁵⁴

DOE, on the other hand, works by measuring the effects that different inputs have on a process.⁵⁵ This is accomplished by identifying a prospective set of input factors, varying the inputs over a series of experiments, collecting data, and analyzing results.⁵⁶ For example, a government-owned-contractor operated (GOCO) munitions plant had a serious problem in producing the ADAM mine. Although SPC was in use and 12 of 13 processes were within their tolerance, 19 of 25 lots were rejected. The plant operator decided to apply a DOE experiment to identify the critical parameters. He selected the 13 parameters used in the SPC program and tested them at three different levels. Only 27 experiments were conducted, firing six rounds each. The results were profound. Four parameters were really found to be important, and when set at their best levels, the process produced good lots without any rejects. The other nine parameters were less important and their tolerances were relaxed. Consequently production schedules were met and significant cost savings were achieved.⁵⁷

To further appreciate the complexity of producing quality items in a cost effective manner there are situations when having a capable manufacturing process might not be good enough. It may not be economical to remove or control some of the causes of variation therefore the product must be designed to be insensitive to the manufacturing process.⁵⁸ Products that possess this feature are said to have a robust or parameter design.⁵⁹ For example, a ceramics manufacturer is having difficulty producing an array of ceramic parts. The problem centers around his inability to control the internal temperature of his kiln. i.e. smaller ceramic parts require a lower temperature and larger ones a higher temperature, not to mention the effect that opening and closing have on the temperature. Modifying the kiln is too expensive, therefore the organization must determine a method to minimize the effects of the uneven temperature. This is accomplished by selecting as parameters the amounts of ingredients, blending procedures and firing temperatures. It is argued that parameter design is rarely done as most engineers focus on the system design to develop the product and then immediately transition to tolerance design to establish the specifications limit.⁶⁰ Often times this results in an inferior product that is sensitive to variations in the manufacturing process.

Consequently parameter design should be done before tolerance design, this would ensure a more robust product, capable of performing over a wider range of operating conditions and environments.

QFD is a systematic process for developing and translating customer needs into critical product characteristics and production requirements.⁶¹ QFD compels the different disciplines and departments to communicate and coordinate and begins by defining customers requirements and then translating them into engineering requirements. These requirements then become product characteristics which should be measurable and given target values. When properly executed the resultant product should fulfill the expectations of the customers.

The philosophy of continuous improvement is also central to VRP. VRP has been adopted by the Air Force and they have directed that all commands involved in weapons acquisition and support to implement VRP by 1993. The Variability Reduction Process makes sense, it produces highly reliable and maintainable weapon systems while reducing development time and costs.

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CHAPTER VI

CONCLUSIONS

It can be concluded that Total Quality Management (TQM) will be the DOD management philosophy in the 1990s and that fundamental changes in the way DOD operates must be effected. It can be further concluded that, when properly implemented, TQM improves productivity, reduces costs and enhances customer satisfaction and employee morale. Supporting conclusions, amplifying the above, are as follows:

a. As the United States emerges into the Systems Age from the Machine Age a new management approach is required.

b. TQM allows Systems Age managers to synthesize and understand information in sufficient detail to deal with the relationships of performance among elements of a system in order to allow the system to be effectively optimum.

c. In order for systems to be effectively optimum, they must be thoroughly understood, quantified, and standardized.

d. A dynamic, committed, driven and properly focused top management is critical in order to establish and maintain the organizational environment and the constancy of purpose that a successful systems age organizations demands.

e. The fundamental cultural change that TQM requires will demand an enormous investment in education, training, and time. Especially in regards to Top Management.

f. The TQM process will never end, individuals and organizations must utilize the TQM tools and techniques to constantly improve their processes and systems.

g. TQM has been successfully applied to DOD organizations.

CHAPTER VII

RECOMMENDATIONS

The recommendations listed below are offered as ways that the Department of Defense and the Department of the Army can introduce the TQM concept and proliferate its implementations and institutionalization:

A. The education of leaders is paramount. The education should emphasize that TQM applies to all organizations and that implementation is not negotiable. Leaders must realize that it is their job to create an organizational climate conducive to implementation.

B. Insist that all documentation, i.e. routine correspondence, policies, procedures, decision papers, proposed legislation, etc. visibly reference and cogently articulate TQM principles and aims.

C. Open organizations to allow the rank and file to participate in the decision-making process. If someone or an organization is to be affected by a change they should be part of the change process.

D. Convince, don't dictate, that TQM is the only way to successfully cope with the systems age. Demonstrate how the

current management system cannot effectively and efficiently accommodate systems age realities.

E. Educate everyone in the military on TQM principles, techniques and organizational applications. Create courses in Basic and Advanced Individual Training, all military academies, Officer Basic and Advanced Courses, and Intermediate and Senior Service Schools.

CHAPTER VII

FINAL THOUGHTS

It has been an extremely rewarding experience to research and write this paper. I have become convinced that Total Quality Management (TQM) is not just another "buzzword" but rather an incisive management tool whose principles can be applied universally to make all of our organizations better.

Additionally, I am convinced that the DOD and Army Civilian leadership truly believe that TQM can make a difference. However, I am not convinced that the operational military leadership has grasped the importance of TQM and is ready to commit their time and effort to support its implementation. This observation is made after listening to remarks presented to the U.S. Army War College Class of 1990 by the Army's Chief of Staff and Deputy Chiefs of Staff for Operations, Personnel, and Logistics. Not one of these individuals endorsed or even mentioned TQM in their respective presentations.

This is unfortunate because successful TQM implementation demands leadership in massive doses at all organizational levels and, if it isn't forthcoming from our highest levels, TQM will never succeed in the Total Army.

APPENDIX

MODELS FOR IMPROVEMENT

ORGANIZATIONAL TRANSFORMATION MODELS

DSMC Q&PMP Model

The DSMC Q&PMP Model, shown in Figure A-1, is a broad conceptual model with interrelated actions and emphases that describe a general process for transformation from the point at which an organization recognizes that it needs change to the point at which it becomes a competitive organization of the future. The model depicts an organization as an open system with various feedback loops from the environment and highlights the interrelationships between the various components of a quality and productivity management effort. The concepts are briefly discussed below, and a significantly more detailed discussion is provided by DSMC.¹⁴

Organizational System

The "organizational system" box in the middle of the model represents the system in which you exist; it could be an entire company, a division, a plant, a department, or just your own day-to-day activities. The system has upstream systems (internal and external suppliers) which provide inputs in the form of labor, material, capital, energy, and data/information. The system takes these inputs and converts them into outputs in the form of products or services. Downstream systems (internal and external customers) then react to those outputs, creating outcomes (customer satisfaction, readiness, profitability, etc.). Quite often, we do not take the time to define, in very specific terms, the systems we manage. You cannot begin to measure or improve quality and productivity until you do this.

Incentive and Strategies for Change

At the top of the diagram is the new competition the organization must respond to in order to compete in a global economy. This new competition and global economy influence our business strategy and our visions of the organization of the future. We then assess our present organizational performance and use this data as a foundation for developing plans for performance improvement. Key performance indicators are identified to provide feedback on our progress.

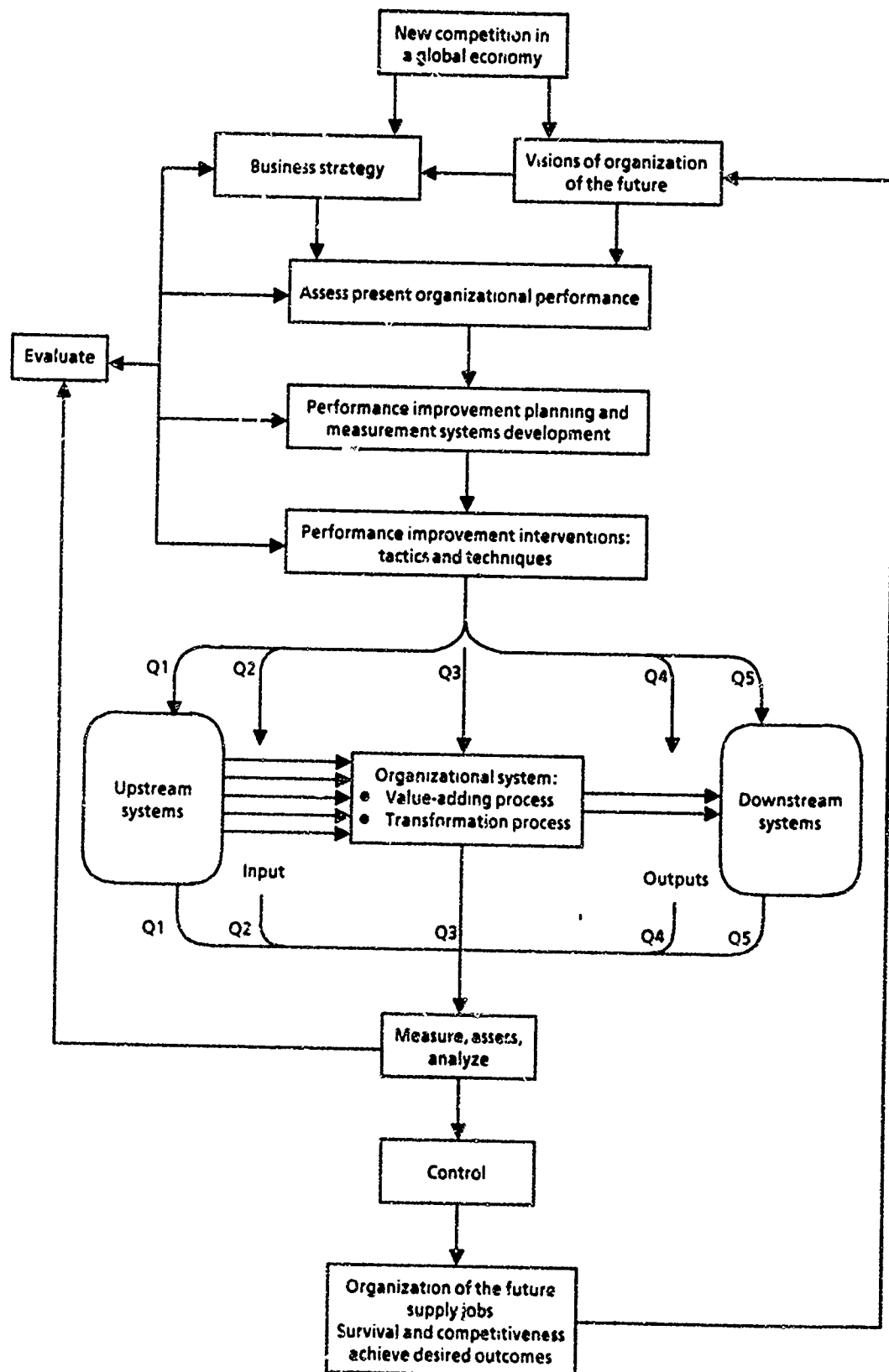


FIG. A-1. DSMC Q&PMP MODEL

The following steps are included in an effective strategic planning process:

- Developing a collective strategic awareness among the management team
- Converting that awareness into specific planning assumptions
- Creating a set of agreed-upon, prioritized strategic objectives
- Focusing those objectives into a series of action items
- Determining who will be accountable and responsible for each action item and developing teams to take action
- Measuring, assessing, and evaluating the effectiveness of improvement actions
- Continuously supporting the improvement effort.

Performance Improvement Methodology and Techniques

Out of the performance-improvement planning process comes specific performance-improvement interventions, tactics, and techniques. Note that these interventions are happening at five checkpoints: upstream systems, inputs, process, outputs, and downstream systems. Quality management efforts must be defined relative to these five checkpoints. In effect, TQM is the commitment to a practice of managing all five quality checkpoints. Your management team then develops, through the performance-improvement planning process, a balanced attack to improve total system performance, not just system subcomponents.

A number of tools and techniques are available to improve quality and productivity. A major shortcoming of many improvement efforts is that improvement is approached like a buffet at a restaurant – we pick and choose one improvement technique or another with no grand strategy to guide us. Long-term, effective quality and productivity improvement requires the use of many different approaches, tactics, tools, and techniques in a comprehensive and integrated manner.

Measurement and Evaluation

After you make interventions to the system, you must then measure, assess, and analyze performance at the five checkpoints to assess whether the expected impact actually occurred. Based on this data, you may make an evaluation relative to your business strategy, your environment (both internal and external), your vision, your plan, and your improvement actions themselves. Note that the process of

evaluation is separate from the process of measurement. In addition, measurement supports improvement as its primary objective. The organizational system or unit of analysis being measured must be precisely defined in order to avoid confusion. A number of measurement and evaluation techniques may be used in this regard.

If your organization has an effective, high-quality management process in the areas of planning, measurement and evaluation, and control and improvement, it will achieve its vision of the future and its desired outcomes over the long term. An integrated approach to continuous improvement is essential to this achievement.

DSMC/ATI Performance-Improvement Model

The DSMC/ATI Performance-Improvement Model, shown in Figure A-2, is primarily an improvement-project-creation model. It has seven steps that begin with establishing a TQM cultural environment and result in implementing a continuous cycle of improvement projects aimed at improving organizational performance. Each step is briefly described below and a more detailed discussion of the presented model is provided by DSMC.¹⁵

Step 1: Establish the TQM Management and Cultural Environment

The TQM process is a total organizational approach toward continuous improvement of products and services. It requires management to exercise the leadership to establish the conditions for the process to flourish. Management must create a new, more flexible environment and culture which will encourage and accept change. The new culture is developed and operated so that all the people, working together, can use their talents to contribute to the organization's objective of excellence. Management must accept the primary responsibility itself and understand the prolonged gestation period before the new systems become alive and productive.

