CONTINUOUS QUALITY IOWA

Managing and Continuously Improving Processes in Iowa State Government to Achieve Results for Iowans

ACKNOWLEDGMENTS

The State of Iowa developed this guide for Process Improvement activities within state agencies. However, these same principles and practices can be applied within any organization. This guidebook includes concepts and general information from the following sources:

•

Process Management
by William Rhoads, Iowa Department of Transportation

•

Reengineering Business Processes and People Systems
by Robert F. Lynch and Thomas J. Werner, QualTeam, Inc.

•

Simply Better
U.S. Department of Labor

•

QStP Materials
State of Ohio Office of Quality

•

The Memory Jogger
by Michael Brassard and Diane Ritter, GOAL/QPC

•

The Team Handbook
by Peter Scholtes and other contributors, Joiner & Associates Inc.

•

The Team Survival Kit
Ruan Transportation Management Systems

•

Transforming Education
by Ronald P. Warwick, Quality Education Seminars

•

The book was written by Linda Leto, State Quality Coordinator. Special thanks to the Department Quality Coordinators for their insights and suggestions, and to Bill Plymat of Plymat Communications for editing and coordinating the production.

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PROCESS IMPROVEMENT IN IOWA STATE GOVERNMENT

Guidebook Overview

Definition

Process Improvement is a structured approach that can be used to evaluate and improve an existing process, or to develop a new process to better meet customer, stakeholder and agency needs. Process improvement is an integral part of the way we do business in Iowa State Government, a practice we refer to as *Continuous Quality Improvement (CQI).*

While CQI provides both a philosophy of management and a specific set of tools and techniques for evaluating and improving work processes, this guidebook focuses on the latter.

History

Iowa State Government's CQI effort had its formal beginnings in April 1991 when a series of executive awareness sessions were initiated to increase the knowledge level of leadership regarding continuous quality improvement. Since then, CQI in Iowa State Government has moved ahead using a two-track approach. The first track provides general information, training and assistance to all interested agencies. The second track offers intensive support to process improvement teams.

Where to Use It

Process Improvement can be effectively applied at any level of an organization. Within Iowa State Government, this could include the agency, division, bureau, or work unit level. In addition, while the focus of this guidebook is on individual agencies, these same tools and methods can be applied across state agencies. For more information on cross-departmental planning efforts, see "Enterprise Planning Guidelines."

Planning for process improvement is most effective when the plan is started at the agency level. Then each division, bureau or work unit can align its plan with that of the agency. This alignment will allow for the best utilization of resources, helping to ensure that activities within all divisions, bureaus, or work units are working together to achieve the agency's vision and mission. The "how-to" of strategic planning, which ideally occurs first, is outlined in the "Agency Strategic Planning" guidebook.

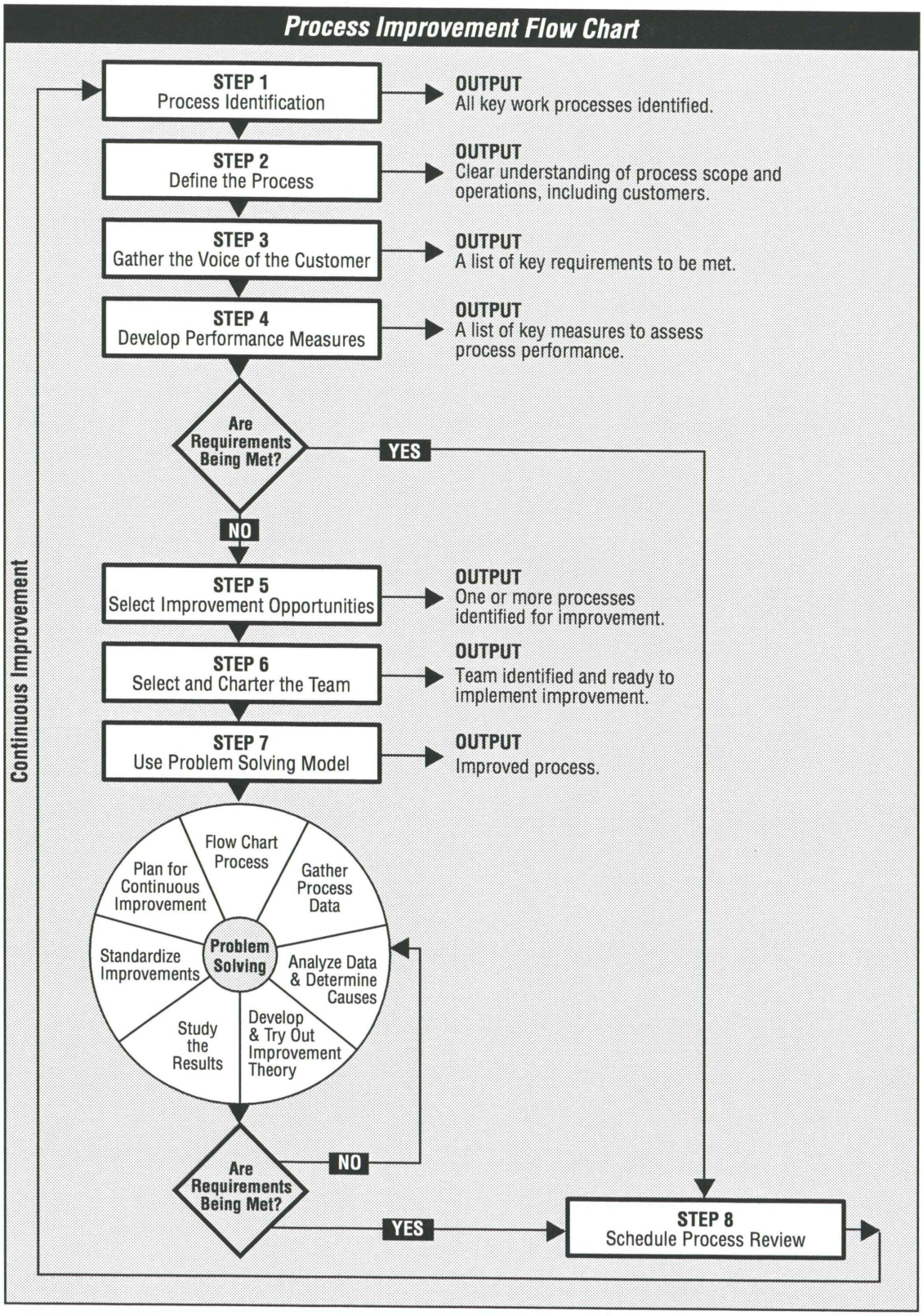
Planning may involve such activities as reviewing the agency's strategic plan, communicating a common vision for the agency, training facilitators and others on how to use the guidebook, identifying a consistent measurement process, and defining how results will be shared within and outside the agency. Communicating the agency vision and requiring use of consistent measurement processes results in the overall alignment and optimization of agency efforts.

Implementing process improvement will typically occur at the work unit level first, since processes at this level result directly in the delivery of products and services to customers. The emphasis of this guidebook is on the implementation phase, the actual "how-to" of process improvement.

How to Use This Guidebook

This guidebook was developed with you, the customer, in mind. Using best-known practices, it is designed to help guide you through process improvement to achieve desired results. The guidebook lists eight steps which can be used individually or together in any combination to meet your specific customer, stakeholder and agency needs.

By working through all eight steps sequentially, you will identify your agency's key work processes, locate opportunities for improvement and utilize a problem solving approach to achieve desired results. You will also set up a schedule for continual process review. The following flow chart outlines these steps.



GUIDE TO THE PROCESS IMPROVEMENT FLOW CHART

A brief overview of each step will help you determine which step or sequence of steps is right for you and your agency.

STEP 1 - Process Identification

What it is: An approach to identify the key work processes within the agency, division, bureau, and/or work unit that directly link to the achievement of the agency's mission and goals.

Who it's for: State agency leaders and employees.

When to use it: When you need to look at how outputs and results are achieved in terms of the processes that produce them.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: When an agency is successful in achieving results, it is because the processes that produce them are successfully designed. When an agency experiences performance problems, it is because it has process problems. Viewing work in terms of processes offers a unique way to look at the work of the agency and identify important improvement opportunities to achieve desired results.

How it's done: A team of people begin by identifying customers and then listing the products and services (outputs) the agency produces. Then, working inward, they identify the key work and support processes that produce outputs.

The result: A complete list of key processes within the agency, division, bureau, and/or work unit that produce outputs for customers and are critical to the achievement of the agency mission.

STEP 2 - Define the Process

What it is: A simple method of gathering key data on process operations, including process scope and identification of customers and stakeholders.

Who it's for: State agency leaders and employees.

When to use it: When you need a complete understanding of process operations in order to manage or improve the process.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: The process information gathered will be critical in determining how well the process is performing to achieve desired outputs and results.

How it's done: Working as an individual or with a team of people, a Process Inventory Form will be completed on each key work process. By completing each of the nine areas on the form, process operations will be defined in detail from beginning to end.

The result: The information compiled will be used to assess process performance in achieving desired results. Data gathered will include a list of the resources required to produce the output, the sequence of events or key steps by which the output is achieved, who the customers of the process are, what the purpose of the process is from their point of view, and the impact or role the process plays in the achievement of the agency's mission.

STEP 3 - Gather the Voice of the Customer

What it is: An overview of the various methodologies and techniques used to identify customer requirements regarding process performance.

Who it's for: State agency leaders and employees.

When to use it: When customer input is needed to manage or improve work processes.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: Customers and stakeholders provide key insights into how well the process is performing to achieve outputs and results. It is risky to assume what a customer needs and/or expects. Guesswork can lead to wasted resources and misguide improvement efforts.

How it's done: Customer input can be gathered in a variety of ways. Some common approaches are outlined in Chapter 3 along with their advantages and disadvantages. The methods include: gathering administrative information, utilizing focus groups, administering written surveys, and conducting informal and telephone interviews.

The result: A list of customer and/or stakeholder requirements regarding process performance.

STEP 4 - Develop Performance Measures

What it is: An approach to developing key process performance measures based on customer, stakeholder, regulatory, and agency requirements. Performance measures tell you how well the process is performing to achieve desired outputs and results.

Who it's for: State agency leaders and employees.

When to use it: When you are ready to use specific measures to determine how a process is performing.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: Performance measures allow you to focus on the specific aspects of a process that have the greatest impact on desired outputs and results. Measures help you target improvement efforts and use resources to produce value for customers.

How it's done: A team of people with knowledge of the process will complete a Process Measurement Worksheet for each key process identified in Step 1. Customer information gathered in Step 3, along with agency and regulatory guidelines, are also used to develop performance measures. Information will then be gathered directly from the process regarding its current performance level and a decision will be made as to whether the process is successful in meeting the identified performance goals.

The result: Knowledge of current process performance in relation to specific measures.

STEP 5 - Select Improvement Opportunities

What it is: Four step-by-step approaches that identify process improvement opportunities.

Who it's for: State agency leaders and employees.

When to use it: When a gap exists between current process performance and desired results.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: While it is certainly true that most processes can be improved in some way, state agencies cannot spare the time or the resources to do it all. With limited resources, you will want to target improvement efforts to achieve the greatest impact for customers, stakeholders, and the agency in attaining its mission and goals.

How it's done: The first approach utilizes a Process Improvement Selection Matrix to look at the current condition of the process in relation to how well it achieves its purpose, how effective and efficient it is at producing the output and the impact it has on achieving the agency mission. The second approach utilizes the knowledge of those working in the process to rank its impact on the achievement of the agency's mission. The third approach uses a data-based graphic known as a Pareto to rank from most to least the processes that need improvement. The fourth approach uses data gathered directly from the process to locate the process "bottleneck" or the area which needs the most improvement.

The result: Identification of key work or support processes that need to be improved and in what order.

STEP 6 - Select and Charter the Team

What it is: A formula for team appointment that sets the stage for improvement action.

Who it's for: State agency leaders and employees.

When to use it: When the agency is ready to begin an actual improvement effort.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: Successful improvement efforts require careful preparation. A clear understanding of specific team roles and responsibilities, how the team process works, and the goals that are to be achieved will help ensure that desired results are accomplished in a timely manner.