Management is responsible for the following activities:

- Providing the vision for what the organization wants to be and where it wants to go
- Demonstrating a long-term commitment to implement improvement

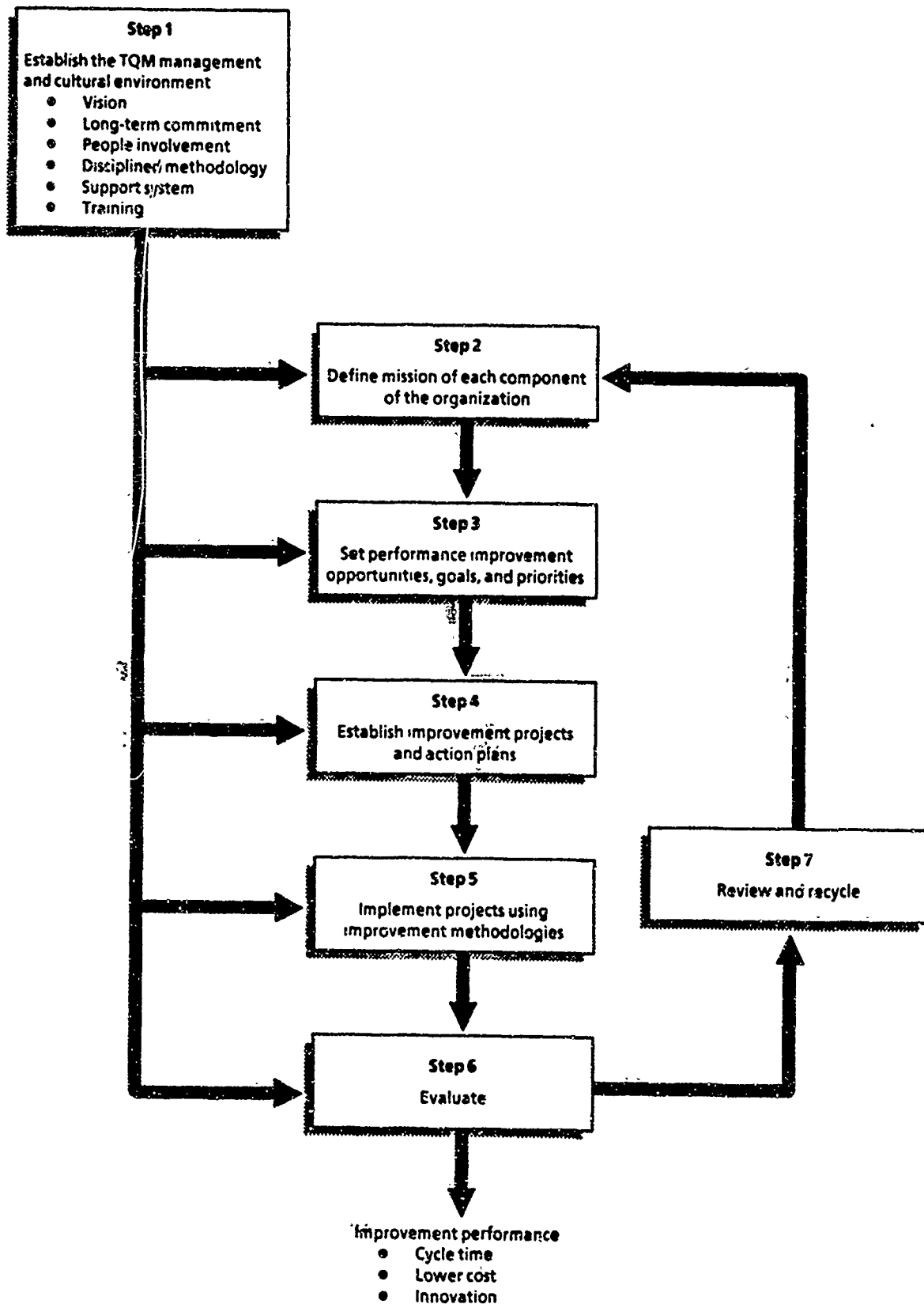


FIG. A-2. DSMC/ATI PERFORMANCE-IMPROVEMENT MODEL

- Actively involving all people in the improvement process
- Using a disciplined approach to achieve continuous improvement
- Ensuring that an adequate supporting structure is in place
- Making all employees aware of the need for and benefits of TQM, and training them in the philosophy, practices, tools, and techniques that support continuous improvement.

Step 2: Define the Mission

The mission of each element of an organization must reflect a perspective such that, when combined with other elements of the organization, it will provide the synergy that produces TQM. You should identify your customer(s), their requirements, your processes, and your products; develop measures of your output that reflect customer requirements; and review the preceding steps with your customer and adjust them as necessary. Define your organization's mission with respect to those characteristics.

In developing this mission, all members of the organization must know the purpose of their jobs, their customer(s), and their relation to others in the organization for providing customer satisfaction. Everyone has a customer (internal or external). One objective of TQM is to provide customers with services and products that consistently meet their needs and expectations. Everyone must know his/her customers' requirements, and must also make suppliers aware of those and other relevant requirements.

Step 3: Set Performance Improvement Goals

Improved performance requires improvement goals. Both involve change. Steps 1 and 2 determine where the organization wants to go, how it is now performing, and what role each member will play in achieving improved organizational performance. Step 3 sets the goals for performance improvement. These goals must reflect an understanding of the organization's process capabilities so that realistic goals may be set. The goals should first be set at the senior-management level. They should reflect strategic choices about the critical processes in which success is essential to organizational survival.

Middle and line management set both functional and process-improvement goals to achieve the strategic goals set by senior management. This hierarchy of

goals establishes an architecture that links improvement efforts across the boundaries of the functional organization. Within functional organizations performance-improvement teams provide cross-functional orientation, and the employees on those teams become involved in process issues. Thus, the entire organization is effectively interlinked to form an ideal performance-improvement culture.

Step 4: Establish Improvement Projects and Action Plans

The initial direction and the initial goals set for continuous-improvement teams flow down from and are determined by top management. The steering group performs the following activities:

- Develops the TQM philosophy and vision
- Focuses on critical processes
- Resolves organizational and functional barriers
- Provides resources, training, and rewards
- Establishes criteria for measuring processes and customer requirements.

It charters subordinate Quality Management Boards (QMBs) as owners for each of the critical processes.

The QMBs conduct system and process analysis, select and train performance-improvement teams, develop improvement plans, track progress, provide facilitators to support teams, aim at continuous process improvement, and apply a structured process improvement methodology. The performance-improvement teams focus on specific process improvements using the structured improvement methodology.

Step 5: Implement Projects with Performance Tools and Methodologies

Improvement efforts follow a structured improvement methodology. This methodology requires the improvement team to define its customers and processes, develop and establish measures for all process components, and assess conformance to customer needs. Analyzing the process will reveal various improvement opportunities, some of which will be more valuable or achievable than others. Opportunities are ranked by priority and improvements effected.

The improvement methodology is cyclic and unending. As one opportunity is pursued and improvements effected, new opportunities are identified and prioritized. Appropriate performance tools are employed at various points in the process.

Step 6: Evaluate

Measurement is an essential element of the continuous improvement process. It focuses on the effectiveness of improvement efforts and identifies areas for future improvement efforts. A basic need in all improvement efforts is the ability to measure the value of the improvement in units that are pertinent and meaningful to the specific task. For example, one evaluation of the "before" and "after" levels of customer satisfaction following an improvement effort might include the numbers of customer complaints. You should also evaluate the method of your performance improvement.

Most organizations have existing measures that may be used "as is" or modified as necessary. No menu of measurements is applicable to all users. The key is to select measures that can be used by work units to manage and evaluate their products and services so that continuous process improvement may be undertaken.

Step 7: Review and Recycle

You must perpetuate the continuous improvement process forever. Approaches to TQM that have limited lifetimes will become ineffective if left unattended. You and all your people will need to review progress with respect to improvement efforts and modify or rejuvenate existing approaches for the next progression of methods. This constant evolution reinforces the idea that TQM is not a "program" but a new expectation of day-to-day behavior for each member of the organization.

PMI IQMP Model

"IQMP" in the PMI IQMP model is the acronym for "Improving the Quality of (the) Management Process(s)." The model has some unique features that set it apart from all other transformation models. Indeed, many managers, particularly senior managers long accustomed to the conventional wisdom, feel uncomfortable about

IQMP initially. Only after experiencing the benefits of IQMP in action are they convinced of its merits. The following features of the PMI IQMP model are unique:

- **It unabashedly focuses on the organization's need to follow Deming's 14 principles more closely.**
- **In deference to management's resistance to "theory," it refers to the 14 principles in terms of a "philosophy." However, it clearly sees the 14 principles as postulating a theory of management and constructs organization-wide experiments specifically designed for managers at all levels to disprove this theory; disproof, not proof, being the route to gaining knowledge.**
- **It recognizes that virtually everyone in the organization prefers to live with Deming's theory rather than with the unacknowledged and highly varied theories of their current management — but they are prevented from doing so by obstacles as yet unidentified and therefore unaddressed. People are not unwilling nor unready; they are unable.**
- **It also recognizes that the farther one goes from senior management and the closer one gets to the actual work of the organization, the quicker people are to grasp the theory. Therefore, while senior managers must be committed to the overall thrust of the theory, educated to the point of supporting a critical mass of managers trying to practice the theory, and given roles that they and only they can perform, they are not expected to direct the rest of the organization through the entire transformation; rather, the rest of the organization is expected, through data-supported experiments, to direct its senior managers. In effect, the model inverts the organization.**
- **It incorporates the use of problem-prevention techniques in applying process controls across the entire organization.**
- **It is designed under the concept of the expanding ripple, not the big bang. Thus, most managers, while knowing that the transformation process is underway and trained to take advantage of the problem-prevention techniques, will participate directly in the model 2 years or more after the transformation process has been initiated. The whole organization, of course, benefits from the experiments.**

The PMI IQMP Model is primarily a team-development model. Its overriding philosophy of continuous improvement is shown in Figure A-3. It has three stages, as shown in Figure A-4, encompassing a specific process for transformation that starts with top management and ends with a team structure in place prepared to conduct

experiments in process improvement activity. Each components is briefly described below. A more detailed discussion is provided by PMI.¹⁶

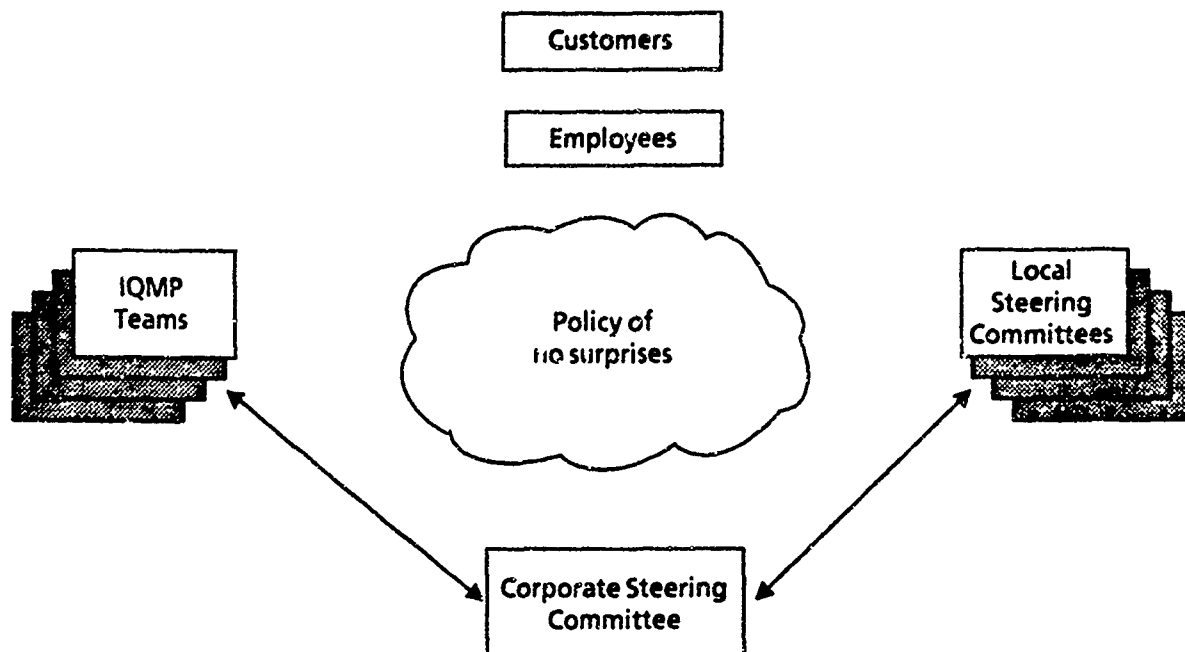


FIG. A-3. STRUCTURE FOR CONTINUOUS IMPROVEMENT

While the model provides management with bottom-up direction, it is developed and implemented in a top-down manner. Each component will go through transition from education to training to implementation to a steady state of continuous improvement. The major activities of each component are described below. The model integrates the cultural transformation, which takes TQM beyond the "program of the year" attitude and the methodology for improving work processes (the technology and tools of continuous improvement).

Corporate Steering Committee / Team

The Corporate Steering Committee (CSC), or Division Steering Committee (DSC), has the primary responsibility for interpreting the Deming principles/TQM for the organization. Composed of the top executive, plus his/her staff, the charter for

the CSC is found in the question: "*What* do we think Deming's principles/TQM mean for this organization?"

In addition to the normal tasks of carrying on the work of the organization, the CSC members research the Deming principles in terms of what Deming means and what each principle means to the organization. This suggests that each CSC member gets to know the organization much more intimately than traditional practices might encourage. It also suggests research into how people work and feel about work as well as into the reality of corporate policies and practices. CSC members look at how they need to operate differently and mobilize others in the business unit to offer recommendations and advice.

During the education stage, the CSC has a major responsibility for "championing" the principles throughout the organization, ensuring that all employees recognize that the transformation is real, and modeling the expected new management behaviors. During the application stage and continuing into the continuous-improvement stage, the CSC has a responsibility to receive/act on recommendations from IQMP Groups and Local Steering Committees (LSCs) on matters of need identified in the organization. It is the job of the executives to support the organization.

The CSC has 10 major areas of responsibility:

1. Establish awareness of the competitive challenge throughout the organization.
2. Establish a vision for the future.
3. Establish leadership for the change effort.
4. Establish a process to encourage/support innovation.
5. Establish broad employee involvement in the effort.
6. Establish proper organizational structure for the effort.
7. Establish appropriate technology.
8. Establish plans for the ongoing development of all employees.
9. Establish a plan to guide the process improvement effort.
10. Establish total quality improvement as a way of life in the organization.

Local Steering Committees / Teams

The LSCs have the primary responsibility for enabling continuous improvement in the workplace as shown in Figure A-4. Their focus is on day-to-day implementation of actions to improve work processes. There are normally as many LSCs as there are independent business units in an organization, and each is composed of the local facility or regional manager plus his/her staff. (Often, a corporate or division office becomes an additional LSC to work on improving the work processes of the office functions.)

The job of the LSCs is to ensure that employees are provided the work tools — including the statistical process control (SPC) training — they need to do their work; the LSCs must also respond to the needs that become apparent through the data gathered by those who do the work. These jobs may require independent implementation of specific changes (with appropriate communications to other LSCs in which there might be an application), implementation of CSC and/or IQMP recommendations, or coordination of actions determined to be jointly useful to several business units. The charter for the LSCs is found in the following two questions: "How do we make a difference in the technical work?" and "How do we support implementation of the IQMP Groups' recommendations?"

It has been found that a "policy of no surprises" is essential to developing trust between the work groups. This is typically dealt with by encouraging people to talk informally, as well as by sharing of meeting notes among the various groups and committees. This kind of structure is not in any way intended to reduce the importance of "common sense" or good communications. The structure is meant to enhance and encourage the use of both. When differences of opinion arise, as they surely do, the focus is placed on the customer needs and the data presented, rather than on such traditional bases as territoriality, or "I'm the boss, that's why." Helping people to find ways to resolve differences constructively is perhaps another good reason for working through the transformation process with a consultant. The LSC has several areas of responsibility:

- Leading the tactical changes in the management process
- Examining the "operational definitions" of Dr. Deming's 14 points for any variance that may be required at the local site

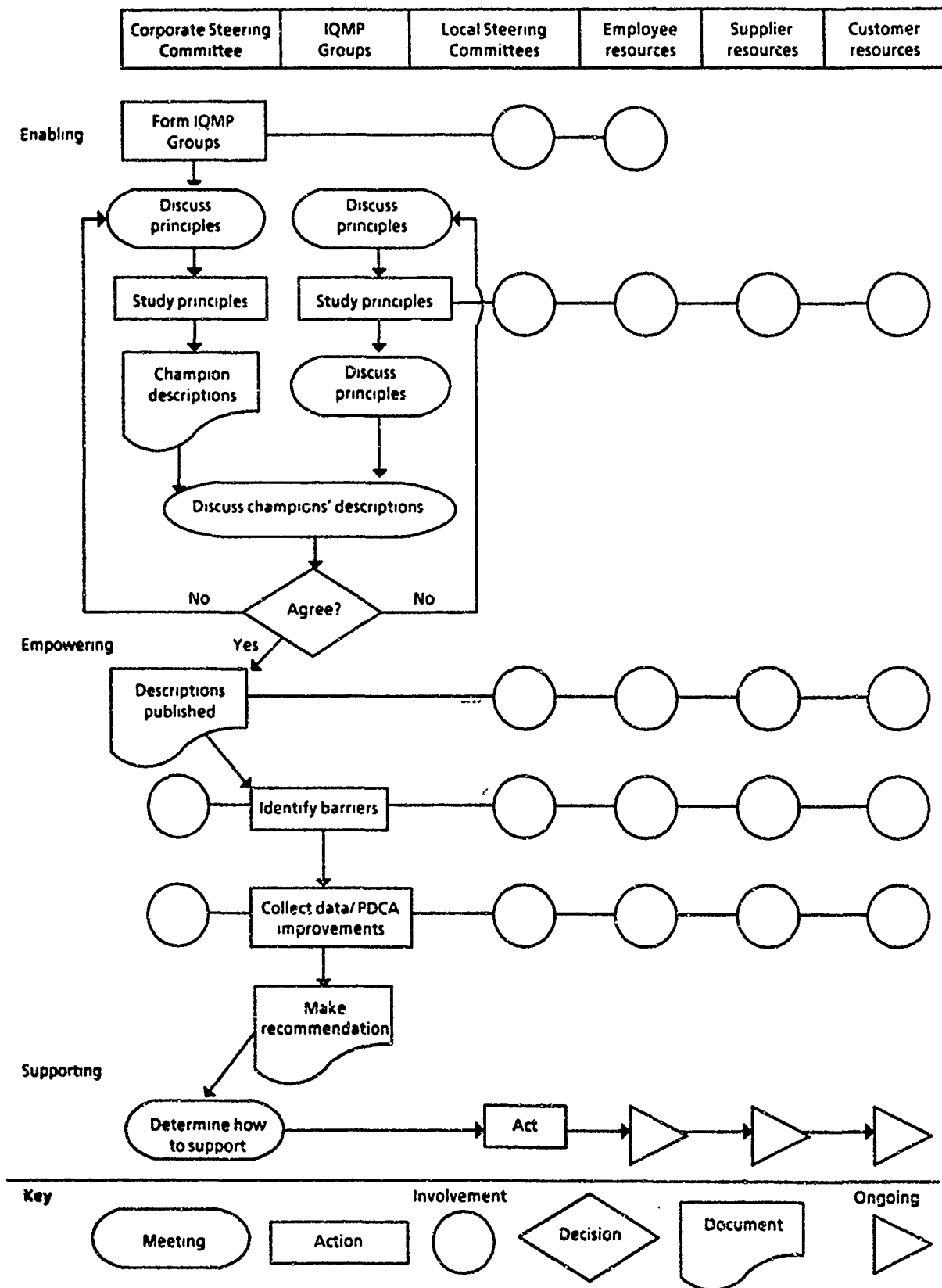


FIG. A-4. MANAGEMENT PROCESS IMPROVEMENT FLOW

- Clarifying mission statement at local level to ensure it is in concert with the new philosophy
- Discussing the impact of the 14 principles in managing their organization
- Defining customer expectations
- Identifying early improvement potential.

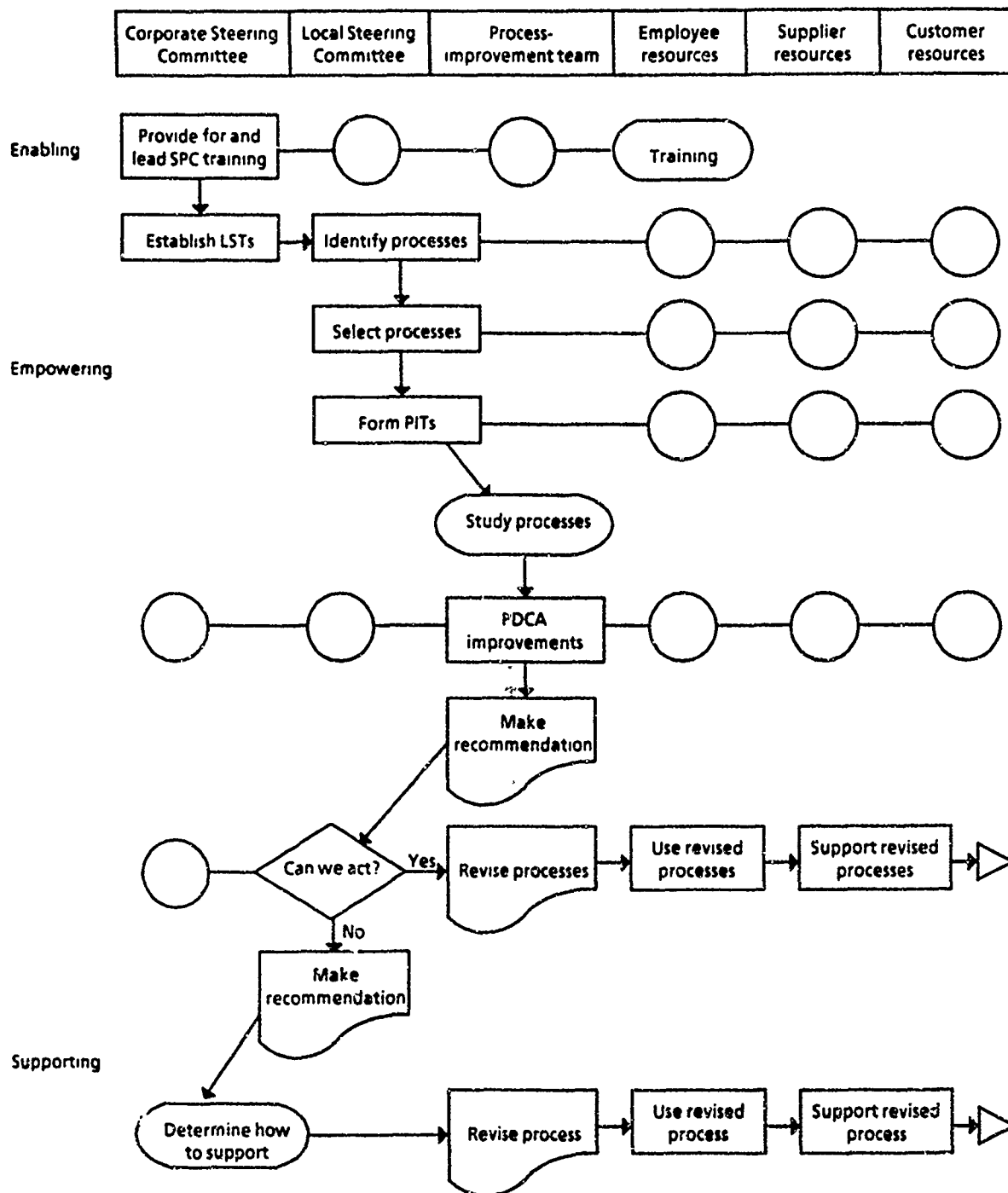
IQMP Teams

The IQMP Teams have the primary responsibility of improving the quality of management in the organization as shown in Figure A-5. Composed of a "lateral slice" of the organization, primarily from the ranks of management but not necessarily limited to managers, the IQMP Teams must actively seek out obstacles to Deming's 14 principles and find ways to remove the obstacles by making improvement recommendations.

Normally composed of several working subgroups, based upon focus on related groups of principles, the charter for the IQMP Teams is inherent in the question: "How do we make a difference in the management work?" IQMP Team members work closely with individual principle champions from the CSC, as well as representing a cross-section of the organization's management, naturally working closely with those on the Local/Regional Steering Committees.

Members of IQMP normally serve 1-2-year terms, so that new ideas are introduced regularly, but a sense of continuity is preserved in that not all members are new to the task each year. The IQMP Teams:

- Are established after the top management team/committee is comfortable with its work relative to mission and strategic direction
- Are chartered to identify the obstacles that prevent the organization from following Deming's principles more closely and to make specific recommendations directly to senior management on how to reduce those obstacles
- Define and diagnose progress
- Ensure a policy of no surprises by working with the DSC and the LSC when appropriate
- May identify potential improvement projects for any part of the organization.



Note: LST = Local Steering Team; PIT = process-improvement team.

FIG. A-5. WORK FLOW FOR PROCESS IMPROVEMENT

The PMI IQMP Model directly addresses management processes — or, rather, the lack of them. As previously stated, it focuses on Deming's 14 principles with the intention of trying to disprove Deming's theory for management. It was also stated that the PMI IQMP Model complements the use of problem-prevention techniques across the entire organization. While IQMP incorporates the same techniques, the application of these techniques in functional and operational processes is not part of the PMI IQMP Model as such. However, this complementary work on process improvement is being done alongside the management work addressed by the PMI IQMP Model. If the management work is not addressed, then the functional and operational processes will not be continuously improved.

Project Teams

Work process improvements are undertaken by project-oriented process-improvement teams formed by LSCs. These project teams

- Will lead the operational change in the management process
- Are voluntary
- Will study specific issues using appropriate SPC technology and problem-solving methods
- Will make recommendations to the appropriate steering committee
- Will keep nonteam members informed
- Will work with Plant Steering Committee on implementation issues
- Will dissolve at the appropriate time.

Streams of Activity Model

The Joiner Associates' Streams of Activity Model, shown in Figure A-6, characterizes the ongoing activities and emphases necessary to achieve continuous improvement in an organization. It presents activities that pervade every organizational function and addresses the underlying elements that must be present for a successful improvement effort: supporting environment; a quality management approach to key activities and their review; a cadre of internal improvement experts; and a supportive, capable education and training community. The streams of activity are parallel and unending; they proceed independently but are interdependent.

There is no temporal relationship between the streams -- you pursue them simultaneously.

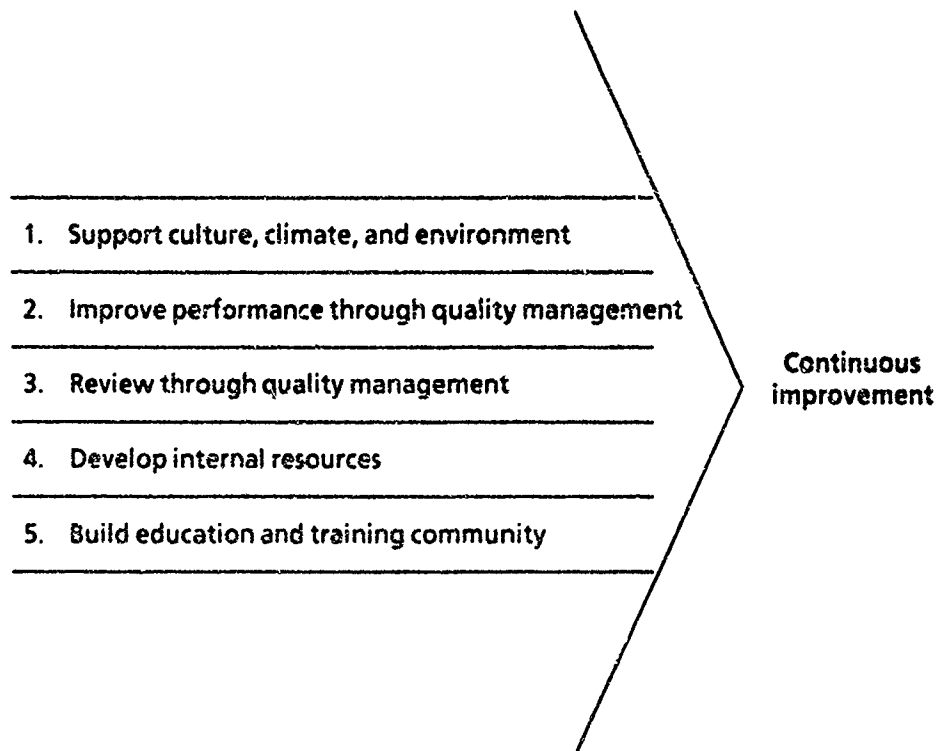


FIG. A-6. JOINER ASSOCIATES' STREAMS OF ACTIVITY MODEL

Stream 1: Assess and Develop the Culture, Climate, and Environment to Support and Sustain Continuous Improvement

This stream addresses the operational definition and deployment of Dr. Deming's 14 points into the organization and the development of a process involving lower levels of the organization. Activities in this stream include asking yourself about each of the 14 points: Why are they important? What do they accomplish? You must define for yourself an ideal picture of your organization and then define where your organization is now. Each level of your organization must ultimately be involved in this process, relating the 14 points to their objectives and their understanding of their organizational role. You must pursue actions to deploy the 14 points and their objectives throughout your organization.

Stream 2: Apply the Quality Management Approach to the Way You Carry Out Improvements and Other Key Activities

The second stream reminds you that you should apply quality management principles, practices, and techniques not only to your improvement activities but to everything you do within your organization. To do this you must establish a systematic approach that involves management and ensures management priorities are reflected by improvements and other key efforts. Existing work groups are focused by their management and work to achieve local priorities. You should ensure a quality management approach is applied to each new initiative you undertake.

Stream 3: Apply the Quality Management Approach to the Way You Review Improvement Activities and Other Key Aspects of the Business

Reviewing and evaluating progress is as important as undertaking new improvements or other initiatives. Not only should you adopt a quality management approach to every aspect of your business, you should also apply this approach to reviewing improvement efforts and to reviewing progress in all other areas as well. Ensure statistics and data support your reviews, and that you use the data in evaluating improvement efforts and other everyday business issues. Use these evaluations to identify needed changes in management emphasis and approach, and to support and enable more rapid improvement and achievement of organizational goals.

Stream 4: Identify and Develop a Cadre of Internal Resources with In-Depth Knowledge and Skills

To enable the flow of the first three streams of activity, you should identify and develop people within your organization who will become your internal experts in quality management and improvement philosophy, practices, and techniques. This effort includes identifying capable individuals, educating and training them, and establishing their new positions along with a career path and opportunities. You then can use these people to help you in your improvement efforts and also in applying quality management methods to key business issues.

Stream 5: Build an Education and Training Community That Can Drive New Knowledge into the Organization

Underlying the other four streams of activity is a continual, strong current of learning which supports and nourishes the continuous-improvement effort. This

stream of activity provides the new knowledge necessary to undertake improvements, to apply quality management to everyday business practices, and to increase the capability of individuals to do their jobs. You must identify your education and training community and develop processes and systems for addressing the organization's learning needs and reviewing your effectiveness in meeting those needs. This includes determining who to educate, when, and to what extent in which subjects.

LMI CIP Transformation Model

The LMI CIP Transformation Model, shown in Figure A-7, is a transformation model that focuses on the organizational and behavioral changes needed to instill and sustain a culture of continuous improvement in your organization. The organization develops a unified, consistent vision of its goals and objectives, and achieves that vision by providing the leadership and resources necessary to implement TQM as well as eliminating barriers to TQM implementation. Broad goals are focused down through all the organization's layers, and improvement practices follow a structured, disciplined methodology. Training and team building have fundamental supporting roles throughout the LMI CIP Transformation Model, as people and groups in the organization must be trained in appropriate subjects at appropriate times, and groups must learn to function as teams. The ultimate objective is to establish a perpetual and total commitment to quality throughout the organization and to involve everyone. TQM should become the organization's way of life.