How it's done: Specific criteria will be used to determine if improvement efforts are to be accomplished by an individual or by a team's effort. If the team approach is used, team members will be selected, their roles clearly defined, and a common approach shared on how to run effective team meetings. Leadership will then charter the improvement team.

The result: An individual or team prepared to implement process improvement.

STEP 7 - Use the Problem Solving Model

What it is: A seven-step problem solving model based on the teachings of Dr. W. Edwards Deming. It helps you improve work processes and achieve desired outputs and results.

Who it's for: State agency leaders and employees actively involved in improving work processes.

When to use it: Whenever an agency wants to improve one or more of its work processes.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: To effectively improve outputs or achieve desired results, it is necessary to focus improvement efforts on the processes that produce them.

How is it done: By using a model which involves data gathering, causal analysis, development and testing of an improvement theory, a small scale pilot, a study of the results, and standardization of the improvement solution agencywide.

The results: An improved process that achieves desired outputs and results.

STEP 8 - Schedule Process Review

What it is: A continual, periodic review of processes to ensure the achievement of desired outputs and results.

Who it's for: State agency leaders and employees.

When to use it: Implemented on a periodic schedule based on current process performance and its impact on the achievement of the agency mission.

Where to use it: Within any organization at the agency, division, bureau, or work unit level.

Why it's important: For continuous improvement of the services and products the agency provides to customers, it is important to periodically review the processes that produce them. This review will help to ensure that products and services continually meet or exceed customer and stakeholder requirements.

How it's done: By a team of people, with process knowledge, completing a Process Review Form for each individual process and/or a form which sets a review schedule for all processes within an agency, division, bureau, or work unit. The team can also use a statistical tool, the control chart, and develop specification limits to monitor ongoing process performance.

The result: Effective and efficient work processes that continually meet or exceed customer and stakeholder requirements.

Summary

After working through this guidebook, you will have identified and improved at least one process directly linked to the achievement of the agency mission and/or goals. You also will have set up a schedule of continual review for all key work processes.

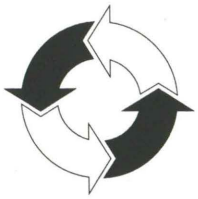
To assist you in implementing the strategies laid out in this guidebook, you may want to obtain a copy of Iowa State Government's "Owners Manual." Developed by the Iowa Quality Government Team, this manual serves as a reference and troubleshooting guide for improvement work. This handbook lists the various resources and contacts throughout state government that may be of assistance to you as you proceed with continuous process improvement. A copy can obtained by contacting your agency's Quality Coordinator.

Continuous improvement is not a one-time event, it is an ongoing process. Thus, this guidebook is designed to be used as a continual working document. When one process has been improved to the satisfaction of customers, stakeholders and the agency, you can then address another important improvement opportunity. We hope that you will find this guidebook one of your most valuable tools as you work toward building a high-performance work organization.

GUIDEBOOK TOOLKIT

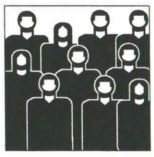
Continuous Quality Improvement is based on management principles and an improvement process which includes a set of tools. When it comes to working through problems, especially in a team setting, tools are extremely powerful. They enable us to gather data, analyze it, and display it. Tools enhance creativity and give structure to our planning.

Listed below are the tools you will use as you work through this guidebook.
They can be organized into four categories.



Tools for Generating Ideas and Collecting Information

Tools for Analyzing and Displaying Data

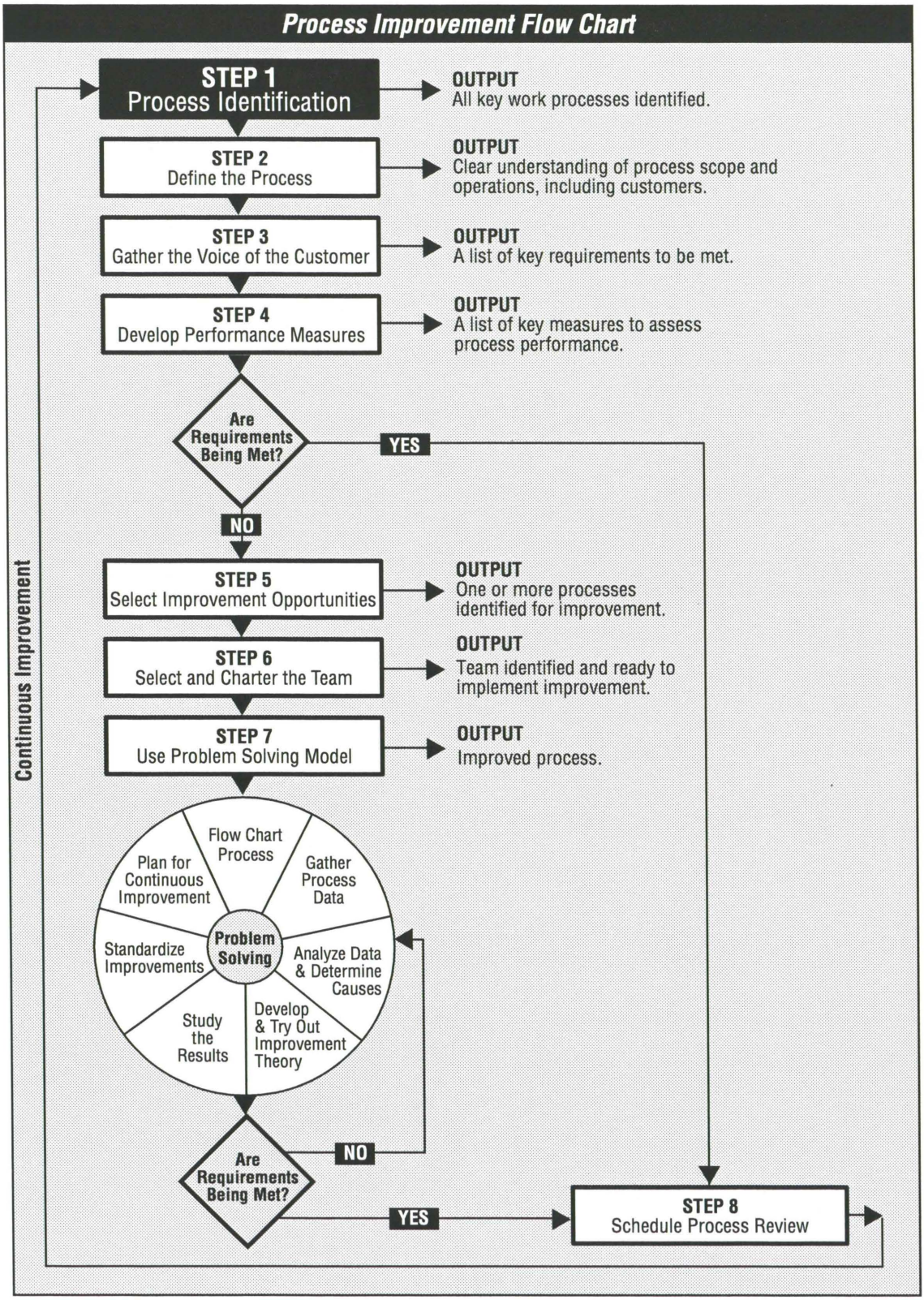


Tools for Reaching Consensus

Tools for Planning Actions

Instructions on how to use these tools are provided on the pages identified above.

CHAPTER 1
PROCESS IDENTIFICATION



Understanding Your Work Processes

Iowa State Government is a place where thousands of tasks are performed daily. *Continuous Quality Improvement (CQI)* asks us to look at these tasks in a new way. Instead of thinking of them as independent events, picture them as steps in a process. For example, if a task involves filling out a form, where does the form come from, who fills it out, how is the information compiled, and who receives it? Everything related to the form is part of a process.

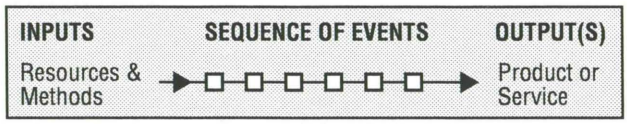
A *process* is a series of activities or steps that produce a product, service, or other output, all of which achieve a desired result.

Your day begins with a process. You press the button on the alarm clock, throw back the covers, stand up, walk to the bathroom, start the water running in the shower. You then do something else for a moment, check to see if the water is the right temperature, get into the shower, get wet, and pick up the soap. Already ten activities have occurred and the process is just getting started. An hour later, after many other activities have taken place, you are ready to walk out the door. You could lump all these steps into one big process—getting ready for work—or you could divide the sequence into a number of smaller processes—getting clean, getting dressed, eating breakfast.

You are involved with dozens of processes during each work day. Examples are the activities or steps in processing a tax form, hiring a new employee, submitting a request for travel reimbursement, or responding to a customer inquiry. When you begin to look at your work in this way, you will see that every activity or step is part of a process and that there are hundreds of processes in each agency.

Process Characteristics

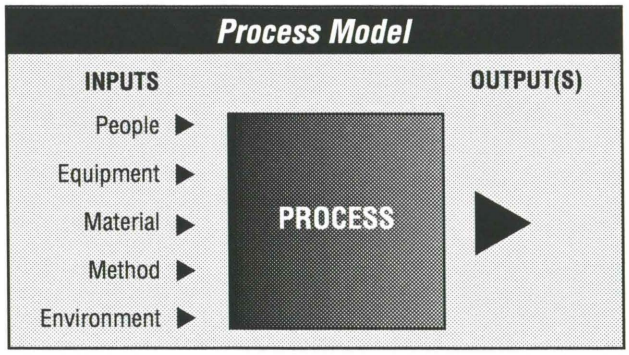
Processes are defined by three distinct characteristics. Every process has (1) inputs, (2) a sequence of steps in the middle that occupy a period of time, and (3) an output.



The output of a process may be something other than a product or service. In the case of getting ready for work, the output is a clean person wearing clothes. It will be easier to identify your own processes if you keep these three things in mind—inputs, sequence of events, and output.

Inputs

The *inputs* of every process can be divided into five categories:



Inputs are things that enter a process from outside like supplies—Material—or things that are built into the process such as employees—People—and the Equipment they use. When processes are not performing well or when problems arise, the causes can be traced to one or more of these five inputs. All of the inputs are important and merit close attention.

Three of the five inputs—**People, Equipment**, and **Material**—usually account for most of the costs incurred by the process. People receive paychecks, equipment costs money to buy and maintain, and material is purchased from a supplier.

The **Environment** is the place where work is performed, and it sometimes costs money. If the work occurs in an office building, there are overhead costs associated with the floor space—electricity, heating, window cleaning, depreciation of furnishings. But if the work takes place on a highway construction site, the environment is free.

Whether it costs money or not, environment can have a significant impact on the quality of the work. In our earlier example about getting ready for work, brushing your teeth is one of the processes. If you happen to be standing barefoot on a cold floor, discomfort may cause you to terminate the activity before the optimum output is obtained—your teeth are not as clean as they should be. Sometimes people create environmental conditions. A manager who gets angry and yells at everyone soon creates an environment that dampens productivity.

Among the five inputs, **Method** is the only intangible. You might watch someone use a method, but it has no physical dimension, so you can't touch it. A method might be the procedure for inspecting an elevator, or the way someone teaches a class or prints a newsletter. A bad method can ruin the output and waste the resources that went into it.

You will need to recall the five inputs whenever you are working on a process, so memorize them. You can best define your work processes and take action to improve them when you use the right words to describe what is happening.