Envisioning

Envisioning, illustrated in Figure A-8, is a process that includes developing your organization's overall mission and goals and, within the context of that overall mission, building individual and group awareness of TQM objectives, philosophy, principles, and practices. Your organization should document its mission and establish the constancy of purpose essential to a successful TQM effort. Creating a customer focus is a key element of improving your organization's effectiveness. Each individual must demonstrate belief in the organization's mission and ownership of its vision. An Executive Steering Committee (ESC), led by the head of your organization, guides and leads the overall TQM effort, which becomes integrated into your organization's way of doing business. The ESC is also instrumental in enabling the achievement of the mission.

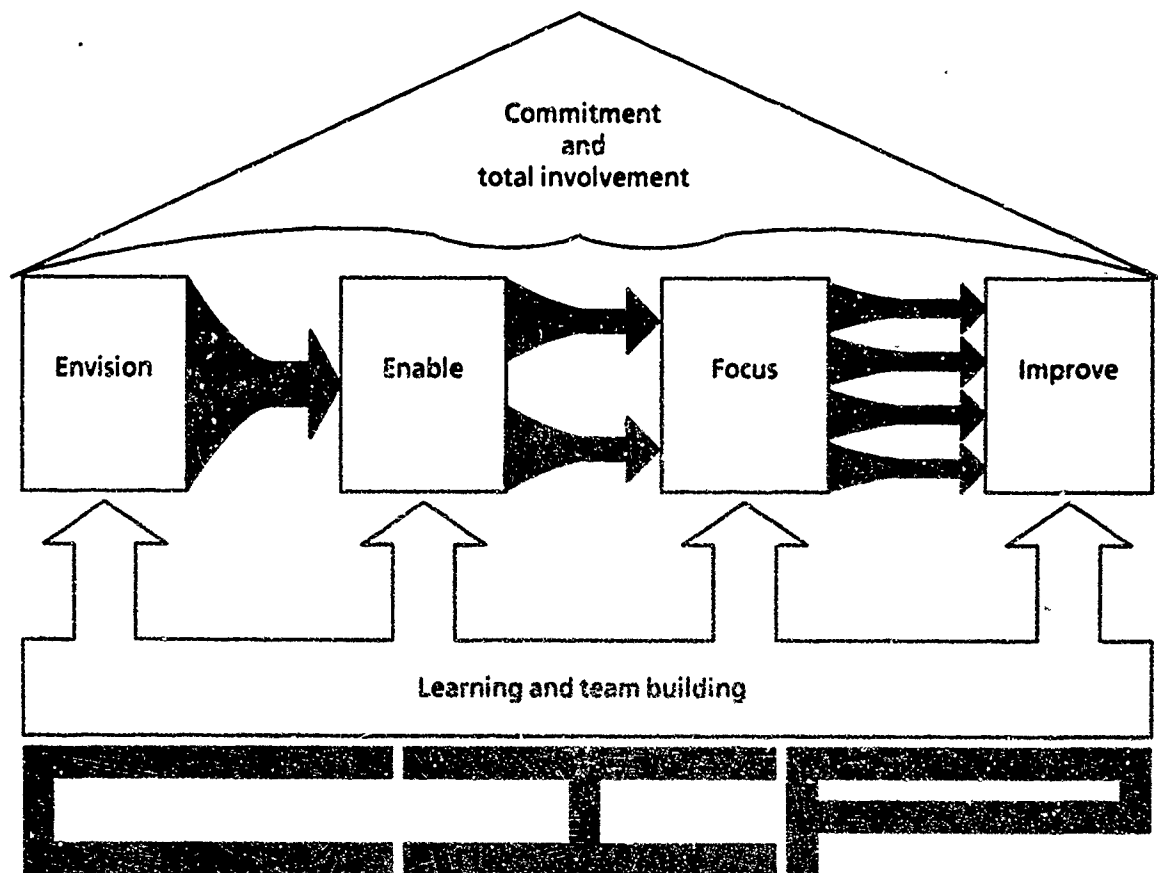


FIG. A-7. LMI CIP TRANSFORMATION MODEL

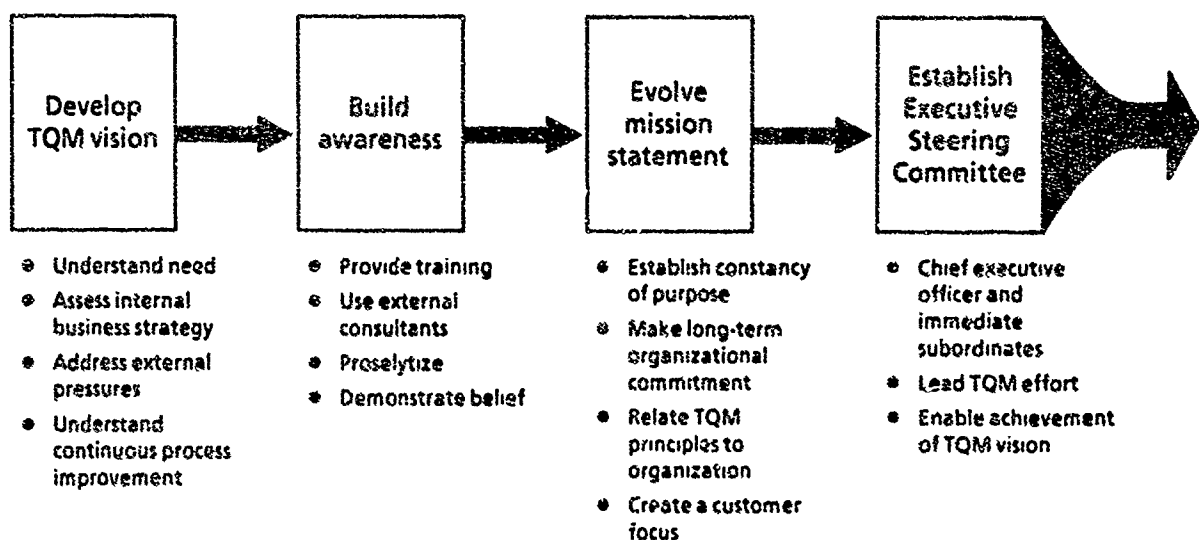


FIG. A-8. ENVISIONING

Enabling

Enabling, depicted in Figure A-9, is the process by which you make it possible for your organization to implement TQM principles and practices. It includes individual and organizational efforts to create an environment that will support and nurture the TQM effort. Top management must become committed to the TQM implementation and must demonstrate that commitment; highly visible and vocal champions can help publicize that commitment. You and every other leader must work to remove barriers to TQM and to establish support, reward, and recognition systems that encourage TQM behavior and drive out the inherent fear of change. Training and time resources, both for yourself and those who work for you, are essential. Finally, your organization must empower individuals and groups at all levels by providing them the authority necessary to meet their responsibility for process improvement.

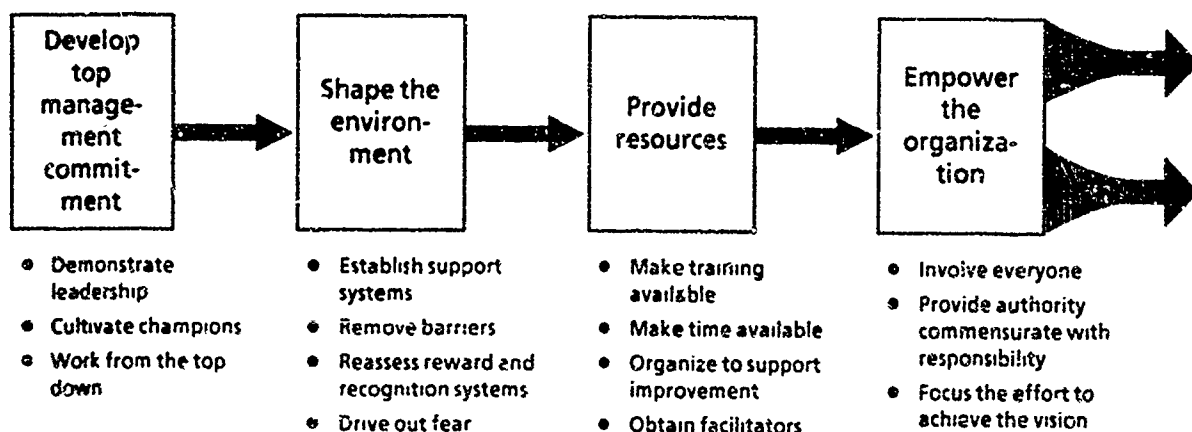


FIG. A-9. ENABLING

Focusing

Focusing the improvement effort, as shown in Figure A-10, turns the philosophy and the broad goals into specific objectives and plans for improvement. These goals, objectives, and plans are communicated throughout your organization. Your effort to focus TQM implementation must ensure that your organization establishes broad, top-level goals and then aligns all improvement efforts with those goals. Policy deployment translates broad goals into more specific, relevant goals at each organizational level. Goals at all levels must be realistic, achievable, relevant to both the group and the individual, and consistent. Involving customers and

suppliers ensures that common concerns are addressed; that you, your customers, and your suppliers understand each other's needs; and that information is exchanged in a timely and meaningful manner.

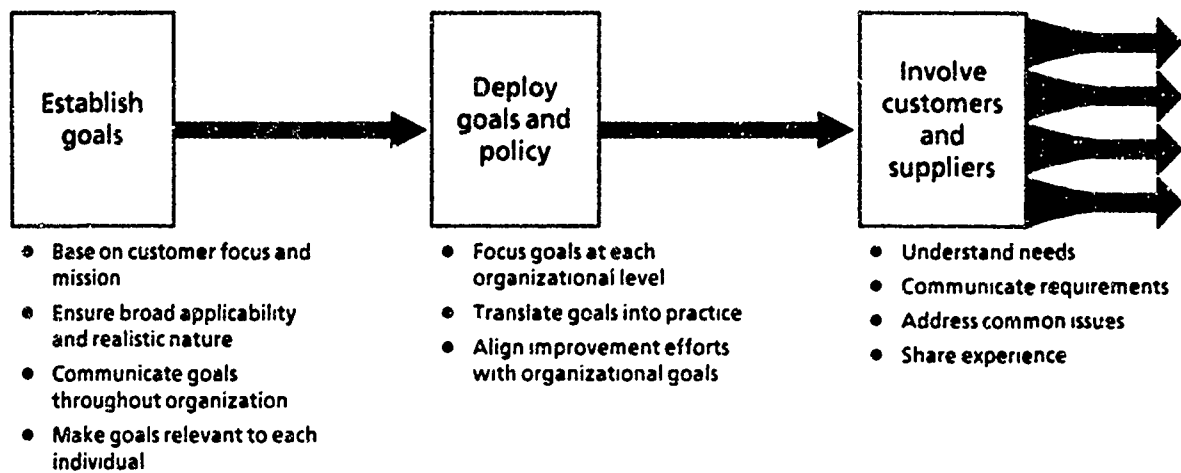


FIG. A-10. FOCUSING

Improving

Improving your processes, illustrated in Figure A-11, is the result of envisioning a new way of doing business, enabling that vision, and focusing the effort to achieve specific goals and objectives. Your organization's improvement activities include many of the more mechanical processes to define and standardize processes, to assess performance, and to improve your processes. Performance and progress measurement are a critical element throughout the continuous improvement process. The overriding characteristic of the improvement process is the establishment of and adherence to a structured, disciplined process-improvement methodology that allows you to take maximum advantage of your individual and collective experience and energy and to institutionalize that advantage for the good of the organization.

Learning

Learning, as shown in Figure A-12, is one of the fundamental elements supporting your TQM effort. It comprises training and education. In brief, your learning objective should be to provide each individual and group exactly the right amount of the correct education and training at just the right time. Doing this requires you to identify your projected needs from awareness through specific technical skills. You must also determine how the education and training will be

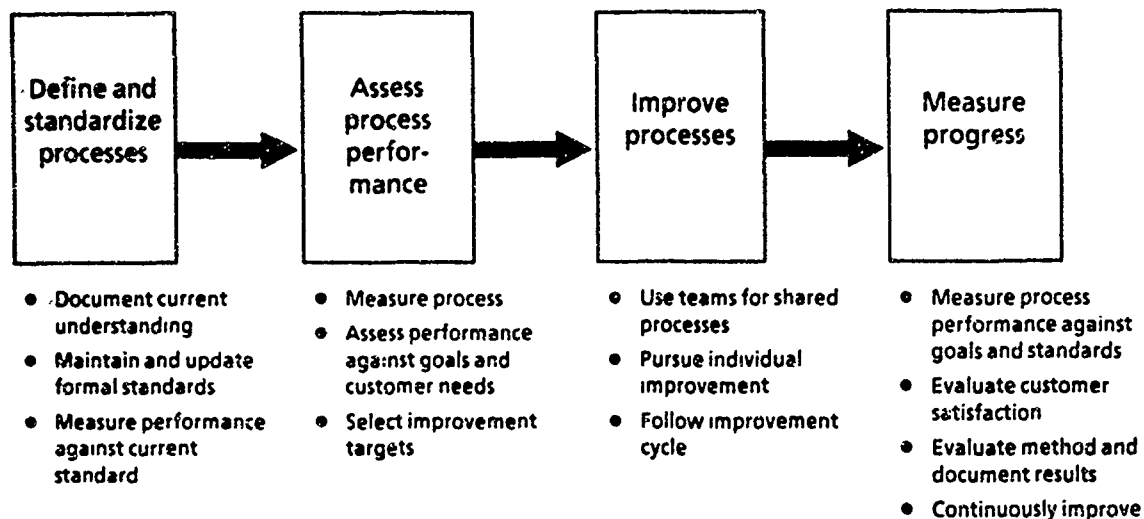


FIG. A-11. IMPROVING

delivered – in a classroom, on the job, or through self-study – and obtain the necessary materials and resources. You should plan learning so that each person and group will be able to use that new knowledge almost immediately after it is acquired. If the learning is not used right away, most people will forget it rather quickly and you will have wasted this valuable resource. Learning is necessary through each of the four phases of the LMI CIP Transformation Model, in different amounts of different subjects at different times for different people.