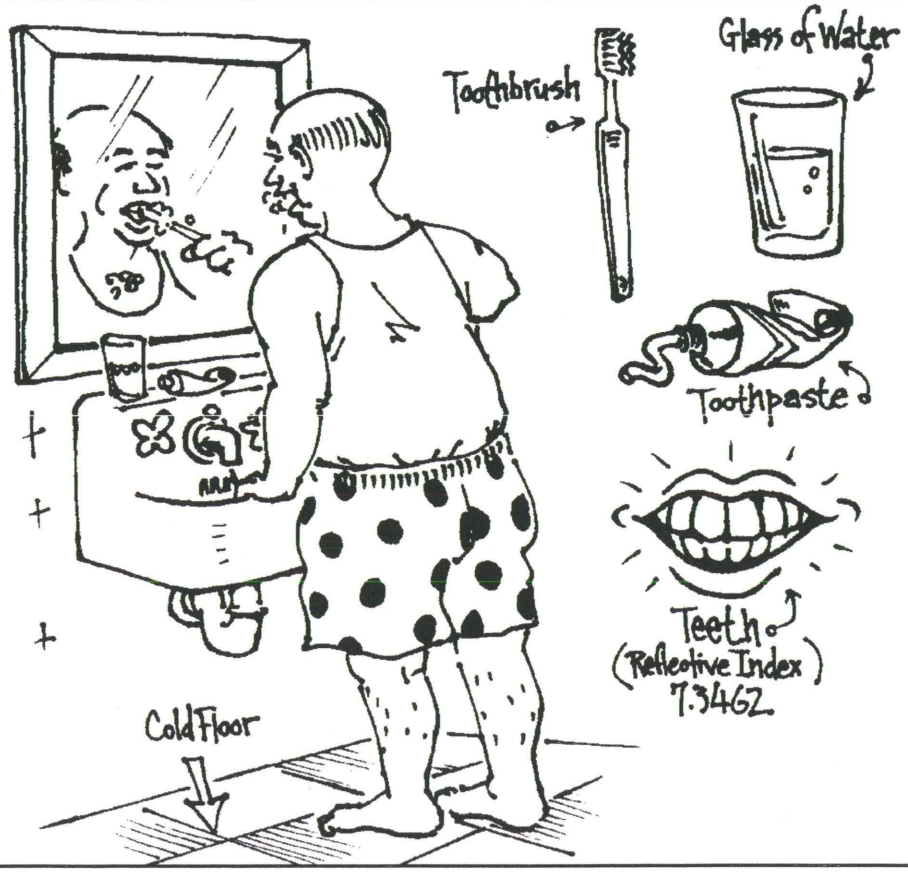
NOTE: A common belief is that when things go wrong, the "People" input is usually to blame. "If only our people would work harder and smarter, everything would be all right." Dr. W. Edwards Deming, the leading pioneer of continuous quality improvement, said that 85% of the things that go wrong are not the fault of the people working in the process. Problems have usually been built into the process accidentally over time. More often than not, improvement opportunities are rooted in the other four inputs—Equipment, Material, Method, and Environment.

IDENTIFYING INPUTS

Brushing your teeth is a process. Can you identify the five inputs?

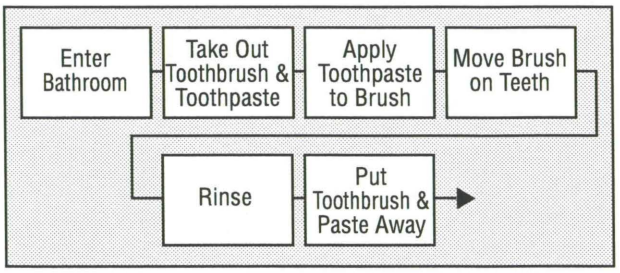
PEOPLE:
You
EQUIPMENT:
Toothbrush and Water Glass
MATERIAL:
Toothpaste and Water
METHOD:
Vertical or Horizontal Brushing Motion
ENVIRONMENT:
Bathroom

While you may not think of your toothbrush as equipment, the definition includes any tool, machine, or other physical object used to produce output. A computer is certainly equipment, but so is a ball-point pen.



Sequence of Events

The second process characteristic is a sequence of events—the steps or activities that use inputs to produce output(s). In our tooth brushing scenario the sequence might look like this:



Note that the desired output can only be obtained if these events occur in the correct order.

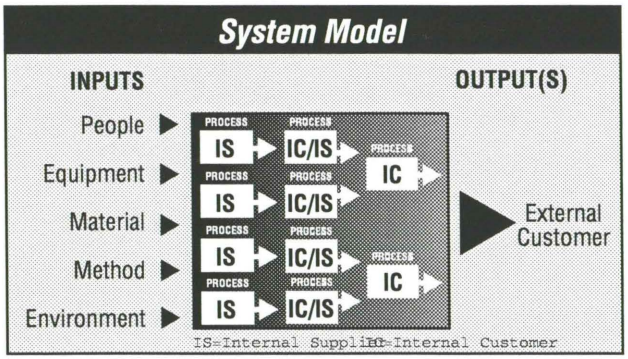
Output

The third characteristic of a process—the output—is usually a product or service that meets the needs of a customer. In state government, however, the output might be something that fulfills the agency's policies or regulatory requirements.

An output may not be an actual product or service. For example, when a Highway Patrol officer writes a speeding ticket, the speeder is not likely to think of it as a service. It is a service to others, however, because the output is a safer driver. The result is a safer highway.

The System Model

We have a tendency to think of a process as a large organizational structure, perhaps something the size of a division or a program. Processes can actually be much smaller than that. The Accounts Payable program, for example, receives invoices and mails checks, but there may be dozens of separate processes, each consisting of multiple tasks.



A group of related processes—like those in Accounts Payable—is a *system*. The System Model shows that processes are interdependent—the output of one is the input of another. In the diagram, "IS" stands for *Internal Supplier*. These are the people and processes inside our organization whose outputs are passed on to another process. "IC" represents *Internal Customer*—the people and processes whose inputs are the outputs of upstream processes. Most people who work inside the system are both Internal Customers and Internal Suppliers. Transitions between processes are commonly referred to as "hand-offs."

External Customers are those outside the system who receive the final output. There is a natural tendency to think that the External Customer's opinion is the only one that matters. The System Model seeks to impress upon us the importance of satisfying our Internal Customers as well. Improvement of the overall system requires an understanding of these internal relationships.

You are now ready to begin Step 1 - Process Identification.

STEP 1 - PROCESS IDENTIFICATION

You can approach process identification from an agency, division, bureau, or work-unit level.

Almost everything we do in state government can be defined as a process. If employees tried to improve every process in their system, the entire workday could be consumed by the improvement activity itself. State employees are involved in countless routine processes like answering the telephone. If these tasks do not contribute directly to the achievement of the agency's vision, mission and goals, it may not be worthwhile to spend time improving them. In Step 1 your goal is to prioritize the processes that really matter.

How to Do It

Process Identification begins with the appointment of a team. Each person selected should have first-hand knowledge of the agency's operation. You will want to include individuals who represent the entire scope of the system (agency, division, bureau, or work unit) for which you will be identifying processes.

First, identify the **key work processes** that produce products or services for customers and are directly linked to achievement of the agency's vision, mission and goals. A system will usually have from five to seven key work processes.

Some processes are indirectly related to the agency's vision, mission and goals. When looking for improvement opportunities, you may also want to examine these **support processes**. Activities that support key work processes may include such things as hiring, ordering, invoicing, planning, and project management. Increasing the efficiency of these operations can improve the effectiveness of the key work processes that directly serve customers.

To identify key processes, answer the following four questions. Notice that you are starting at the end of the system and working upstream.

1. **Who are your key customers?**

   If you have different kinds of customers, prioritize those who are the focus of your efforts. Some may be internal customers. Consider the extent to which customer needs and expectations relate to the agency's mission. A stakeholder is a customer who does not directly receive a product or service, but who has a vested interest in the quality of the output.

2. **What results are you trying to achieve for customers?**

   Results are defined by the benefits the output provides to your customers specifically and to Iowans in general. What does the product, service, or output do for customers? What can a customer or stakeholder expect to find changed or accomplished as a result of the agency's efforts? Results can include such things as safe roads, healthy families, or the percent of Iowans who are self-sufficient. A list of results for Iowans can be found in the Budgeting For Results (BFR) handbook.

3. **What outputs produce the results you are trying to achieve?**

   Outputs describe what was accomplished, results describe the impact or benefit the outputs have on Iowans. What are the products or services you produce that achieve results for Iowans? Examples of outputs could include the number of licenses issued, lane miles resurfaced, tons of waste recycled, or workers placed in permanent full-time jobs.

4. What are the processes that produce the outputs?

Define the processes from the point where inputs enter the system through the key steps involved in turning input into output.

The following suggestions will help you answer these questions.

Question #1 - Who are your customers?

Identify customers in this order:

- external customers
- internal customers
- stakeholders

You may have no external customers if everything you produce is received and used by others in state government. No matter what your process produces, however, there are always stakeholders, the most obvious of which are the legislature and taxpayers.

Remember that process identification is a job for a team. Place a flip chart at the front of the room so that everyone can see it. Write the question: "Who are the external customers of our agency, division, bureau, or work unit?" Another way to frame the question might be: "Who are the customers that directly receive our products and services?"

When you are finished writing, ask the team to identify external customers. You can do this by asking people to give ideas one at a time as you proceed around the room, or you can allow them to speak at random (sometimes referred to as the "popcorn" method). Continue adding to the list until ideas have been exhausted. The output of this exercise is a complete list of external customers. Now do the same for internal customers and stakeholders.

Here's an example. A team from the Motor Vehicle Division of the Department of Transportation (DOT) identified two kinds of external customers—Previously Licensed Drivers and Student Drivers—who are vital to its mission of the Driver's License Issuance Process. There are other external customers, such as insurance companies, law enforcement agencies, and DOTs in other states. How broadly you define your customer base will determine the results, outputs and processes you identify. In this example, the *key* customers—those who receive driver's licenses—are closely linked to achievement of the agency's mission.

Question #2 - What results are you trying to achieve?

Again, use a flip chart to record the team's ideas. Ask them to list the results your customers expect. If possible, invite several customers to participate. You may be surprised to learn that the results you have identified are not the only ones. Customers are an excellent source to find out what the product or service does for him or her.

When you identify intended results, you are defining the process purpose. The purpose answers the question: "Why does the agency provide this product or service?" It's a good idea to review the Program Purpose Statements developed by your agency as part of *Budgeting For Results*. These written statements articulate the reasons why the program exists, so they will help you define the intended results. The purpose of the process ideally ties into the Program Purpose Statement.

The process purpose reflects the planned benefit customers receive and stakeholders care about. To help define the purpose and corresponding result, you may want to use the following format:

The purpose of the _____
system/process

is to provide/produce _____
service/product

to _____
customers

so they can _____
planned result

In the case of the Driver's License Issuance Process, the completed format might look like this:

CUSTOMER PERSPECTIVE

The purpose of the Driver's License Issuance System (system/process)

is to provide/produce driver's licenses (service/product)

to licensed & student drivers (customers)

so they can drive legally (planned result)

In this example, the result is "so they can drive legally." Obviously, this result pertains only to the "customers" who receive licenses. As we know, however, the real reason for issuing driver's licenses is to ensure that individuals operating motor vehicles are qualified to do so. Everyone who travels the State's roads has a vested interest in this process. From the stakeholder's point of view, the format might end with a different result—"in order to."

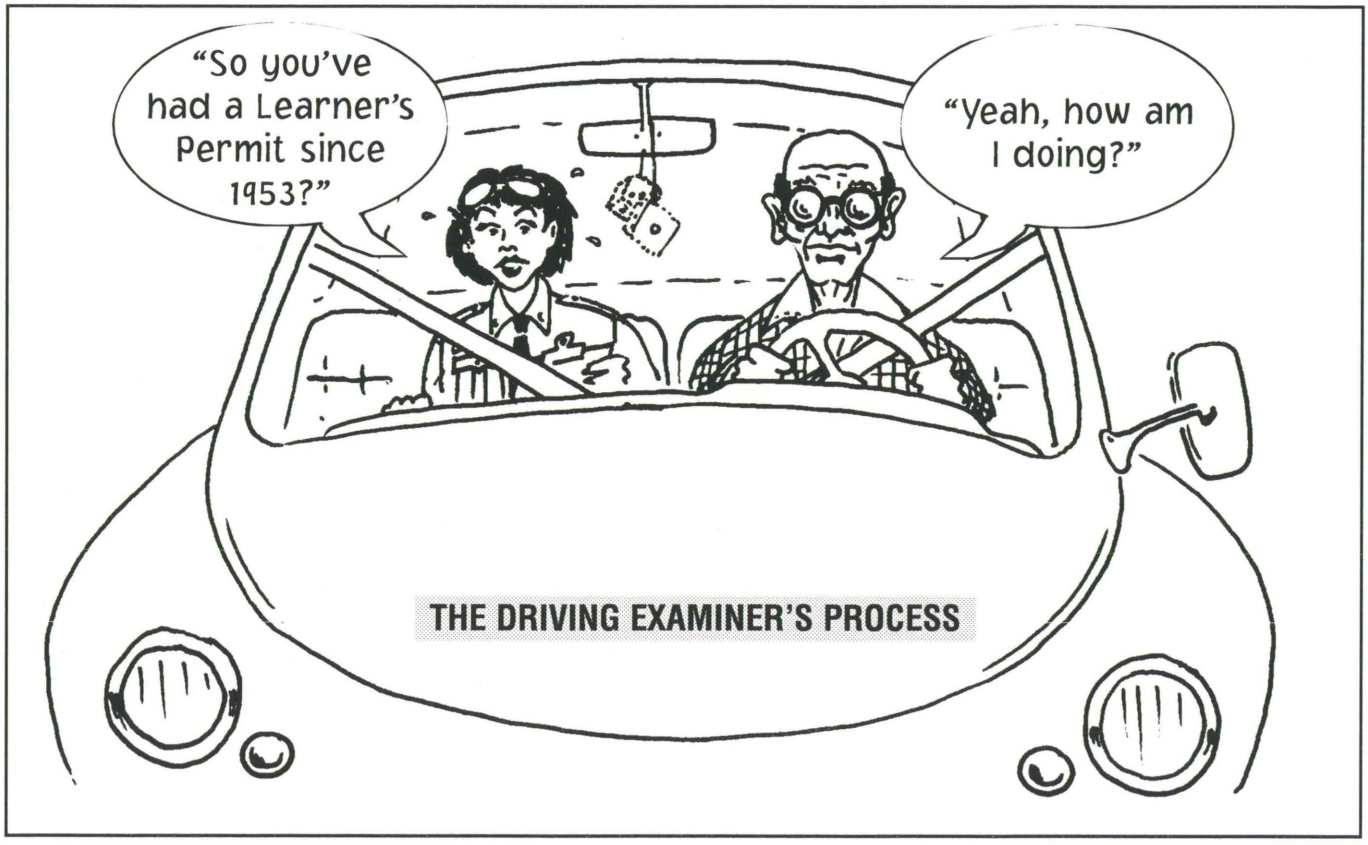
STAKEHOLDER PERSPECTIVE

The purpose of the Driver's License Issuance System (system/process)

is to provide/produce driver's licenses (service/product)

to licensed & student drivers (customers)

in order to ensure that drivers are qualified (planned result)



Question #3 - What outputs produce these results?

What are the outputs produced by the agency that achieve results for customers and stakeholders? The Driver's License Issuance Process provides key customers with one kind of output—a Driver's License. Stakeholders, however, are interested in several intermediate outputs.

Before receiving their licenses, drivers must pass a written test to prove that they understand safe driving practices. Next, they must prove that their vision is adequate by reading the chart in the eye-test machine. Finally, they must drive with an examiner in the passenger seat to demonstrate basic skills and safe habits. The final output—the License—can only be produced when these intermediate outputs have been achieved.

As you can see, we are beginning to focus on the individual processes that produce outputs.

Question # 4 - What processes produce the outputs?

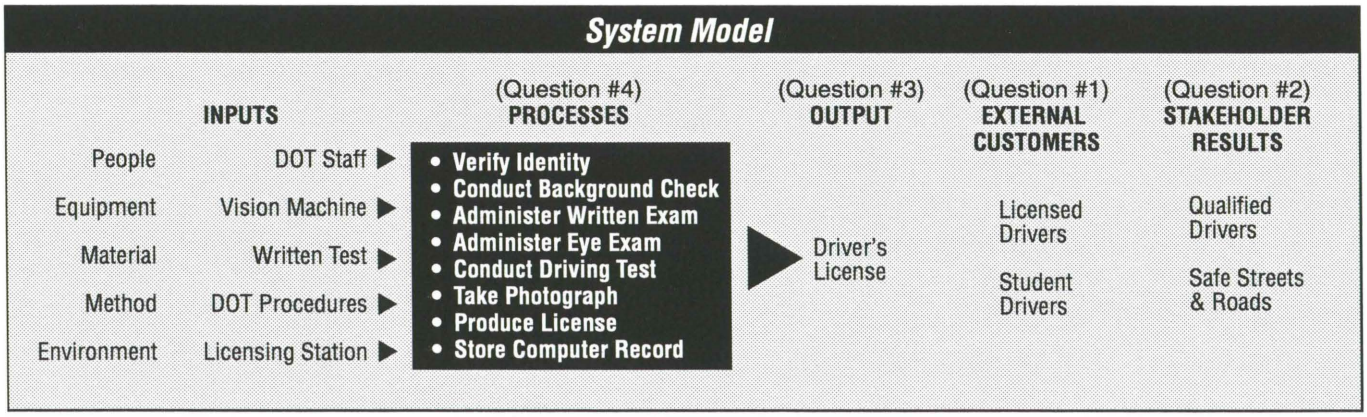
Once you have identified the customers you serve, the results you are trying to achieve, and the outputs that produce the results, you are ready to identify the key processes that produce the outputs. We have already listed several processes associated with the Driver's License Issuance System—written exam, eye exam, driving exam. But there are others. How does the Licensing Station know that the applicant's license has not been revoked for moving violations? Maybe the person failed to appear to answer a traffic summons. What if the individual's license has been suspended or revoked in another state? Obviously, a background check is necessary, and that's another key process.

We have used Driver Licensing as an example because the customers, results, outputs, and processes are rather obvious. That's not always the case. In fact, you may discover that Question #4 can be difficult to answer. That's because state government is not typically organized around processes, but instead is structured around functions and program areas. As the team works to identify processes within these areas, it may struggle to define the underlying processes. A continued focus on the characteristics of a process—inputs, sequence of events, outputs—should prove helpful.

Example

The accompanying illustration is a System Model diagram with inputs and processes identified. You can see how each of the four questions relates to the flow of activities that produce the desired results.

Remember, there are many levels of processes and sub-processes. You and your team will need to decide if you are only interested in large processes or if your improvement effort should delve into the sub-processes that exist within these larger structures.



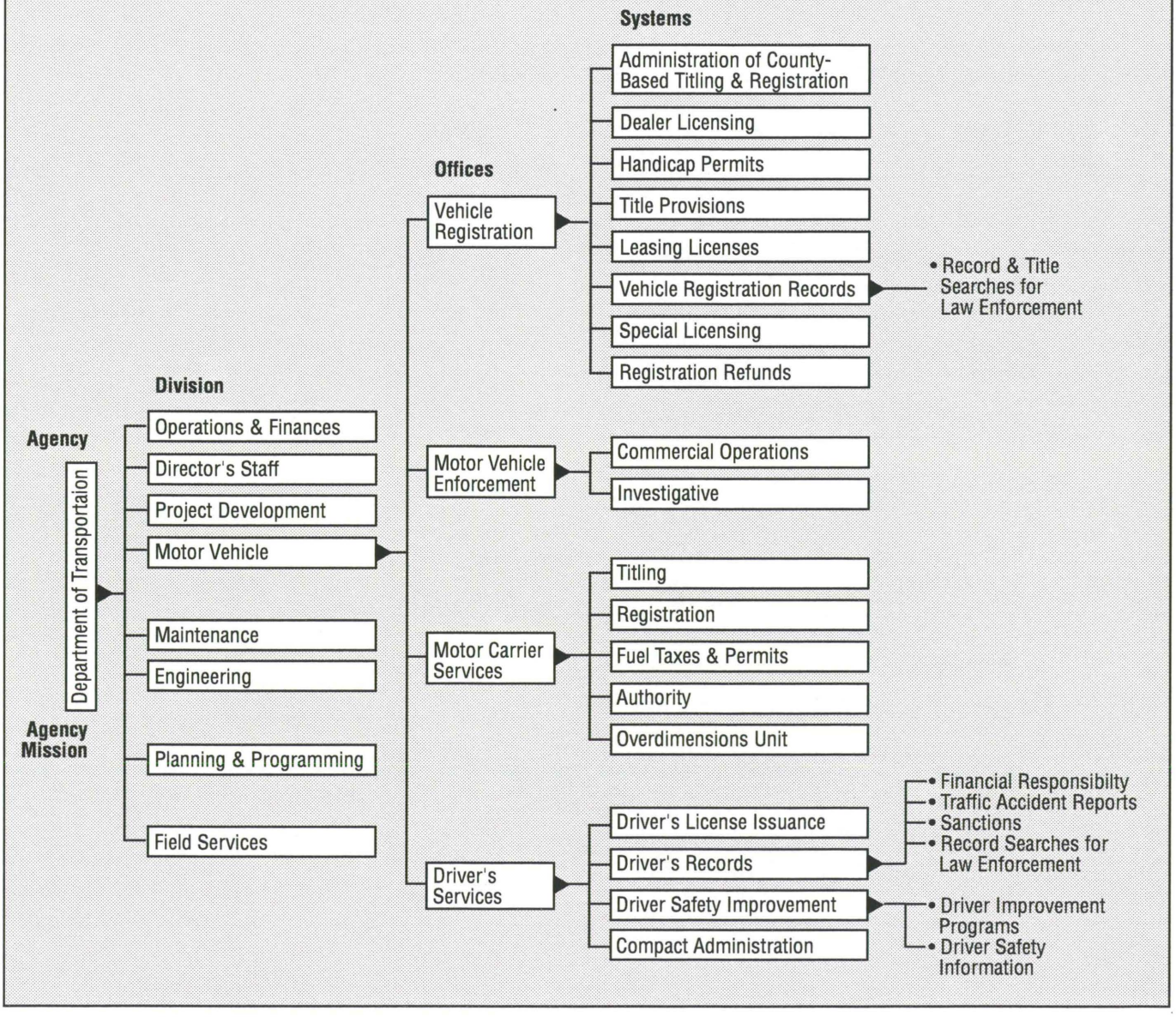
TOOL

The Driver's License Issuance Process is part of a larger system known as the Driver's Service Office, which is part of a larger system known as the Motor Vehicle Division, which is part of a larger system known as the Department of Transportation. To link the processes that contribute to your outputs and results, you may need to cross some organizational boundaries.

A **System Diagram**—more commonly known as a **Tree Diagram**—is a tool that can help you understand how individual processes fit into the larger scheme of things. In the adjoining tree diagram, the trunk of the tree is the DOT and the major branches are the department's eight divisions. In this diagram, one branch—the Motor Vehicle Division—is divided into smaller limbs—Offices and Systems.

This tree diagram is a kind of organizational chart. It could be used to illustrate who manages what and who reports to whom. When a team is working on process improvement, however, that's not the primary concern.

MOTOR VEHICLE DIVISION TREE DIAGRAM



Most of the work of state government is organized around functions or program areas (divisions, bureaus, agencies, offices), so we tend to see ourselves as compartmentalized. There are important distinctions, however, between processes and systems and the offices and divisions in which they exist. To improve a particular system, a team may need to be cross-functional within a department.

If the team is charged with improving the Driver's License Issuance Process, team members should consider the extent to which other systems interact with theirs. For example, does the Driver's Records System produce an output that flows into the Driver's License Issuance System? If so, someone from that system should be asked to join the team.

The Motor Vehicle tree diagram seems to show that everything the team needs can be found within the Driver's Services Office. Is that true? What about Vehicle Registration Records? That system is located in another office. Does our system receive inputs from that group? If so, maybe we should be talking to them.

Diagramming systems in this way helps a team see how a particular group of processes fits into the larger system. Whether or not you choose to complete a tree diagram will depend on the scope of the system you are defining. If you are identifying processes within a broad scope, such as an agency or division, you may find this tool helpful. You may also use the tree diagram to identify key support processes and diagram their relationship to key work processes.

Identifying key processes will help you optimize your system and make it as good as it can be. Optimization of the system occurs when all processes within your agency or division are working together to achieve the agency's mission. It avoids making one process better at the expense of another.

Summary

To achieve results, you must improve the processes that produce them. Your first step in process improvement is to identify your key work processes. A team with knowledge of agency operations accomplishes this by:

1. Identifying the key customers and stakeholders whose satisfaction is vital to the achievement of the agency's mission.