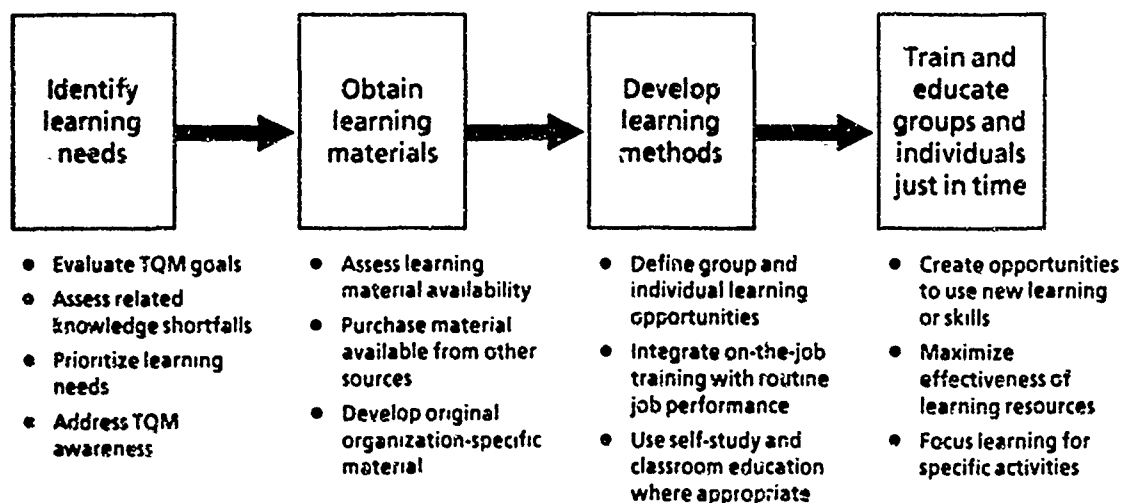


FIG. A-12. LEARNING

Team Building

Team building, depicted in Figure A-13, is the other fundamental element that will support your TQM effort. TQM will gain much of its power and momentum through the formation and activity of teams at all levels in your organization. You should form teams according to your overall organizational goals and ensure that teams have the necessary training and time resources to work effectively. Team building begins with the establishment of the ESC and continues through all levels to the bottom of the organization. In many cases team building simply means training existing work groups to act as teams; in other situations you may address common problems and concerns through creating cross-functional teams, sometimes coordinated by QMBs, that will draw participants from all interested areas. All teams should be linked, horizontally and vertically, and should follow the structured process-improvement cycle within the framework of the common organizational goals.

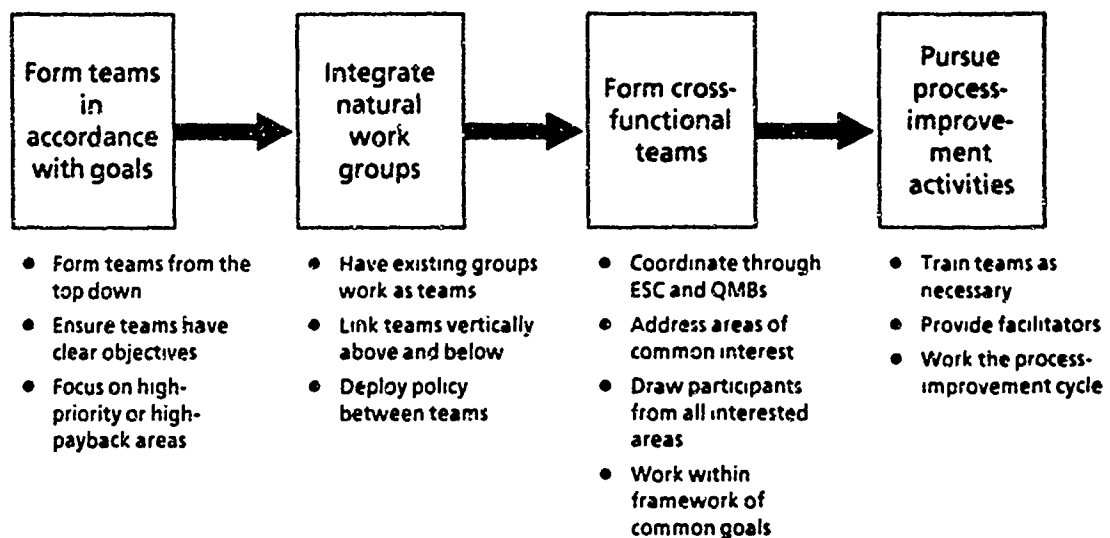


FIG. A-13. TEAM BUILDING

PROCESS-IMPROVEMENT MODELS

Moen and Nolan Strategy for Process Improvement

The Moen and Nolan Strategy for Process Improvement, shown in Figure A-14, is an 11-step strategy centered on the classic Shewhart or *Plan-Do-Check-Act* (PDCA) improvement cycle as are the remaining two process-improvement models. Its 11 steps start with selecting a process to improve and result in implementing a continuous-improvement cycle operating on the process. The model looks at an organization as a network of linked processes run by internal producers and customers. The ultimate output of the network is the product or service provided to an external customer. Each step of the model is briefly described below.¹⁷

Step 1: Determine Team Objective

You should identify a process that will have the greatest effect on improving customer satisfaction. The team chosen to work on improving a process should include people working in the process, people in authority to change the process, upstream suppliers, downstream customers, and related experts. The team must start off with a clear statement of the objective they hope to achieve. Each member of the team should see the accomplishment of this objective as important and worth working for.

Step 2: Describe the Process

Once the team has determined and agreed upon its objective, it should describe and document the process it intends to improve. The documentation should identify all process stages, inputs, and outputs. Complete documentation will identify all process suppliers and customers as well and will attempt to define customer needs and requirements.

Step 3: Flow Chart the Process

One key element of describing a process is creating a flow chart that documents the important stages in the process and identifies relationships between suppliers and customers. The flow chart demonstrates visually the flow of the process over

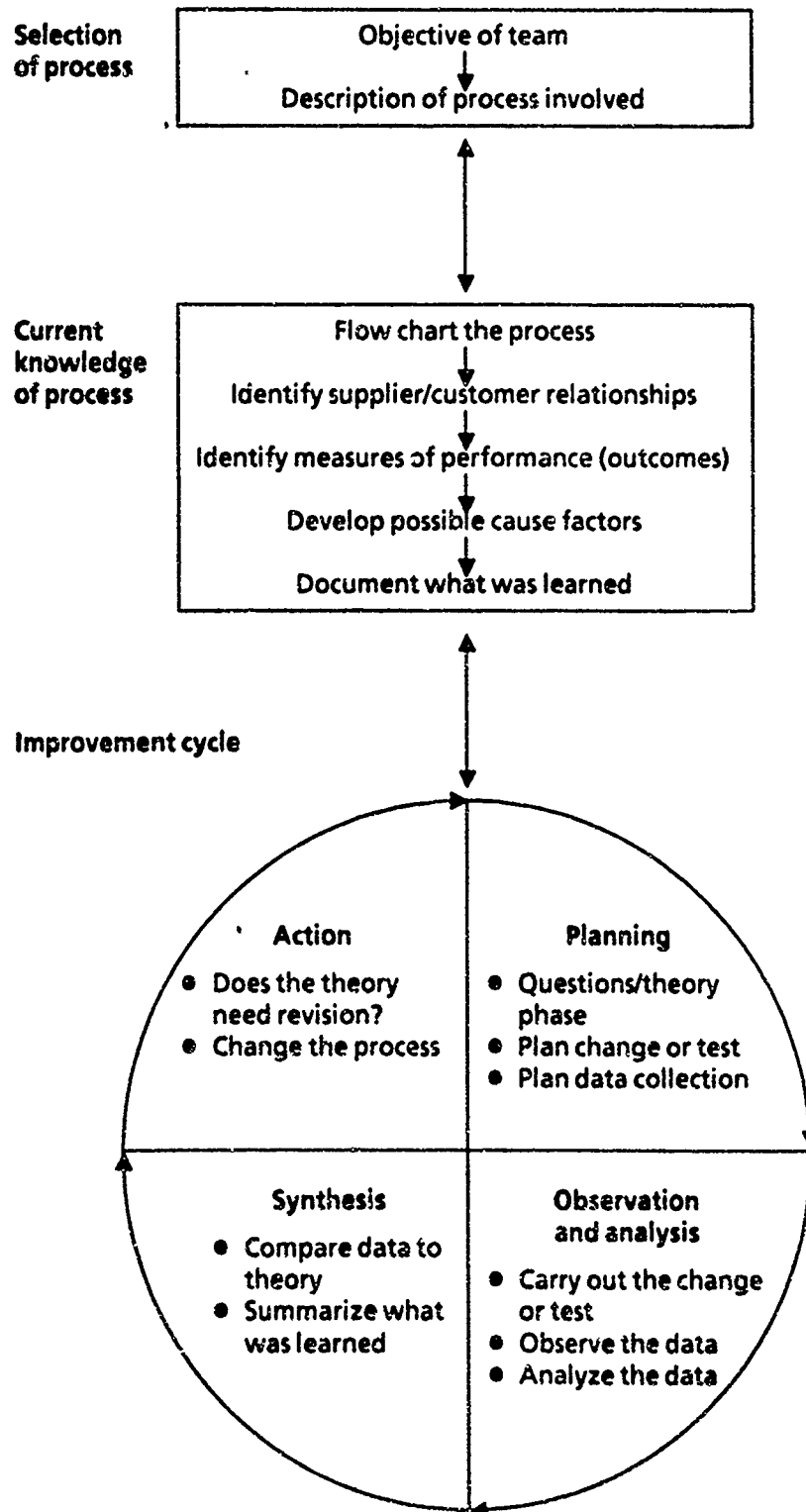


FIG. A-14. MOEN AND NOLAN STRATEGY FOR PROCESS IMPROVEMENT

time. Flow charts work best when simple, including only enough detail to give a basic understanding of what is happening.

Step 4: Identify Supplier / Customer Relationships

Quality and productivity are improved as producers work in teams with their suppliers (internal and external) to improve internal customer satisfaction and hence external customer satisfaction. Suppliers' targets serve as surrogates for customer needs. Each customer becomes the supplier for subsequent needs. Customer and process feedback provide a basis for the improvement action and for measuring subsequent performance.

Step 5: Identify Measures of Performance

Once the team agrees on the flow of the process, it must identify basic measures of performance for the outcome of each stage. These measures are identified as checkpoints on the flow chart. Each measure must be clearly defined as to what is specifically being measured and more importantly what those measures mean. Identifying performance measures creates windows through which you can observe your processes. If those windows do not provide predictable, consistent views of the processes, you will not be able to make intelligent decisions about how to improve the process.

Step 6: Develop Possible Cause Factors

Measurements provide key indications of process performance problems and their causes. You can use a number of tools to keep track of and assess these possible cause factors, which will identify opportunities for improvement.

Step 7: Document What Was Learned

Strict, consistent documentation is essential to maintaining control over the improvement process. Once improvements have been implemented, you must be able to maintain a history of the entire improvement effort. This history serves to provide lessons which might be applied to others in your organization and also will leave you a data trail with which you may analyze the success or failure of your improvement efforts.

Step 8: Plan

Once a project has been selected, the theory phase of the planning step begins. Theory may range from a hunch or "gut feeling" to well-accepted scientific principles at various times throughout the cycle. The next phase is to plan data collection. Data will be used to increase process knowledge and will help establish a consensus among team members. The questions to be answered by the data will guide the data collection process.

Step 9: Observe and Analyze

The observation phase begins when the plan for data collection is put in place. The data should be observed as soon as they become available. Any data collection process has many opportunities for error and many opportunities for special causes to occur. Plotting the data chronologically as they are obtained is vital for recognizing problems.

Once the data are obtained, they are analyzed to help answer the questions posed in the theory phase. In preparing for this analysis the team should determine the resources needed. Most data from well-planned studies can be analyzed using simple graphical methods, but there may be occasions when computers are needed. Most teams should quickly learn to use simple tools to collect and display their data. They will usually be able to analyze their own data, but there will be times when help from a statistician or other expert is needed.

Step 10: Synthesize

This phase brings together the results of the data analysis and the existing knowledge of the process. The theory is modified if the data contradict certain beliefs about the process. If the data confirm the existing theory about the process, then the team will be confident that the theory provides sufficient basis for action on the process.

Step 11: Act

Do we make a change in the process or go through the cycle without making a change? If a change is made, will it affect people? What other impact would a change in the process have? These questions and others may be answered by the data collected during the improvement cycle and subsequent analysis. Depending on the

answers, process modification may or may not be in order. There is no unique route to problem solving. Agreement on the suitability of improvement action is obtained by repeating the improvement cycle; it is the repeated use of the cycle that is important.

NPRDC TQM Process-Improvement Model

The NPRDC TQM Process-Improvement Model shown in Figure A-15 is also a PDCA-based model. It begins by stating a goal for improving a process and proceeds through institutionalizing successful process changes in documented process standards. Each step is briefly described below.¹⁸

Step 1: Plan

During the *Plan* phase you select the process you wish to improve and you state your goals for that process. Defining those broad goals further, however, requires you to describe your process flow by charting the flow itself, documenting your current understanding of how the process functions, defining the customers of the process, and understanding customer needs and requirements. Once you understand the process, you should make your improvement goals more specific, defining actual desired changes in process outcomes. These changes should be realistic, achievable, and measurable.

Step 2: Do

The *Do* phase is where you emplace the structure that will enable you to improve your process. You should identify the elements of your process, both internal and external, that potentially have an effect on the quality of your process and its products. To verify your theoretical causes of quality, you need to identify measures of your process's performance. In defining measurement points, ensure that they are specific, repetitive, and consistent. Before obtaining measurement data you should establish clear, concise data collection procedures to ensure that data are collected periodically and consistently.

Step 3: Check

You need to *Check* its performance to ensure that you accurately understand your process and more importantly to improve that process. Collecting and analyzing

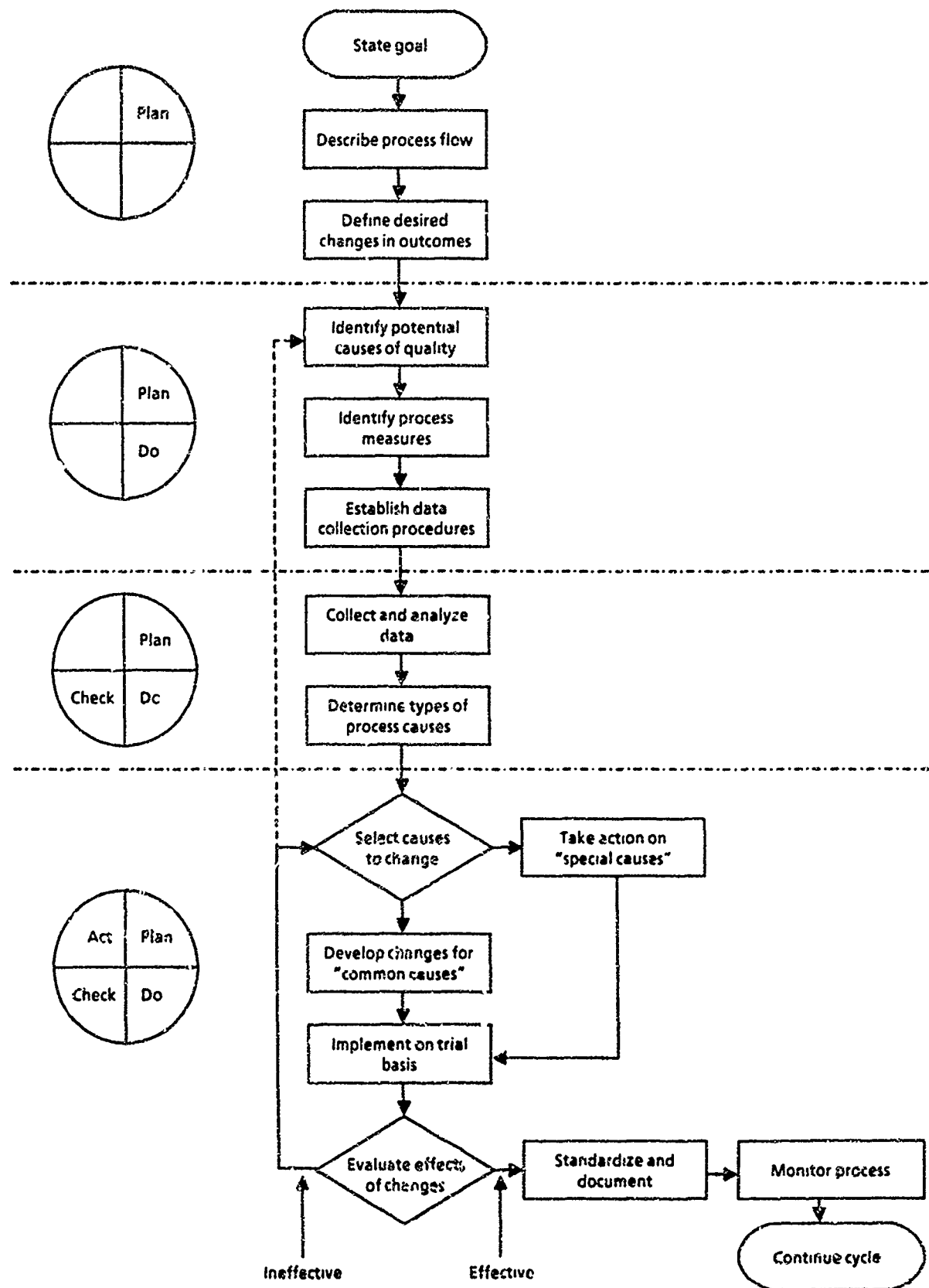


FIG. A-15. NPRDC TQM PROCESS-IMPROVEMENT MODEL

data is your primary tool for doing this. Data collection must be focused and consistent, performed in accordance with the procedures you established in the *Do* phase. You should analyze your data aggressively and thoroughly, looking to confirm your initial hypotheses or to identify new causes of performance problems. You should look for two types of problem causes — special and common causes. Special causes are those sources of variation or problem performance that are not endemic in the system itself but rather are the result of a specific error in process input or process operation. Common causes, on the other hand, are those that arise from the system itself and influence overall performance in a statistically predictable fashion.