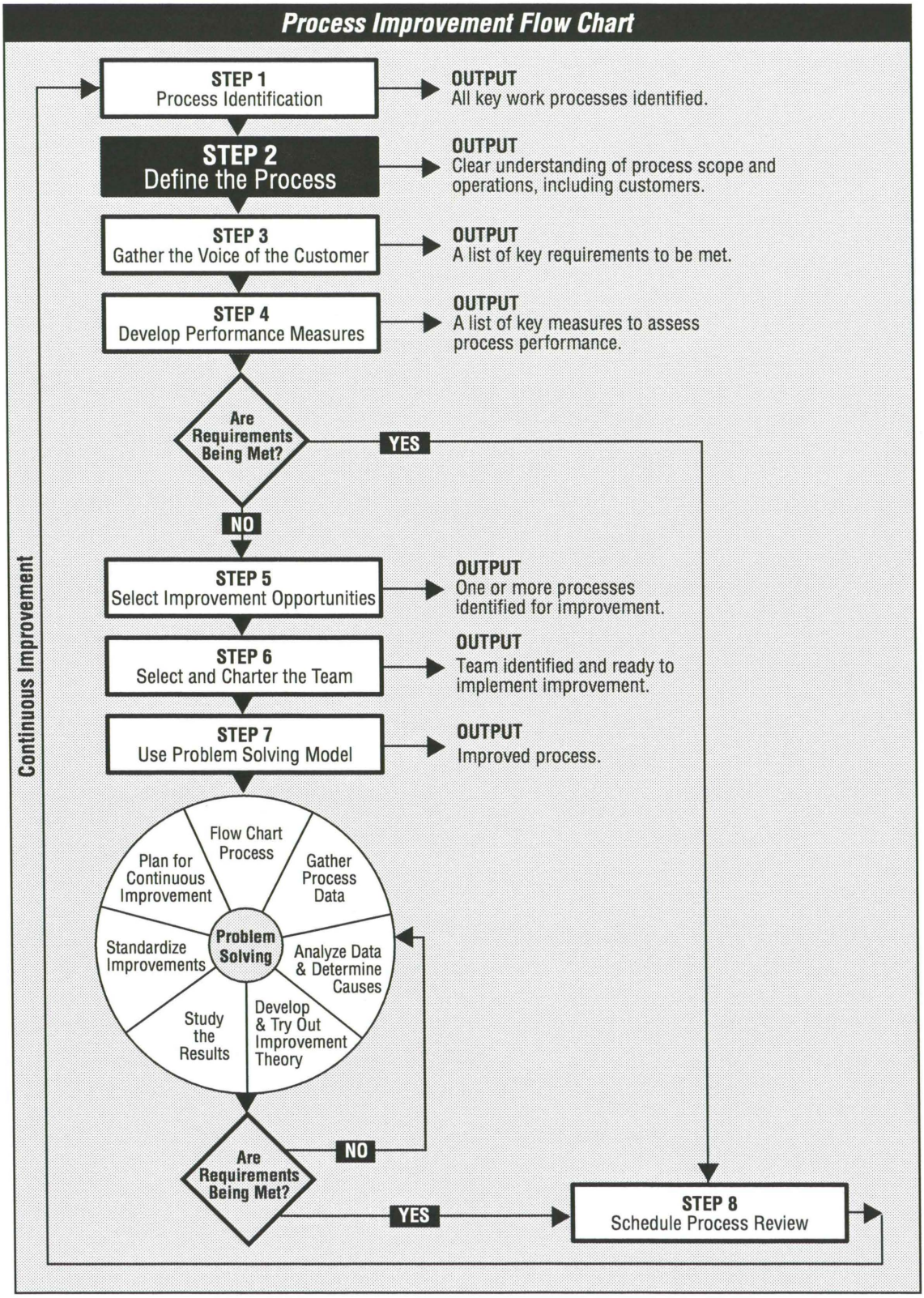
2. Identifying the results you are trying to achieve for customers and stakeholders.

3. Identifying the outputs that produce the results.

4. Identifying the processes that produce the outputs.

Once you have identified the key work processes of your agency, you are ready to move to Step 2 and define them in greater detail.

CHAPTER 2
DEFINE THE PROCESS



Once you have identified your key work processes, including high-impact support processes and the outputs they produce, you are ready to define them in greater detail.

Defining a process will provide you with pertinent information to assess how well the process is performing to achieve desired outputs and results. You will answer important questions such as:

- What are the resources or inputs required to produce the output (people, equipment, material, method, and environment)?
- By what process (activities/steps) is the output achieved?
- Who are your customers? (See Step 1)
- What is the purpose of the process from your customer's point of view?
- What problem does the process help them to solve? What does the output do for the customer?
- What impact does the process have on the achievement of the agency's mission and goals?

If you did not start at Step 1, please note: As you begin to identify customers, it is important to remember that complex organizations like state agencies have many different customers. In addition to internal and external customers, Iowa State Government has *stakeholders*—groups, organizations, or individuals who have a vested interest in the cost and effectiveness of the system, as well as the result or impact the product or service produces for the State. Legislators and regulators are stakeholders—they may or may not directly receive a particular product or service, but they must always answer to taxpayers. Taxpayers are the largest stakeholder group.

STEP 2 - DEFINE THE PROCESS

In this step, you will define the process by completing a Process Inventory Worksheet for each key work or support process identified in Step 1. This involves identifying where the process begins and ends, sometimes referred to as the process scope.

Inventory worksheets can be filled out by Process Managers or by teams of people who work directly with the identified processes. Having a team complete the inventory is based on the premise that people who actually do the work know the process best.

Process Managers are the individuals with in-depth knowledge of the process who have immediate responsibility for ensuring that the process is successful. Work unit processes may be inventoried by front-line supervisors, division processes by mid-level managers, and agency level processes, such as budget development, by upper-level management.

TOOL

You will fill in the **Process Inventory Worksheet** by completing items #1 through #9 as shown on page 20. If several employees could be considered process managers, you can elect to have one individual complete the worksheet or assign it to a small team of 5-8 people. DO NOT ask each person in the work unit to complete a separate process inventory. This redundancy will expend valuable resources of time and effort.

IOWA DEPARTMENT OF PUBLIC HEALTH EXAMPLE

PROCESS INVENTORY WORKSHEET

1 NAME OF PROCESS Vaccine Shipment

2 DATE FORM COMPLETED September 1997

3 PROCESS MANAGER(S) Ron Gustafson

Phone Number(s) (515) 281-7992

( )

4 PROCESS PURPOSE

To ship viable childhood vaccines to public health departments and physicians' offices.

5

INPUT(S)	KEY PROCESS STEPS	OUTPUT(S)
People: 2 staff members	1. Receive vaccine orders	1. Provide physicians and other
	2. Enter data into computer	2. health care professionals with
Equipment: Refrigerators, freezers,	3. Print shipping orders	3. viable vaccine to immunize
shipping materials	4. Attach mailing labels to order	4. children in a cost-effective
Materials: Childhood vaccines	5. Remove vaccine from refrig.	5. manner.
	6. Place vaccine in box w/ cold pack	6.
Method: United Parcel	7. Attach machine label to boxes	7.
Service Delivery	8. Take boxes to dock for pick up	8.
Environment: Basement Facilities	9. Respond to calls concerning delivery	9.
in Lucas Building	10. Contact UPS to verify delivery	10.

6 VOICE OF THE CUSTOMER

Stakeholders

Iowa State Board of Health
Center for Disease Control & Prevention
Iowa Department of Public Health
Local Public Health departments & their boards

Internal Customers

IDPH staff/Bureau of Immunizations

VOICE OF THE CUSTOMER

External Customers

Physicians, public health agencies
Children & their families

Regulatory/Agency Guidelines

Iowa Administrative Code specifies immunization schedule

7 Suppliers and Others Who Assist in the Process

NAME	ROLE
Vaccine manufacturers	Provide viable vaccine
Cold pack & box material suppliers	Provide packing materials
Mail room staff	Expedite shipment
CDC	Approves vaccine orders & forward to manufacturers.

8 Process Drivers

☒ Customer Needs ☒ Regulatory Guidelines ☒ Agency Needs

9 Process Impact

4 Critical (4 pts) ___ Necessary (2 pts)
___ Important (3 pts) ___ Unnecessary (1 pts)

How To Use It

A Process Inventory Worksheet is available for your use in the Forms Section of this guidebook. Complete items #1 and #2 by filling in the name of the process and the inventory date. In the spaces provided for item #3, record the name of the person who has primary responsibility for the process and include a phone number where he or she can be reached. Item #4 calls for a statement of purpose from the customer's or stakeholder's point of view. You may have developed a process purpose statement in the last chapter when answering question #2: What results are you trying to achieve?"

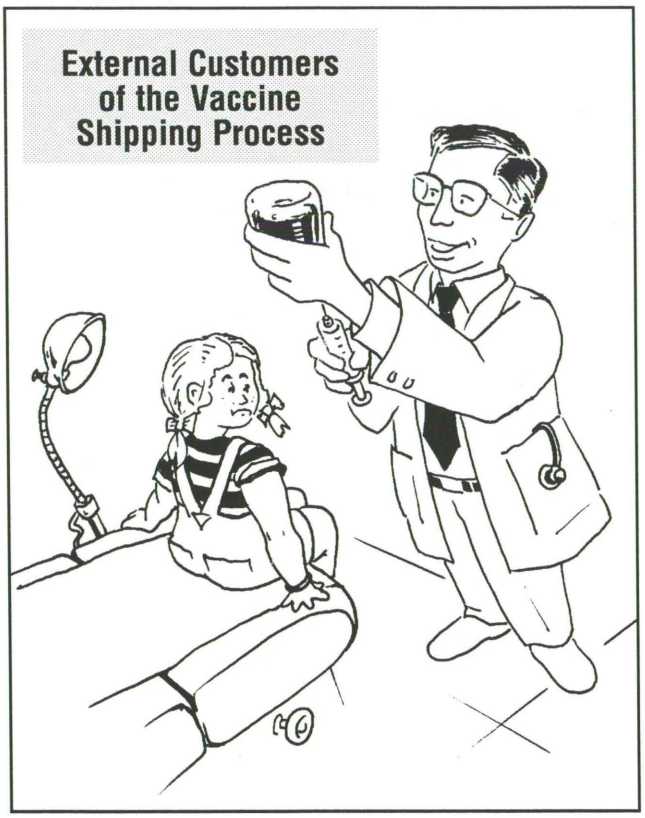
In the boxes provided for item #5, list all of the inputs required and the key steps involved in producing the output, as well as the actual output achieved. Item #6 of the Process Inventory Worksheet asks you to identify internal and external customers, stakeholders, and regulatory requirements for the process. (You may have developed this list in the last chapter when answering question #1: Who are your key customers?)

In item #7, you will include the names of others involved in the process and their specific roles or responsibilities. In #8, check the applicable boxes to reflect the main process drivers: Customer Needs, Regulatory Guidelines, or Agency Needs. Processes can be driven by more than one. Last, but not least, in item #9, identify the importance or impact of the process in relation the agency's mission by placing a check mark in the appropriate box.

An effective way to complete the Process Inventory Worksheet is to establish a team representing the entire process and together brainstorm the lists of entries. The team will use brainstorming to complete several of the items.

TOOL

Brainstorming is a technique used to generate a list of ideas on any topic in a short period of time. The atmosphere should be considerate, open, creative, and free flowing. Some brainstorming methods rely on oral responses from team members. The following technique uses post-it notes.



How To Do It

- Identify the issue and frame it into a question. For example: "Who are the customers of this process?" Be sure everyone understands the question. Write the question on a flip chart at the front of the room so that everyone can see it.

- Allow silent time for each person to write down his or her list of responses on post-it notes (one item per note). Give the group 5-7 minutes for silent idea generation. This lets each person to analyze his or her own thoughts on the topic and not be dominated or influenced by others in the group. When the time has elapsed, ask participants to place their post-its on a table where everyone can view them.

- Ask the group to review the list of items for clarity and to discard any duplicates. It's best to discard notes only when responses are virtually identical. It is often important to preserve subtle differences that may be worded in a slightly different manner. If the list gets very long (more than 30), you may want to use an affinity diagram to organize the information.