Step 4: Act

Finally, it is time to *Act*. In this phase, you select the causes you want to change, taking one-time action on special causes, and developing remedial changes for common causes. You should implement both types of actions on a trial basis, evaluating their effects. For ineffective changes, you may have to go back and identify new causes of poor quality or causes of performance problems. You should document effective changes and build them into the normal way of performing the process. This usually entails the modification of existing process standards. Finally, you must set in place a means of monitoring process performance over the long term and ensuring both that your changes continue to have their desired effect and that people are performing the process according to the new standard. The process-improvement cycle continues forever, without end.

FPL Improvement Opportunity Process Model

The FPL Improvement Opportunity Process Model, shown in Figure A-16, is a seven-step process which follows the fundamental logic of the PDCA cycle. It provides a structured way for teams to identify improvement opportunities and solve problems. It begins with identifying opportunities for improvement and ends with tracking the effectiveness of implemented solutions. Each step is briefly described below.¹⁹

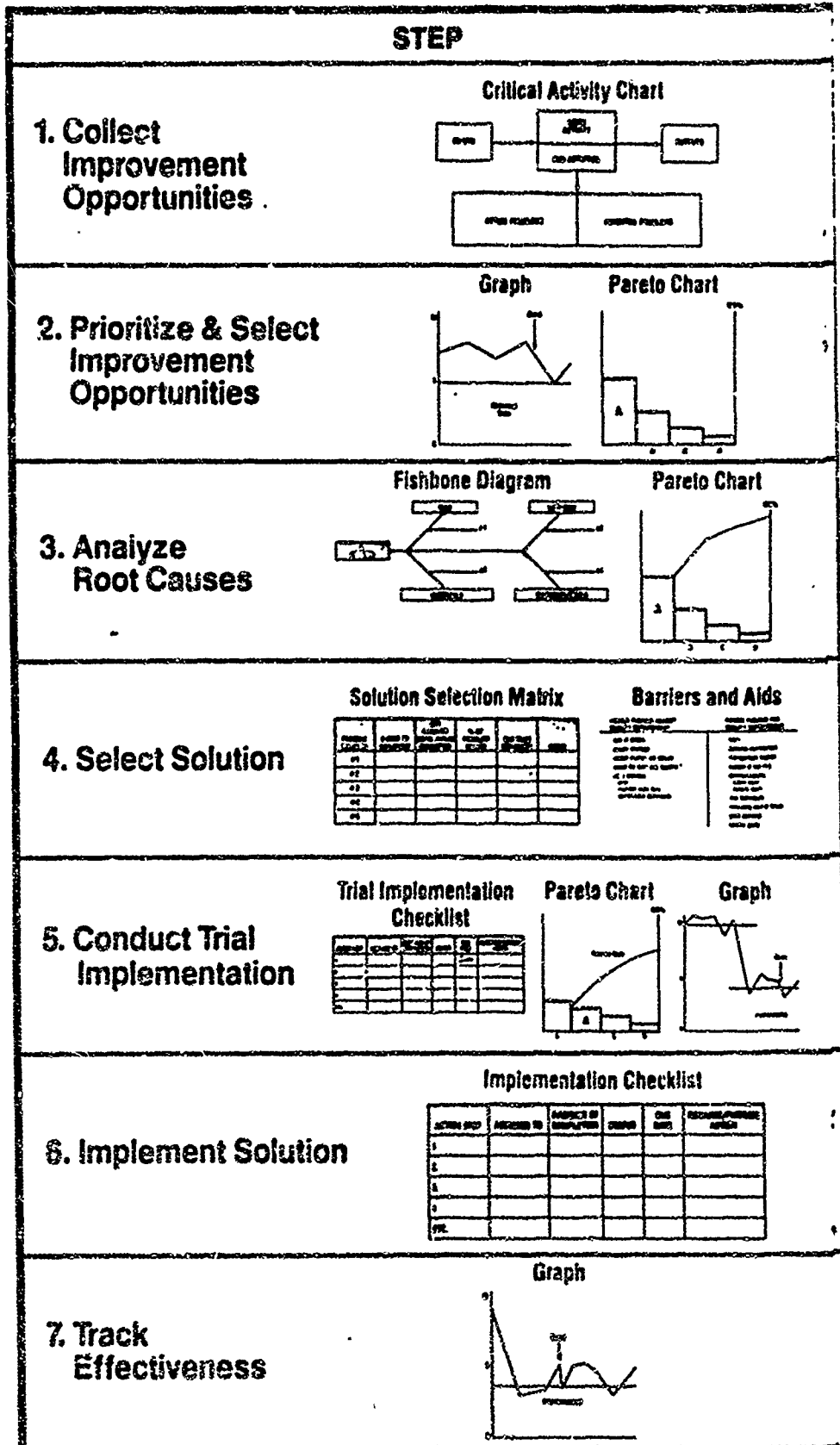


FIG. A-16. FPL IMPROVEMENT OPPORTUNITY PROCESS MODEL

Step 1: Collect Improvement Opportunities

Before beginning the improvement effort, you should identify the most promising opportunities for improvement. This requires collecting all possible improvement opportunities. Through suggestion programs, critical activity charts, brainstorming, and thorough interviewing, you may identify a number of opportunities for improvement. Ideas may also be generated by current organizational performance or by policy deployment plans that lay out organizational goals and objectives.

Step 2: Prioritize and Select Improvement Opportunities

Once improvement opportunities have been identified, their priorities must be established so that the opportunity with the greatest potential for improvement or the largest potential benefit is selected. Key considerations in prioritizing and selecting problems include how the problems relate to daily work; their potential impact internally and on your customers; and the demonstrated need for improvement. You should write clear problem statements, establish valid requirements, and develop a desired goal. You may select from a number of statistical and group interaction techniques in selecting problems for improvement.

Step 3: Analyze Root Causes

Selecting your problem is only the beginning of the improvement effort. Identifying and verifying the most significant root cause(s) of the problem is the next key step in addressing it. Root causes will point to the improvements you will make in your process. You should keep asking why things happen and ensure you are identifying causes instead of symptoms. Once you have identified a number of causes, you narrow them down to the most significant ones, which you analyze using quality control tools.

Step 4: Select Solution

Root causes will themselves suggest different means of resolving your problem. In addition to the obvious solutions, however, you and your team should pursue less-evident solutions that may be even more suitable. You should also attempt to select solutions that address as many root causes as possible. Other things to consider include how the solutions will affect your customers and the people actually working

with the affected process, whether or not the team can actually implement the solution, and the resources needed to accomplish the improvement.

Step 5: Conduct Trial Implementation

After selecting its preferred solution, your team should plan and conduct a trial implementation. You will need to develop an action plan that addresses all aspects of the proposed change and assign responsibility for individual action items. The planning activity includes notifying and obtaining approval from appropriate management personnel. You should ensure a methodical approach to your trial so that improved performance is clearly documented and may be used to justify making the improvement permanent.

Step 6: Implement Solution

Once a trial implementation proves the viability of your chosen solution, you should quickly move to ensure the solution becomes part of your daily work process and that it is properly documented. Presentations to management may be appropriate, using the results of the trial implementation to justify final approval. You should put together a quality improvement story that traces the improvement from its initial identification and justification to its actual performance. Finally, you will have to modify procedures and standards to ensure your solution is made permanent.

Step 7: Track Effectiveness

Implementing the solution is near the end of the improvement cycle, but you must continue monitoring the solution to ensure it remains effective. The team may assign individuals to follow up on the improvement periodically. Any discrepancies or degradations in performance should be immediately addressed by the team as part of the ongoing quality improvement effort. Tracking the effectiveness of improvement efforts should as much as possible be part of ongoing measurement and evaluation efforts.

Joiner Associates' Model of Progress

The Joiner Associates Model of Progress, shown in Figure A-17, is a six-step process that includes an additional five-stage plan for process improvement. The overall model shows the general progression of events in project teams. It begins by

establishing a clear goal based on the organization's mission statement and proceeds through evaluation and management recognition of completed team improvement projects. Each step is briefly described below.²⁰

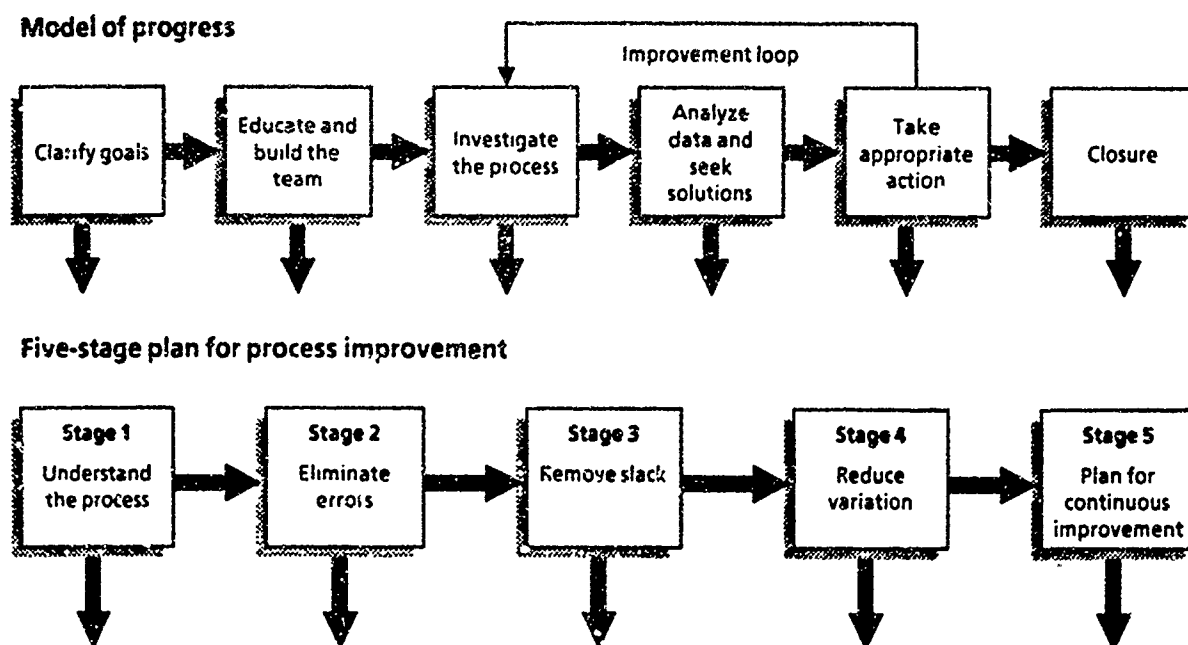


FIG. A-17. JOINER ASSOCIATES' MODEL OF PROGRESS

Model of Progress

Step 1: Clarify Goals. Before the team is even completely constructed, team members begin discussing their mission. They should understand what it means to be on the team, what process they will work on, and what kinds of improvements are expected. From these goals and expectations they will draft an improvement plan that will guide all subsequent team activities.

Step 2: Educate and Build the Team. The first few team meetings are typically devoted largely to team building and education. Team building includes setting the ground rules for team interaction and the logistics for the team's operation. The team should discuss its particular quality issues. The team proceeds with general discussion of the overall quality philosophy and education and training in specific quality improvement tools and techniques. In addition to developing the technical

expertise necessary to improve its processes, the team must take ownership of the process and perceive that process improvement is important.

Step 3: Investigate the Process. After team members have been exposed to quality and scientific principles, and have been trained in technical improvement methods, they are ready to begin work in earnest on the process. They begin by studying the process to learn more about how it operates and to identify problems. Process investigation includes documenting the process by using flow charts and diagrams, identifying and communicating with customers, and collecting process data. Process data yield clues to root causes of the problems, which point to additional data needs.

Step 4: Analyze Data and Seek Solutions. Once you collect the necessary data, your team should analyze them to identify possible causes of problems and then determine which of those possible causes are actually root causes. The five-stage plan for process improvement, described below, helps the team analyze root causes and develop appropriate, permanent solutions to the problems.

Step 5: Take Appropriate Action. Once potential solutions have been identified, you should develop a strategic plan to test the proposed solutions. Implementing the test involves gathering data on the changed process, analyzing that data, and redesigning the improvements if necessary. The results of the changes must be continually monitored, not only during the testing period but permanently. You should establish a system with which to monitor improvements as part of the normal way of doing business.

Step 6: Closure. Closure involves presenting the improvement project to management and other interested people in your organization. It is a means of allowing others to take advantage of your lessons learned and of providing your team recognition for their efforts. During closure you will also evaluate the results of your team's improvement effort and your team's performance during that effort. Finally, you should complete documentation of your project.

Plan for Process Improvement

Stage 1: Understand the Process. Before your team can make improvements, each member must thoroughly understand the process. To really know what is right and what is wrong with a process, you must answer three questions: How does the

process currently work? What is it supposed to accomplish? What is the current best-known way to carry out the process? Investigating these questions is the best way for your team to gather information that will let you set goals and objectives for the rest of the improvement project. Understanding a process is achieved through describing the process, identifying customer needs and concerns, and developing a standard process.