TOOL

An **Affinity Diagram** allows you to group brainstorming ideas into categories. This makes it easier to work with the information. Allow 7-10 minutes for the exercise.

How To Do It

- Once you have displayed your post-it notes, ask participants to sort ideas into related groups. This process is done without any talking. Any team member can move post-its around on the table. If an item is moved back and forth, try to see the connection that the other person is making. If movement continues beyond a reasonable point, agree to create a duplicate post-it.

- It is fine if you have some post-it notes that stand alone in their own category.

- For each grouping, create a summary or "header" title. The headers should be words or short phrases that capture the central idea or theme of each grouping. Write these in large letters on post-its and place them at the tops of the categories. Possible headers could include "Internal Customers," "External Customers," and "Stakeholders."

- When the team has reached a consensus, record the information on a flip chart. You may want to reproduce and distribute the Affinity Diagram to team members for later reference.

Process: Vaccine Shipping		
INTERNAL CUSTOMERS	**EXTERNAL CUSTOMERS**	**STAKEHOLDERS**
• Immunization Bureau Staff • Counselors • Center for Disease Control & Prevention	• Doctors • Public Health Nurses • Children • Parents	• Iowans • Legislators • Communities • Schools • Board of Health • Health Organizations

Conclusion

Although the completion of the Process Inventory Worksheet requires compiling information, the time spent up front will save time later. It will also allow you to make more accurate decisions about the process.

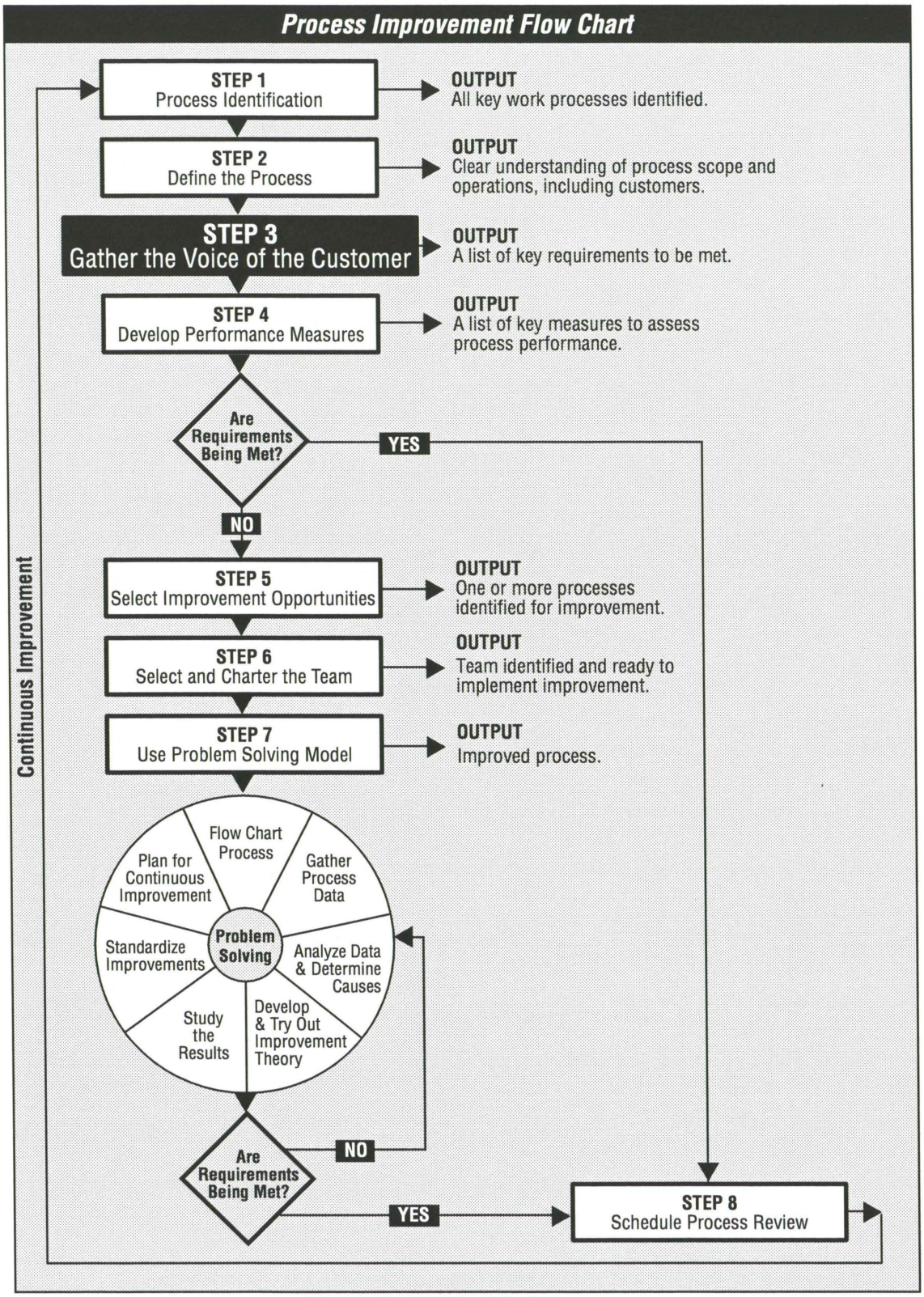
NOTE: Remember that some large processes are actually made up of several smaller processes. The process manager will need to determine if it is more efficient and practical to inventory the large process as a whole or to inventory each smaller process individually. Example: The Immunization Process may be made up of smaller processes such as ordering, shipping, community education, service delivery, and follow-up.

When Process Inventory Worksheets have been completed, the information should be reviewed by the process manager and his or her supervisor. If a team approach was not used, employees who work in the process should review the forms to ensure accuracy and completeness. Adjustments can be made as necessary.

Summary

In Step 1 you identified key work processes and support processes that help achieve the agency's mission and goals. In Step 2 you defined these processes in greater detail, gathering important information that will be used to assess process performance. In Step 3 you will listen to "the voice of the customer."

CHAPTER 3
GATHER THE VOICE OF THE CUSTOMER



Item #6 of the Process Inventory Worksheet asked you to identify customers and stakeholders for each process. These individuals or groups of people can provide key insights into how well the process is performing. It is important to work closely with customers and stakeholders to fully understand their needs and expectations.

It's risky to assume that you know what the customer thinks and wants. Guesswork can waste resources and misguide your improvement efforts. It is important to gather pertinent data directly from customers and stakeholders.

There is an important distinction between needs and expectations. A customer may need to get an unemployment check, but expects the check to arrive in ten days. A customer may need to get an answer to a question, but expects the answer to be right the first time. Together, needs and expectations form "customer requirements."

Customer Requirements

Customer requirements can be organized into a number of general categories.

Requirement	Definition
Availability	The degree to which your customers can readily and easily contact you
Responsiveness	Reacting promptly to the customer
Timeliness	Providing services within the customer's stated and/or negotiated time frame
Comprehensiveness	The degree to which the service is complete
Pleasantness	The degree to which you use suitable professional behavior and manners while working with customers
Reliability	Whether your agency does what it promises customers it will do
Satisfaction	The degree to which customers are satisfied with what they receive

When requirements are very general, you may need to get input from customers. For example, if the customer expects a report to be "on time," there is room for misunderstanding. However, if the customer wants the report to be delivered "each Wednesday by 4:00 p.m.," the specifications are clear. As the word suggests, specifications provide the specifics of the requirements.

OUTPUT: TYPEWRITTEN REPORT	
Customer Requirements	**Specifications**
Typed in draft form for approval by Person A	One-inch margins, double-spaced lines, proportional character spacing
Professional looking document	Title centered, subheads bold
Must be finished today	Delivered to Person A by 4:00 p.m. today

In the example above, the specifications are tangible and measurable. This enables you to determine the degree to which the output actually meets the customer's requirements. You can almost always match a requirement with a measurable specification.

Customer requirements may be somewhat subjective. For example, a customer might indicate that he or she wants a brief summary. Working with the customer you could translate this requirement into objective, measurable specifications. Brief could become: "No more than two pages."

Value and Satisfaction

The value provided by a product or service is defined by customers and stakeholders. In the private sector, value is characterized as something that the customer is willing to pay for. Translated to state government, this may mean that the product or service justifies the resources expended to produce it.

Satisfaction relates to the performance of a product or service in relation to customer and stakeholder expectations. Some agency operations—such as environmental protection and enforcement of OSHA regulations—are regulatory in nature. These processes produce results for stakeholders, but are not always satisfying to those who are regulated.

Providing value and satisfaction to customers and stakeholders, though important, is certainly not the only measure of an agency's success. You may have to balance needs and expectations against other concerns such as costs and budgets, legal constraints, and other external requirements. In some cases, these concerns may outweigh the satisfaction of customers and stakeholders. However, the general focus of this guidebook is on the delivery of value to and satisfaction of customers and stakeholders.

Since the level of value customers or stakeholders receive is measured against their own standards, it is important to find out what those standards are. Customers may be dissatisfied even though, by objective standards such as federal guidelines, your agency is doing a great job. As you work to improve your processes, it is essential to develop and maintain an open and honest dialogue with customers. When assessing needs and expectations of these varied groups of people, you may have to use more than one approach to gather information. Some of the most common techniques include written and telephone surveys, focus groups, and one-on-one interviews with customers.

STEP 3 - GATHER THE VOICE OF THE CUSTOMER

There are two principal ways to gather the voice of your customer:

1. **Qualitative Research** is a semi-structured information gathering method whose purpose is to develop hypotheses that help explain the "whys" of specific problems. Internally you may brainstorm among yourselves and speculate about customer attitudes, but ultimately only the customer has the information you need to make meaningful decisions.

   A clear and precise statement of the recognized problem, or a complete understanding of the central issue, is the main goal of qualitative research. It is important to have a clear objective in mind before you invest time and effort in a research project to gather your customers' opinions. How will the information be used to improve our operations?

   Qualitative research gives you insights into the views of the particular customers you gather information from, and thereby allows you to develop hypotheses about your customers in general. Focus groups, advisory boards, seminar evaluation forms, and informal conversations with staff and management are examples of qualitative data gathering.

2. **Quantitative Research** develops numerical measures from the population of customers and stakeholders. Telephone surveys, mail surveys, and personal interviews are examples of quantitative research. These methods use structured lists of questions to ensure consistency among respondents.

   You may use qualitative methods to define the critical issues, then conduct quantitative research to measure the "facts" of the case. Quantitative measures usually deal with what, where, and when, rather than why.

   Quantitative data collection usually draws responses from a sample of the entire population. A hundred survey responses may adequately represent a population of one thousand customers.

COMPARING QUALITATIVE AND QUANTITATIVE RESEARCH METHODS		
	Qualitative	**Quantitative**
Purpose	To describe a situation or gain insight into a particular practice, belief, attitude, etc.	To measure the prevalence of a practice, attitude, or belief—how widespread is it?
Format	No predetermined response categories; essay answers	Predetermined response categories (e.g. on a scale of one to five, how would you rank...?)
Resulting Data	In-depth explanatory information from a small, representative segment of the population	Numerical data from a large, statistically representative segment of the population
Limitations	Complicates the issues—results cannot be generalized to larger population	Simplifies the issues—results can be generalized to the larger population
Framework	Draws patterns from concepts and insights	Tests an hypothesis and uses data to support a conclusion
Process	Illustrative explanations from individual responses	Numerical bundling of clustered responses into percentages, tables, graphs
Approach	Subjective	Objective
Analysis	Interpretative—how and why	Statistical—who, what, when, where
Analytical Strength	Face validity—results usually look valid	Statistical reliability
Methods	Varied formats for group and individual interviews—direct observation	Counted responses to standardized interviews and surveys

TOOLS

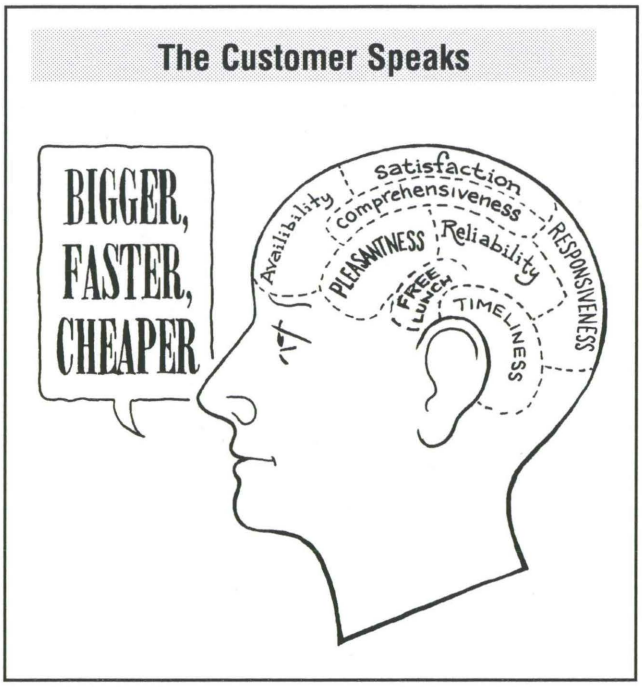
Here are some methods that are commonly used to gather the voice of the customer.