Stage 2: Eliminate Errors. Everyone makes mistakes. Yet we fail to realize that many mistakes can be prevented by making simple changes to a process. For instance, if people forget to fill in a certain blank on a form or to add the right number of components to a kit, make changes that either highlight the needed step or stop the process until a step is completed. Through actions such as these you will be able to "error-proof" your processes.

Stage 3: Remove Slack. Increasing numbers of organizations are realizing that traditional practices of keeping huge inventories and doing work in large batches are more harmful than helpful. These now-standard practices mask problems instead of solving them. In addition, processes tend to grow over the years, many steps losing whatever value they once had.

To get out of this trap, move toward "just-in-time" flow and examine each step to see if it is necessary and adds value to the product or service. The result of this critical examination is often dramatically reduced time required to complete a process. The resulting improvements usually increase quality, too.

Stage 4: Reduce Variation. The sources of variation come from both common and special causes; the key is to tell them apart. Common causes typically come from numerous, ever-present sources of slight variation. Special causes, in contrast, are not always present, and usually create greater fluctuations in the process. Eliminating common causes requires fundamental changes in how a process is performed; special causes can often be taken care of through relatively simple changes. You should first focus on reducing sources of variation on your measurement processes and bringing those processes under control and then performing the same sequence on your targeted processes.

Stage 5: Plan for Continuous Improvement. By this stage, the most obvious sources of problems will have been eliminated from the process. Now your team must look for ways to make improvement a constant, never-ending part of the process and

your jobs. Ongoing training and education in areas related to the process and instruction in the skills associated with statistical tools are critical. Before bringing the project to a close, discuss ways to keep the improvement philosophy alive. Keep records about the process and procedures up to date; make sure they are used.

LMI CIP Process-Improvement Model

The LMI CIP Process-Improvement Model, shown in Figure A-18, incorporates the PDCA approach but also addresses the need to standardize processes and maintain comprehensive, up-to-date process standards. It begins with the activities needed to create an environment conducive to continuous process improvement, follows that with selecting and improving a process, and finally assesses the level of performance improvement; the model then cycles around to focus on another process-improvement effort. This model flows logically from the LMI CIP Transformation Model (see Figure A-7). Each step is briefly described below.²¹

Step 1: Set the Stage for Process Improvement

At the organizational level, setting the stage for process improvement involves everything your organization does to become aware of the need for improvement and to establish a commitment to continuous improvement. It includes basic education and training, goal setting, barrier reduction, and leadership. Setting the stage means your organization must create an environment in which process improvement activities are encouraged and nourished. Your organization must have a clear vision of what it wants to accomplish and where it wants to go, and it must lay in place support systems to help the improvement effort.

At the team and the individual levels, setting the stage involves selecting and educating the team or individuals, and training them in the specific concepts, tools, and techniques they will require for the contemplated improvement effort. They should determine how they will function in the overall organizational environment and ensure that all individuals have enlisted themselves in the accomplishment of their perceived mission.

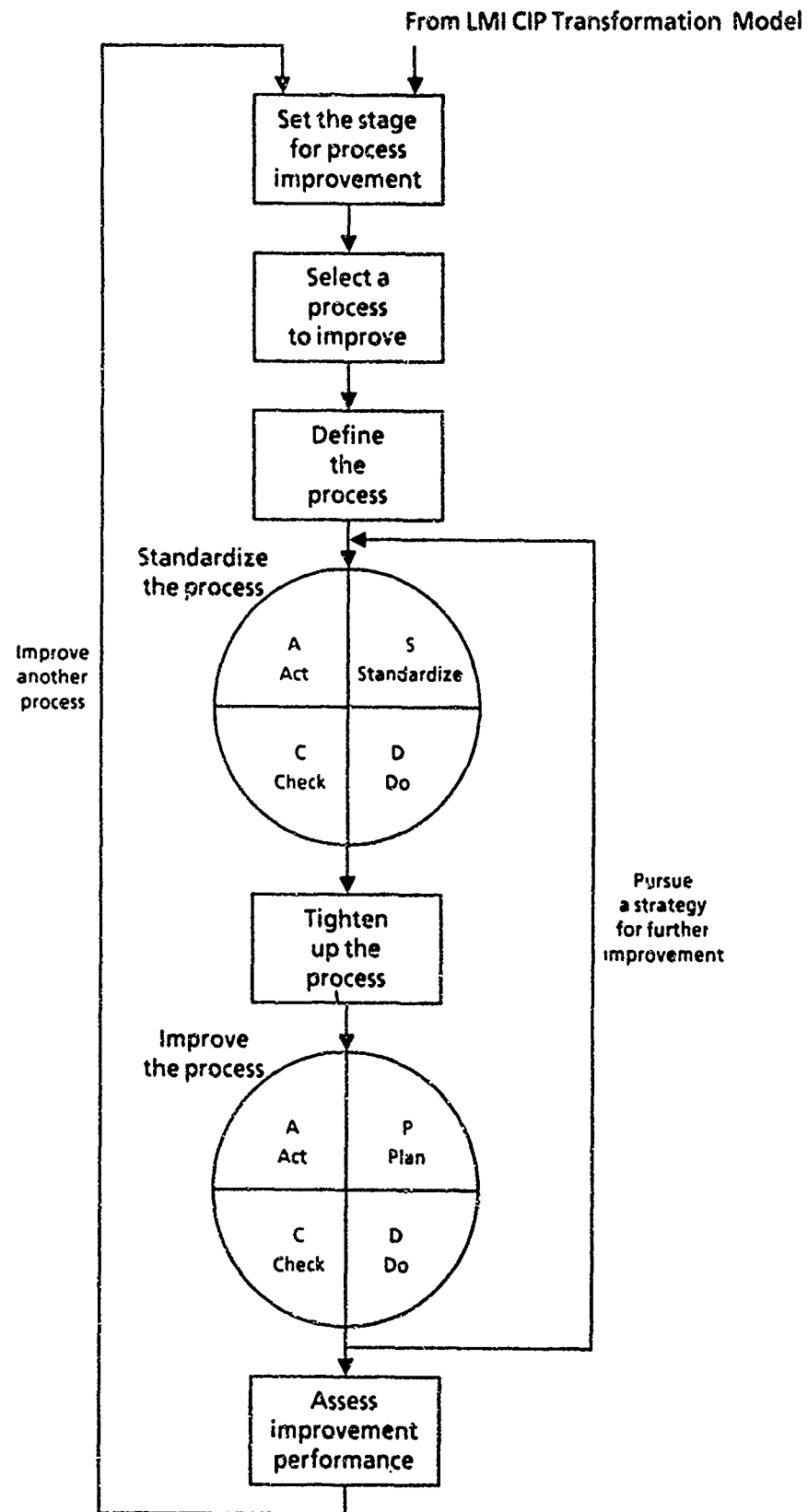


FIG. A-18. LMI CIP PROCESS-IMPROVEMENT MODEL

Step 2: Select a Process to Improve

Your team must identify, from all the potential candidates and in conjunction with organizational and team objectives, one process on which they will focus for each pass through the improvement cycle. Selecting the improvement target involves identifying all the potential opportunities, prioritizing them, and choosing the process that currently presents the biggest problem or the greatest opportunity for improvement. Once selected, the team must identify the major problems and isolate their root causes. From this background work, the team may create a plan for improvement that builds on the team's objectives. Identifying measurement points is also necessary before beginning the process improvement effort.

Step 3: Define the Process

Once a process has been targeted for improvement, you should define that process as clearly and completely as possible. Process definition involves determining the customers (both internal and external) and the suppliers of the process, documenting how the process is currently performed (usually through using a flow chart or diagram), and identifying measures of process performance. Documentation should be formal and consistent among all organizational processes. A firm process definition provides you a consistent base from which to begin process improvement; without knowing where you are at a given moment, it is hard to determine how to get to your destination.

Step 4: Standardize the Process

By standardizing a process, you institutionalize the current best way to perform that process. You create a means of instructing people in their jobs within a consistent performance definition, you provide a means of evaluating performance consistently, and you provide a basis for evaluating the success of your improvement efforts. You may accomplish all this by following the *Standardize-Do-Check-Act* (SDCA) cycle, which initially requires you to bring your measurement systems under control, to identify and document your current method of performing the process (which becomes the process standard), and to communicate and promote use of the standard. You train people to the standard, enable its use, and enforce that use. Once the standard is in force you should measure all process performance against that standard and respond appropriately to deviations from it. Reducing performance variation by assessing the causes of deviation and eliminating them

allows you to prevent recurrent deviation. The standard should always reflect the best current way of performing the process.

Step 5: Tighten Up the Process

Once you have defined a process standard you should tighten up the process before actually attempting to improve it. Tightening up is the maintenance work you can do that will make your process improvement efforts as effective as possible. Ensuring that your process meets its stated and perceived requirements, cleaning and straightening the process work areas, eliminating unnecessary equipment, instituting total productive maintenance, and establishing reliable, adequate data collection systems are essential elements of this effort to tighten up the process.

Step 6: Improve the Process

Your efforts to improve the process should follow the classic PDCA cycle in which you plan for improvement, implement solutions, check for improvement, and act to institutionalize improvements. Your effort will involve developing solutions that address stated requirements and conform to your theories on problem causes. Your data collection and measurement methodologies must support whatever solution you envision. Your team must be trained in the techniques necessary to carry out the plan. After you carry out your planned improvement, you should assess your data to determine how well actual performance matches planned improvements. Successful improvements should be institutionalized; less-than-successful efforts require another pass through the improvement cycle.

Step 7: Assess Improvement Performance

After an improvement has been implemented, you should document improved performance and the successful improvement effort thoroughly. This documentation allows others to benefit from the lessons your team has learned and gains you recognition for your efforts. It also provides a road map so you may replicate successful improvement techniques. Documenting your improved process also requires you to update your process definition and flow diagrams and requires that process standards be rewritten to reflect the new standard of performance. You should set in place a means of continuously measuring performance levels if this system does not already exist. Recommending follow-up actions or subsequent improvement efforts is also appropriate. Finally, celebrate your effort!

INDIVIDUAL IMPROVEMENT MODELS

PMI Leadership Expectation Setting Model

The PMI Leadership Expectation Setting (L.E.S.) Model, shown in Figure A-19, revolves around continuous improvement of "quality indicators" or the factors that are truly critical to success. Its primary expectation is continuous improvement of processes and systems within the employee's own function. Leaders and co-workers participate and are expected to provide constructive help and support. L.E.S. is predicated on the belief that you and every other individual in your organization are leaders just as much as top management. L.E.S. comprises eight main steps, which are briefly described below.²²

Step 1: Develop a Mission Statement

The first step is to develop your own mission statement which is consistent with the mission of your entire organization. Make it explicit, but remember that it is to be a guideline for future decision making. As a leader, your vision and mission must be able to be understood by all those you influence in your organization. A vision understood only by you will not move others. You must cultivate a feeling of employee ownership in the organization's future.

Step 2: Identify Key Leadership Functions

Your main improvement priority should be to focus process-improvement efforts on your highest priority functions. To do this you identify the responsibilities of your job which have the greatest effects on your group's results. From this identification you determine specific opportunities for improvement in your leadership processes.

Step 3: Identify Improvement Opportunities

In identifying improvement opportunities, you first need to understand what your major job functions and tasks are. You focus on your customers, determining their requirements and priorities and using those requirements to focus your own improvement efforts. Finally, you must identify factors that indicate the level of

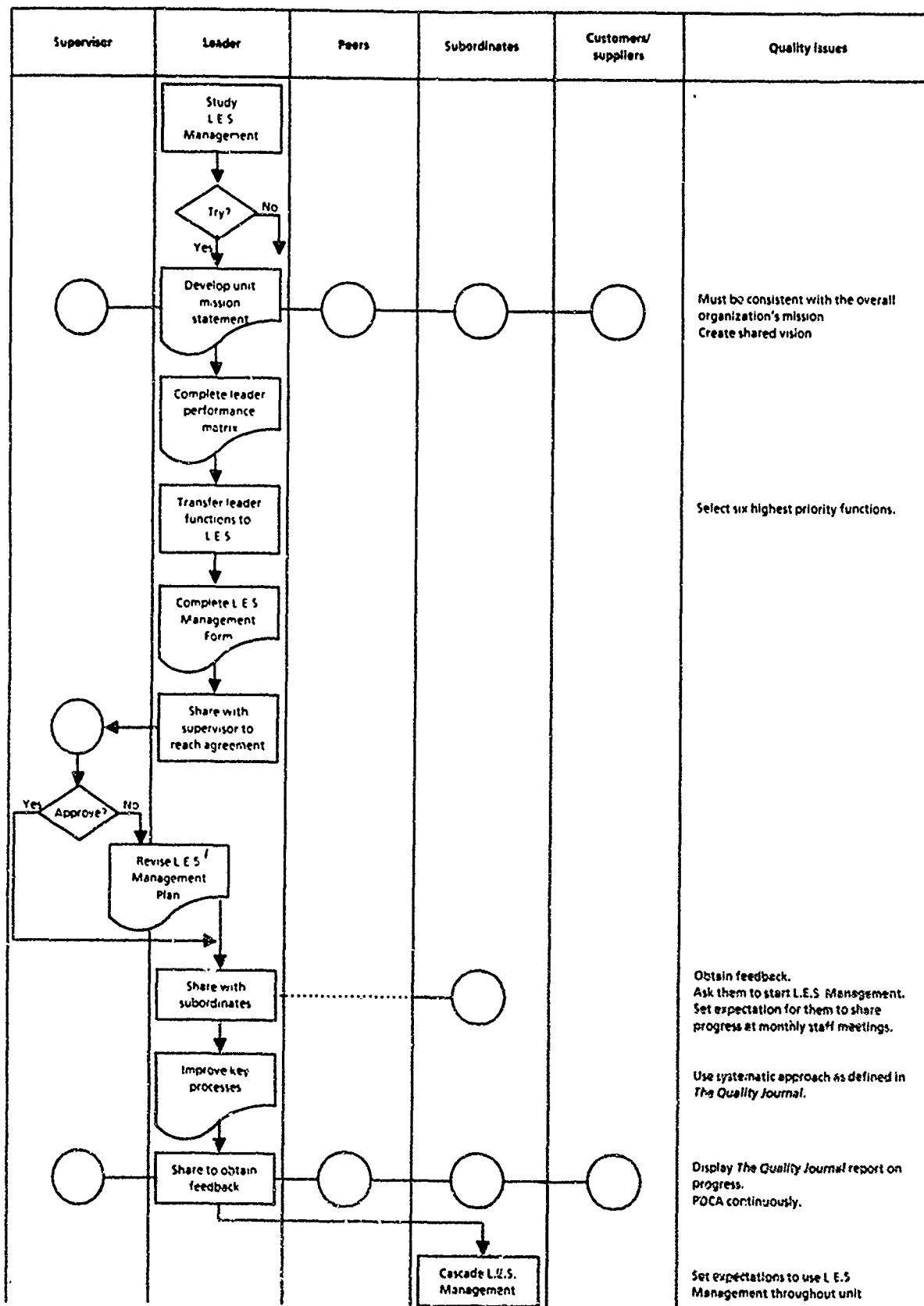


FIG. A-19. PMI LEADERSHIP EXPECTATION SETTING MODEL

quality in your work — how will you establish the basis for improvement and measure the level of improvement you achieve?