Administrative Information

This is information you already have on file. Most organizations keep records of some kind, and it often costs less to tabulate existing data than to conduct a survey. Can you tell, for instance, how long customers are waiting? Are certain age groups not being served? How many units of output are produced monthly?

Administrative information will not answer all your questions, but it may help focus the inquiry on the kind of information you need to define processes and measure performance. Reviewing internal records allows you to identify useful types of data that are not currently being collected.

Administrative data seldom measures differences of opinion among segments of your customer base. It can also yield biased results if not tabulated and interpreted with care. Errors in a database can also lead to false conclusions. Combined with other data gathering methods, however, administrative information can be very useful.



Focus Groups

Focus groups are forums for carefully planned discussions. They are designed to elicit perceptions from selected groups of individuals who represent specific areas of interest. Groups are typically comprised of six to twelve people and run from 90 minutes to two-and-a-half hours. Participants are selected based on demographic characteristics or experiences that relate to the topic being studied.

Focus groups yield qualitative information about the attitudes of a target group—typically customers—and reveal how the chosen individuals feel or think about a specific issue. Focus groups are not intended to reach consensus or make decisions about potential courses of action. However, they can be used to test new ideas.

Because only a few individuals are involved, and because participants build on each other's thoughts, focus groups do not produce valid statistical data. They should not be used if the information sought is in any way confidential.

Written Surveys

Surveys are quantitative information gathering tools that give numerical expression to attitudes and convictions. To ensure consistency in surveys, identical questions are asked of all respondents. A properly designed survey can provide reliable information not only about the particular customers surveyed, but about all customers in general.

Surveys can be used to measure customer satisfaction, the perceived value of specific services or programs, the quality of service delivery, and the importance that customers ascribe to specific outcomes.

Written surveys are useful when you want a lot of information. Keep in mind, however, that the longer the survey, the less likely it is to be returned. Written surveys are also appropriate when large numbers of people must be contacted. Because a document is less intrusive than a conversation, it is the preferred method of gaining personal information.

Surveys should ask for customers' views, not for information you already have. Since surveys can provide erroneous information—people forget, make mistakes, and fabricate answers—use them only to collect information that cannot be obtained in any other way. For example, if you want to know how long people spend waiting in line, visit the location with a stopwatch. If you want to know how they feel about standing in line, use a survey.

Written surveys are sometimes collected immediately following the delivery of a service. At the end of an instructional course, for example, students may be asked to complete an evaluation form. More often, printed questionnaires are distributed and returned by mail. Keep in mind that people are more likely to return a questionnaire if they are dissatisfied. You have seen "comment cards" on restaurant tables, but you probably did not bother to fill one out unless you were annoyed.

One final caution: When sampling customers, be sure that the sample you select is representative of the entire population.

Personal Interviews

This technique uses a live, in-person interviewer who asks questions and records answers. People seldom refuse to answer polite questions posed to them by another person, so a verbal presentation encourages the respondent to answer all the questions. To avoid bias, the interviewer should not be involved in the services being rated.

A skilled interviewer can ask open-ended questions and probe for more informative responses. Live interviews also afford an opportunity to ask different follow-up questions based on a respondent's answers to previous questions.

Telephone Interviews

Telephone interviews can be completed quickly and are relatively inexpensive. Also, interviewer bias is less likely than with personal interviews. If the series of questions is not too long, telephone interviewing produces a good response rate. There is a challenge, however—reaching the respondent.

Not all people have telephones, and you need correct numbers for those who do. Many people cannot be reached by phone during business hours, so you must be willing to call in the evening or on weekends, and to phone repeatedly until you make contact. You may have to leave messages on answering machines or talk to family members.

Other Methods

Informal ways of gathering the voice of the customer include listening to complaints, compliments, and suggestions. Try to establish easy channels of communication so that customers can express opinions to appropriate persons in nonembarrassing ways.

Depending on the workplace setting, you may be able to conduct "intercept interviews." This is as simple as walking around your facility or office and engaging your customers in informal conversations. Encourage appropriate staff members to do the same to observe the effects of their operations. Talk to customers who are waiting for or who have just received service.

Whatever method you use, always record complaints and analyze their patterns over time, then create a system to investigate and resolve complaints quickly and in a manner visible to customers.

ADVANTAGES AND DISADVANTAGES OF RESEARCH METHODS

ADMINISTRATIVE INFORMATION

Advantages	Disadvantages
• The information is already on file, so data can be extracted inexpensively. • You may not need to survey your customers. • A review of existing records may point you toward other types of useful data.	• The information may not be based on customer input. • Numbers in a database can be difficult to organize in useful ways. • Careful interpretation is required; errors can lead to false conclusions.

FOCUS GROUPS

Advantages	Disadvantages
• Free-ranging discussion produces a holistic view of key issues. • There are no preconceived answers, the format is open-ended. • Cognitive responses and emotional reactions can be explored in depth. • Insights and nuances are discovered that other methods, such as surveys, cannot reveal. • Quantitative research is effectively focused.	• Participants' schedules may complicate the task of assembling the group. • A location must be chosen that is both accessible and conducive to open discussion. • A skilled moderator must encourage expression while keeping the discussion on track. • Only a few people are involved, so no valid statistical analysis is possible.

WRITTEN SURVEYS

Advantages	Disadvantages
• If the sample is large enough, statistically significant data can be collected. • This method is inexpensive and easy to administer. • Interviewer bias is not a factor. • Results can be tabulated by computer.	• The response rate is low, and those who are dissatisfied are more likely to respond. • In the absence of an interviewer, not all questions are answered. • The questionnaire must be properly designed. • No one is available to answer questions, so clear instructions are required.

PERSONAL INTERVIEWS

Advantages	Disadvantages
• In-depth responses are obtained and the completion rate is high. • The interviewer can observe respondents and note subtleties. • Additional questions can be formulated based on initial responses.	• Responses can be biased if the interviewer asks leading questions. • Participants may try to satisfy the interviewer with insincere responses. • Respondents may not be representative of the population.

TELEPHONE INTERVIEWS

Advantages	Disadvantages
• This method is relatively quick, easy, and inexpensive. • If the survey is brief, high rates of participation are usually achieved. • Interviewer bias is reduced but not eliminated. • Follow-up questions are possible.	• Phone numbers are required and respondents may be hard to reach. • Evening/weekend work is usually necessary.

TOOL

The **Process Measurement Worksheet** is used to record important information about customer requirements. The form will be used again in Step 4 to record key measures of process performance.

How to Use It

Working with others involved in the process, use information gathered from customers to develop a list of requirements for each key work process identified in Step 1. In general, you will develop two to four requirements for each process. Record these requirements, along with any regulatory or agency guidelines, in Column A of the Process Measurement Worksheet.

Referring back to the Driver's License Issuance example from Chapter 1, a survey may have identified the following customer requirements: (1) Receive a valid driver's license in (2) a short period of time (no more than 20 minutes). This information is shown in the sample worksheet. A blank Process Measurement Worksheet for your use is located in the Forms Section.

When collecting information on customer requirements, develop your surveys or questionnaires to obtain relevant information about specific criteria such as availability, responsiveness, timeliness, reliability, etc. You may also decide to ask customers to rank specific requirements in order of importance to them. Ranking requirements may help you determine where to launch your improvement efforts.

Summary

Gathering customer input is vital to the assessment of process performance. Several methods were described on how to collect valuable information from your customers. As you implement Step 3, it is always helpful to seek guidance from statistical experts in both the design and implementation of your data gathering efforts.

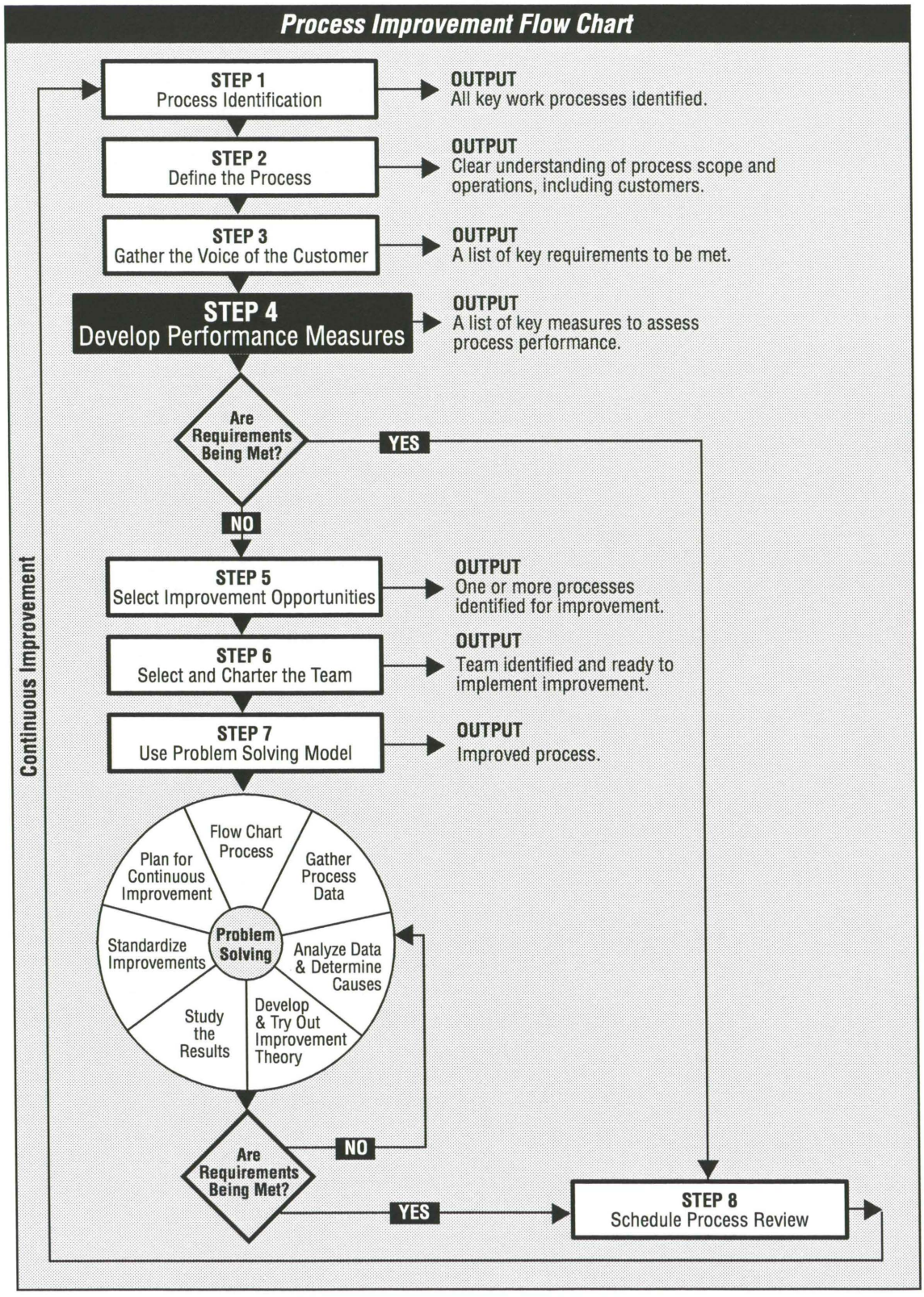
Once you have identified and recorded customer requirements for each key process, you are ready to move to Step 4, the development of performance measures.