Step 4: Share Results With Supervisor

You must discuss your personal-improvement plan with your supervisor to ensure it is meaningful to the organization as a whole and that it contributes to overall organizational goals. Your supervisor should agree with your proposed plan for improvement and should provide comments on your approach where appropriate. Since the time and resources available to you for your own improvement depend to a large extent on your supervisor's support, it is essential for you to obtain his/her agreement before proceeding.

Step 5: Share the L.E.S. Plan with Subordinates

Leadership improvement is meaningless absent the context of those individuals being led. Your subordinates are the ultimate purpose of your improvement plan; in effect they are your major customer. You should share the plan with them and ask for their comments and perceptions. You should invite them, inasmuch as all individuals in the organizations are leaders, to begin the L.E.S. process themselves. You should encourage each individual to share his/her progress with the group.

Step 6: Use a Systematic Approach

To provide consistency to the improvement process, you should adopt a structured, systematic approach. Such an approach enables you and each person using the L.E.S. approach to display progress in a manner understandable by all. A disciplined method of defining a problem, observing it, determining its causes, taking action, checking the effectiveness of that action, standardizing the solution, and evaluating the process is a key to providing that consistency. Such a disciplined approach is outlined in the description of *The Quality Journal*, published by PMI, below.

Step 7: Share Progress

Leadership Expectation Setting is not only a model for individual improvement, it is also a basis for continuous performance communication and feedback between employees and supervisors. When you share progress, you should not focus on completing or updating forms, but you should rather engage in substantive

discussion of improvement objectives, obstacles to meeting those objectives, and lessons learned on the way. Often you will find that more important lessons are learned in failure than in success; therefore your performance assessment, both with your supervisor and with your subordinates, should focus on the underlying causes of failure instead of the fact of failure itself.

Step 8: Cascade L.E.S. Management Through the Organization

You should set the expectation that L.E.S. and individual improvement can be applied at any level in the organization. Your leadership and adherence to the process is crucial to its success in your organization however. You must demonstrate a belief in and commitment to the improvement process if you are to inspire its adoption by others.

The Quality Journal

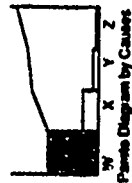
The Quality Journal, shown in Figure A-20, is an adaptation of a Japanese discipline for problem solving. It brings consistency to problem solving in all areas of an organization and displays progress so that anyone can look at the problem-solving activities, understand progress, and offer additional suggestions for improvement. It is a means for documenting your individual improvement efforts. *The Quality Journal* displays a summary of activities that may be displayed in more detail by specific statistical tools. It basically encompasses the seven steps described briefly below.²³

Step 1: Clearly Define the Problem

You should factually state the extent of the problem and how it impacts the total system. Then construct an integrated flow chart to graphically display the process. A problem statement documents in detail what is known about the problem. It explains the reason for selecting the problem, the background of the problem, and what has been done to date. An integrated flow chart is a means to examine the process to see what can be done to simplify it — remove complexity, redundancies, and unnecessary actions. The problem-solving effort should be planned, and schedules, time, and costs should be estimated.

Author: _____ Date: _____

b) Testing the Hypothesis



4. Action

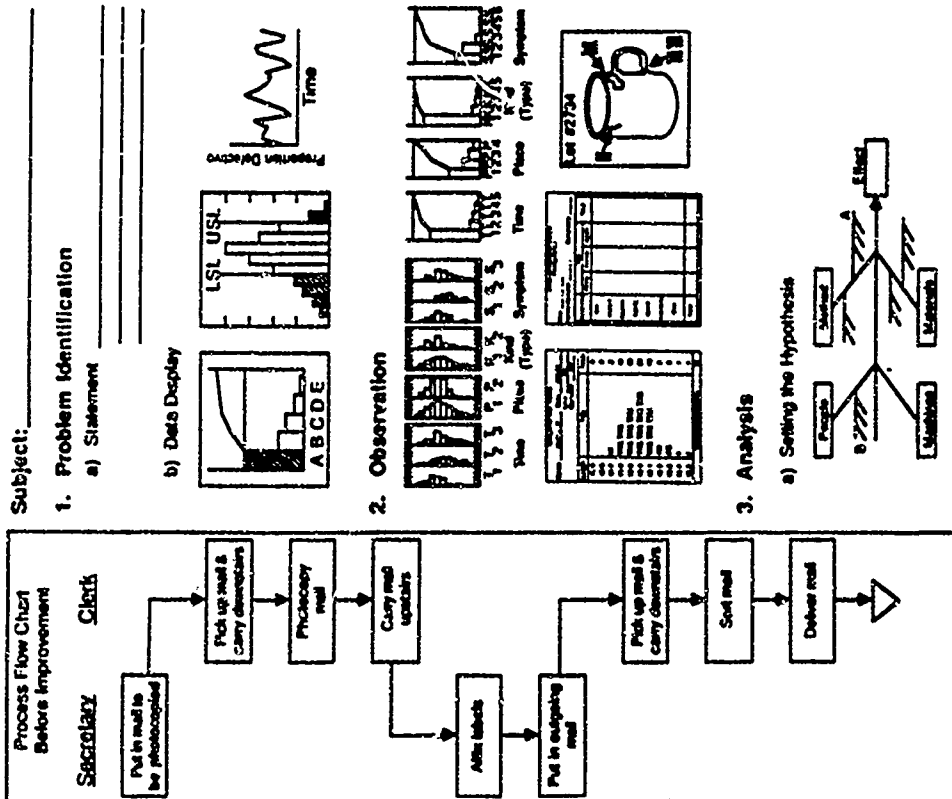
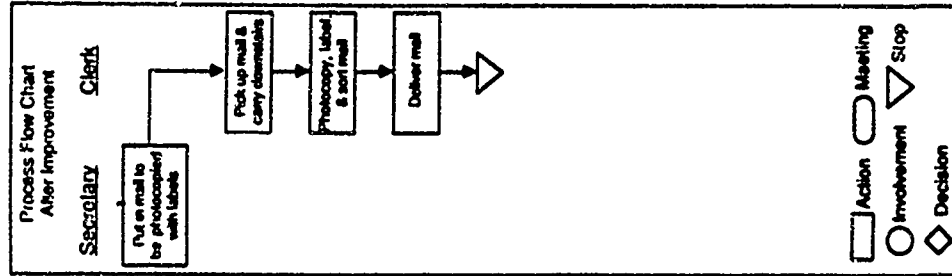
5. Check



6. Standardization



7. Conclusion

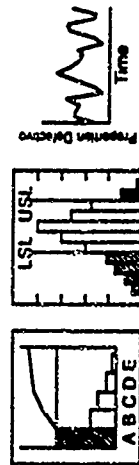


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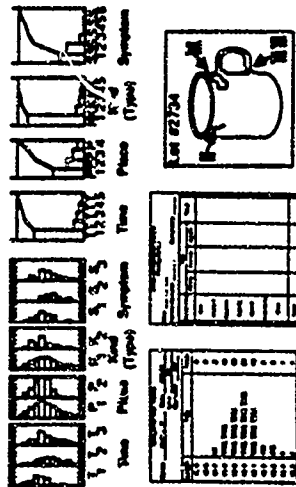
1. Problem Identification

a) Statement

b) Data Display



2. Observation



3. Analysis

a) Setting the Hypothesis



FIG. A-20. THE QUALITY JOURNAL

Step 2: Observe the Problem

You should examine your problem from several points of view, which might include different times, places, methods, and symptoms. Use specific, focused data collection methods to ensure consistent, accurate, useful data. Involving your employees in the data collection process can also help.

Step 3: Determine Causes

In determining the causes of your problem you should first hypothesize possible causes and then test those causes. You may identify possible causes according to main categories you establish for the problem. Causes that seem to make the highest contribution to the problem should be noted; information gained from the observation step will be helpful in making this determination. Collect new data to test your hypotheses and either prove or disprove them.

Step 4: Take Action to Eliminate Main Causes

Again, use your data to evaluate several different solutions to the main causes of the problem. Be careful that you are evaluating and removing root causes and not merely symptoms. You should also ensure that your solution does not have any detrimental side effects. Finally, select your solution and implement it.

Step 5: Check Your Solution

You must determine the effectiveness of your selected solution. Data are once again the key to this determination. Compare the situations before and after. If the results of the action are not what was desired, first determine if the action was implemented as planned. If so, but the results are undesirable, you will have to test a different solution.

Step 6: Standardize Successful Solutions

After the desired results are achieved, you should standardize your solution. This involves documenting the successful solution in a new process standard and communicating it to everyone involved in the process. Provide training to ensure the standard is correctly implemented, and devise a system of observing compliance with the new standard.

Step 7: Conclusion

Finally, review your problem-solving procedure and identify any lessons you learned about the improvement process itself. Note what worked well and what did not so that your future improvement efforts and those of others will be even better.

LMI CIP Personal-Improvement Model

The LMI CIP Personal-Improvement Model, illustrated in Figure A-21, follows the basic guidelines of the LMI CIP Transformation Model but applies those guidelines to individual-improvement efforts. It involves establishing a vision for your own improvement effort and enabling that effort; focusing your behavior and your expectations to achieve continuous improvement in your performance, your job, and the performance of others; and finally in evaluating your efforts to improve. Below is a brief discussion of the CIP improvement concepts.²⁴

Step 1: Envision Personal Improvement

Before you can begin to improve you have to decide that there is a need for improvement and then determine the general emphasis of your improvement effort. You should build your own self-awareness of the need to improve and your individual ability to improve. Assessing your relationships within the organization and with your customers and your suppliers provides a fundamental understanding of the current status quo. From this assessment you will develop your expectations for your own behavior, and you can begin creating your personal vision for your improvement.

Step 2: Enable Personal Improvement

You must make your vision a reality and must begin by smoothing the road along which you will travel. This effort starts with educating yourself about your improvement goals and about TQM concepts, principles, and practices. Seek training for yourself in the skills and principles you see as essential to your effort. Enabling is a process of learning — learning about using TQM tools, about your processes, about the collection and use of data, and about the process of learning itself. You should also seek the support of others, not so much from the standpoint of gaining their approval as from the standpoint of cultivating their help in removing barriers to your effort.

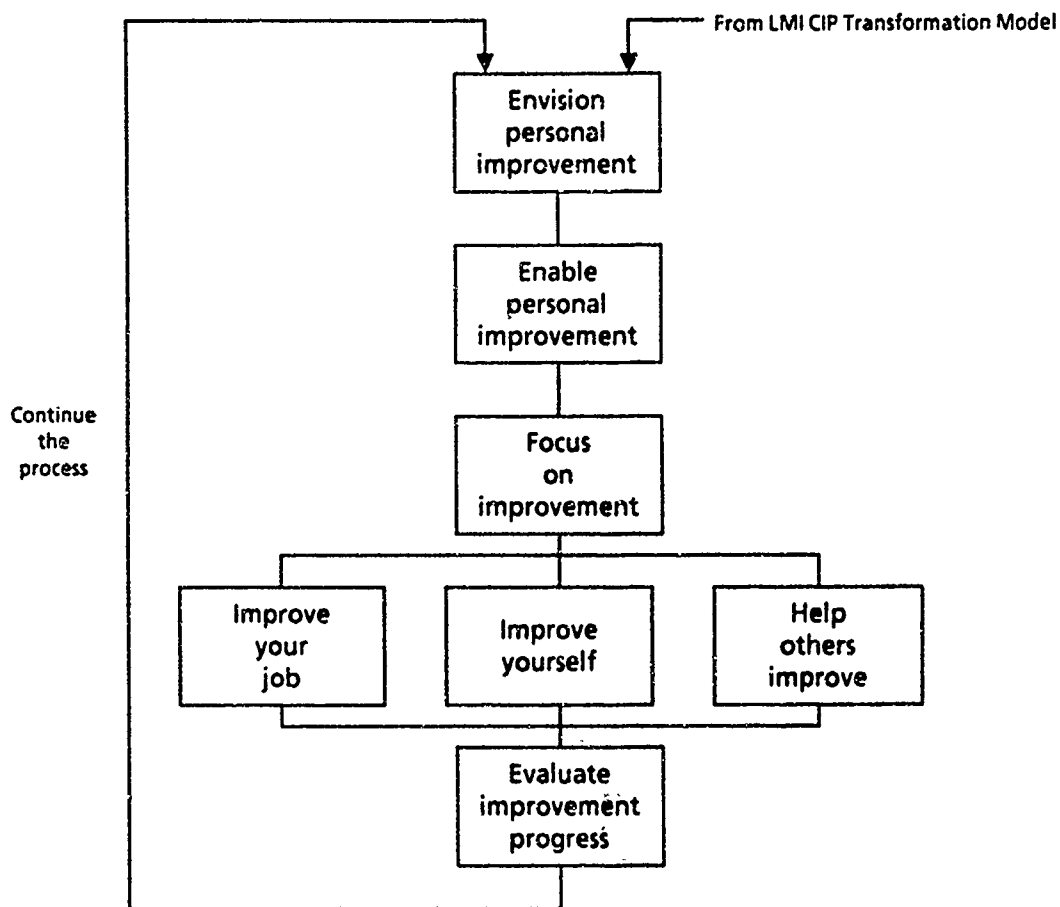


FIG. A-21. LMI CIP PERSONAL-IMPROVEMENT MODEL

Step 3: Focus on Improvement

You focus your improvement effort through establishing goals for that effort and then ensuring that your improvement activities are aligned with those overall goals. You should develop a cohesive improvement strategy to guide your efforts and ultimately use that strategy to evaluate the success of those efforts. Making improvement a high personal priority and creating time in your schedule for improvement activities are vital to this effort and are a clear demonstration to yourself and to others of your commitment to improvement.

Step 4: Improve Your Job

Your job may be defined as the collection of the processes you own. You should establish control over your job by defining your processes and understanding how those processes interrelate and relate to others, including your customers and your suppliers. By removing complexity from your processes and pursuing small, incremental improvements, you will substantially increase the effectiveness of your performance in your job, and you will greatly enhance your personal-improvement effort.

Step 5: Improve Yourself

You must demonstrate leadership in the improvement effort through your commitment to personal improvement. This means that you must establish and adhere to a structured, disciplined approach to improvement that clearly defines your goals and requires steady, consistent improvement performance. You should also facilitate communication between yourself and others, and among others. Remove the barriers you place in your own way, seek the assistance of others to remove the barriers you do not control, and work to eliminate your own fears of change and improvement. This is best done through education and through communication with others. Depend on your vision as your guide for improvement and use that vision to maintain your momentum.

Step 6: Help Others Improve

Through your improvement effort, you will help your organization as a whole improve. An essential part of your personal-improvement effort should be to help others improve themselves and the organization. By training and coaching others, by creating more leaders, by working to create teams and eliminate barriers, and by encouraging others' improvement activities, you will spread your own example and your enthusiasm throughout the organization. Personally you can make a substantial contribution to the individual-improvement efforts of others.

Step 7: Evaluate Your Improvement Progress

You must ascertain your success in your efforts to improve. By measuring your performance against an established base, by recognizing that the value of improvement lies in the effort to improve instead of the results, and by documenting your improvement efforts so they may be shared with and used by others, you will

derive the most from your own efforts. Celebrate your success and the success of others. Ensure through your evaluation that the improvement effort itself is rewarding and provides further incentive for continuous-improvement effort.

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