PROCESS MEASUREMENT WORKSHEET

Name of Process: Driver's License Issuance **Date:** 1/2/98

COLUMN A	COLUMN B	COLUMN C	COLUMN D	COLUMN E
Customer Requirement(s) (Based on Need or Expectation) **or Regulatory Guideline(s)**	**Key Performance Measure(s)**	**Type of Measure:** **A.** Process Effectiveness **B.** Process Efficiency	**Current Process Performance Level**	**Success in Meeting Performance Measures**
I Receive valid license	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
II Wait in line no more than 20 minutes	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
III	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
IV	1.	A B	1.	YES NO
	2.	A B	2.	YES NO

CHAPTER 4
DEVELOP PERFORMANCE MEASURES



Measuring Process Performance and Customer Satisfaction

Once you have gathered the voice of the customer, the next step is to measure how well your process is performing. In Step 2, you defined your processes in detail. Now you must answer some challenging questions.

- How can the quality of the output be measured?
- How do we know that our product or service actually meets the stated requirements and achieves the intended purpose?
- How can we be sure that regulatory and agency guidelines are satisfied?

To help answer these questions, you will develop performance measures. Performance measures are a specific set of measures that tell you how well the process is achieving desired results. The voice of the customer, gathered through qualitative and quantitative research, will help you collect the appropriate data.

Some performance measures, particularly those used in *Budgeting for Results*, are built around programs and include a family of measures.

- **Results Measures.** The impact or benefit of the product or service on customers and stakeholders.
- **Output Measures**. The amount of product or service provided.
- **Input Measures**. Financial and nonfinancial resources utilized.
- **Efficiency Measures.** The ratio of resources to outputs and results.

When processes are improved, outputs and results are automatically improved, so most of your improvement efforts will focus on the two basic kinds of process measures.

- **Process Effectiveness.** The quality and value of the output, or the extent to which the output meets customer, stakeholder, and agency requirements.
- **Process Efficiency.** The volume of output relative to the resources invested.

Sometimes effectiveness is not an issue. Everyone who wants a driver's license and is entitled to have one, eventually gets an output that is 100% effective. Even if customers are not thrilled with their machine-made photos, driver's licenses always do what they are supposed to do. The real issue is efficiency—how long did the customer have to wait in line?

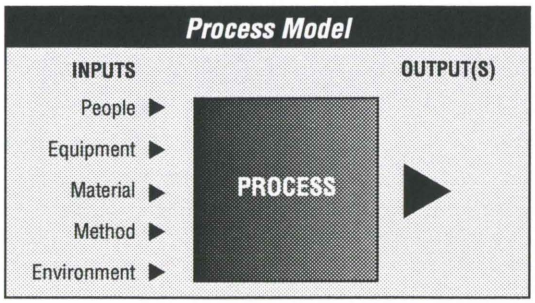
Sometimes the efficiency of a process is irrelevant to the customer. Campers arriving at state parks do not care how long it took the staff to prepare the campground for their arrival. The only thing they care about is the effectiveness of the process. Are the restrooms clean? Do the electric outlets work? Has the previous customer's trash been removed? In this case, the efficiency of the process is only important to stakeholders.

Because stakeholders and customers often have different needs, you may find yourself reconciling tradeoffs. A state agency could reduce a customer's waiting time by hiring more workers, or by opening more locations, but that would increase the cost of the system. What's convenient for customers may not be efficient from the stakeholder's point of view.

When effectiveness is the primary concern, it's almost always possible to improve the system by throwing more resources at the problem. In state government, however, resources are limited. The best way to increase productive capacity is to free up some of the resources you already have, and that requires improving efficiency.

In Chapter 1, we learned that in the production of any product or service there are three process components:

- **Inputs.** The resources required and methods used to produce output.
- **Sequence of Events.** The key steps involved in converting inputs to outputs.
- **Output.** The product or service that achieves the desired result.



To measure effectiveness and efficiency, you will extract data from each of these components. If output data shows that effectiveness is lacking, you will collect data from the inputs and process events that influence effectiveness. If efficiency is the issue, comparing input measures with output measures will help you modify process events. Keep in mind that performance measures are not limited to inputs, processes, and outputs. You may also need to measure results.

STEP 4 - DEVELOP KEY PERFORMANCE MEASURES

Select two or three key measures that tell you how well the process is performing. These measures should be based on customer and stakeholder requirements, regulatory and agency guidelines, or both. Gathering too much data is time-consuming and keeps you from focusing on the vital issues that are important to you and your customers. Concentrate on the two or three measures that are the best indicators of process performance.

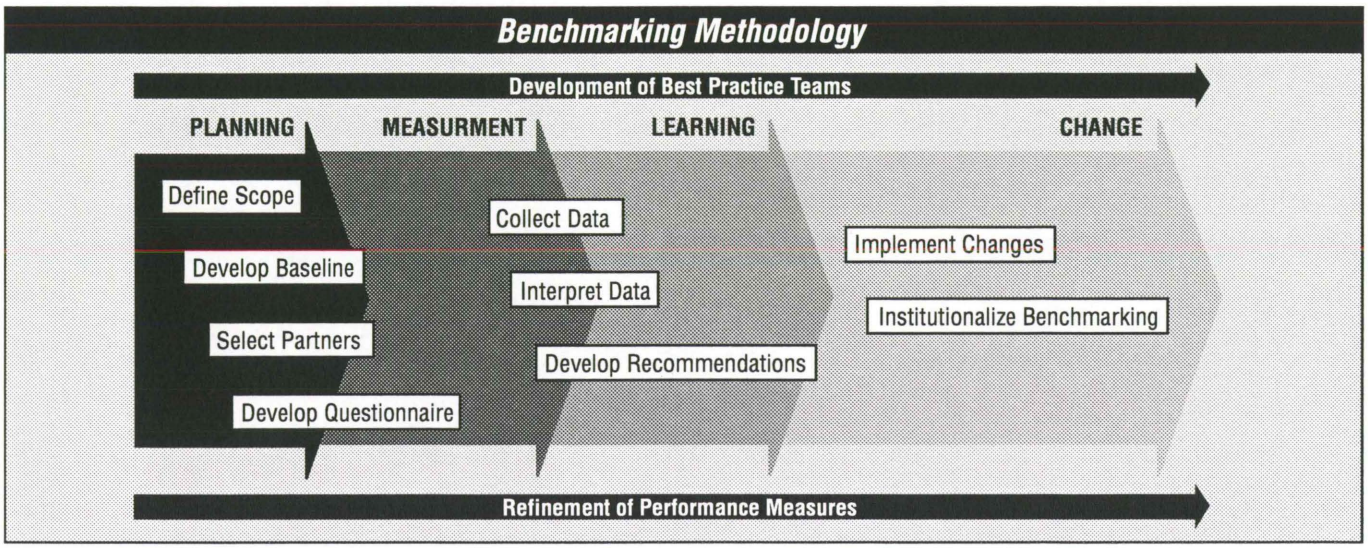
Identifying more than one measure will reduce the risk of sacrificing one quality measure for another (e.g. quality of service is not compromised while reducing the processing time.)

Setting Performance Benchmarks

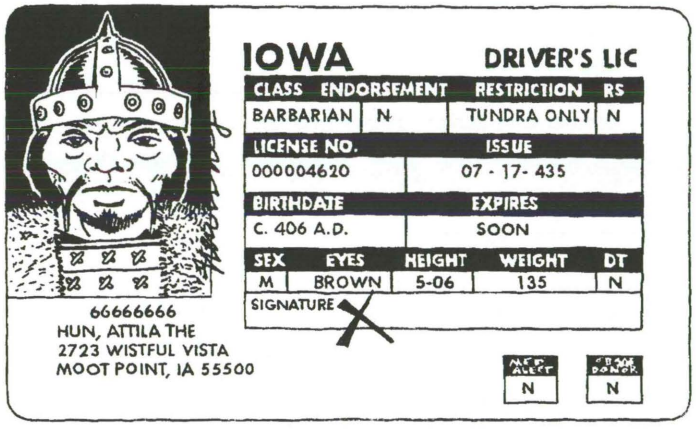
Another effective way to identify performance measures is to set benchmarks that compare your process results with that of a high-performance organization. A benchmark is the setting of a target or goal based on that comparison. The terms *benchmark* and *benchmarking* are often used interchangeably but have distinctly different meanings. To clarify, whereas a benchmark is a target or goal, benchmarking is the process in which your agency compares its performance to the highest level attained by best-in-class organizations and then acts to close whatever gaps may exist. The focus is to identify and implement best practices to improve performance.

It may be possible to compare your process with those of outside vendors who provide similar products and services, or other government entities at state, local, or federal levels. If the performance standard comes from inside your own organization, the process is known as *internal benchmarking*.

An in-depth explanation of benchmarking is beyond the scope of this guidebook. However, each agency has trained individuals who can serve as resources. The benchmarking approach used in Iowa State Government was developed by Coopers & Lybrand L.L.P. (See diagram below.)



MEASURE OF EFFECTIVENESS



A VALID DRIVER'S LICENSE

A significant amount of learning occurs when you implement a formal benchmarking process. It may be somewhat time-consuming and resource-intensive, but it generally provides a huge payoff down the road.

Process Measurement Worksheet

In Step 3 you identified customer requirements for each key process and recorded them in Column A of the *Process Measurement Worksheet,* along with any existing regulatory or agency guidelines. Your next step is to turn these requirements into relevant performance measures.

In the example of the Driver's License Issuance System, the requirements were stated as:

- **Customer Need.** To obtain a valid driver's license.
- **Customer Expectation.** To receive a valid driver's license no more than 20 minutes after walking into the Driver Licensing Station.

Column B

Once you have established the customer's requirements, the next step is to identify ways in which these performance criteria can be quantified. For example, "validity" might be defined as licenses that are free of errors when handed to customers for inspection.

Performance Measures

- Percentage of licenses issued without errors
- Percentage of customers who wait in line in the Driver Licensing Station for more than 20 minutes

These are the types of measures that might be listed in Column B of the Process Measurement Worksheet. (See diagram on page 35.)

Column C

In our continuing example, a driver's license is only valid if the information on the license is completely accurate. Because validity is a measure of process effectiveness, circle choice A in Column C. The length of time required to obtain a license is a measure of process efficiency. For that measure, circle B in Column C. (See diagram on page 35.)

Column D

At this point, you must collect data to establish how well the process is performing. You, or members of your team, will visit a Driver Licensing Station to observe the output being produced. Take a watch to measure time and a note pad to record the results of 100 customer transactions. How many licenses were accurate? How many were redone to correct errors? How long did it take to complete each license?

For the purposes of this example, let's suppose that 99 of the 100 licenses you observed were entirely correct and that 93% of the customers left the station within 20 minutes. Record these measures in Column D. More information about data collection is included in Chapter 7 on pages 61-64 under "Gather Process Data."

Column E

This column asks you to decide if the process is successfully meeting the requirements. To answer that question, you may need to adopt some specifications—performance standards that you have reason to believe are acceptable to customers and stakeholders. This is where benchmarking may be relevant. What is the *Current Process Performance Level* of the best Licensing Station in the system? Should other stations be expected to match the effectiveness and efficiency observed at that location?

For the purposes of this example, assume that the following specifications have been adopted:

Specifications

- 97% of licenses are error-free
- 95% of licenses are issued in 20 minutes or less

These specifications allow you to answer the question in Column E. Circle YES for effectiveness, NO for efficiency. The Process Measurement Worksheet is now complete.

Summary

Statistical measures—based on data gathered directly from the process—tell you how well the process is performing, and how good a job you are doing of meeting your customer, stakeholder, and regulatory requirements. The emerging picture may not be entirely complete, but it should serve to narrow your inquiry. Remember that data collection is not a one-time event. You may need to go back for more.

The next step is to determine where to focus your improvement effort. For each performance measure circled NO in Column E of the Process Measurement Worksheet, you will need to determine what action is needed.

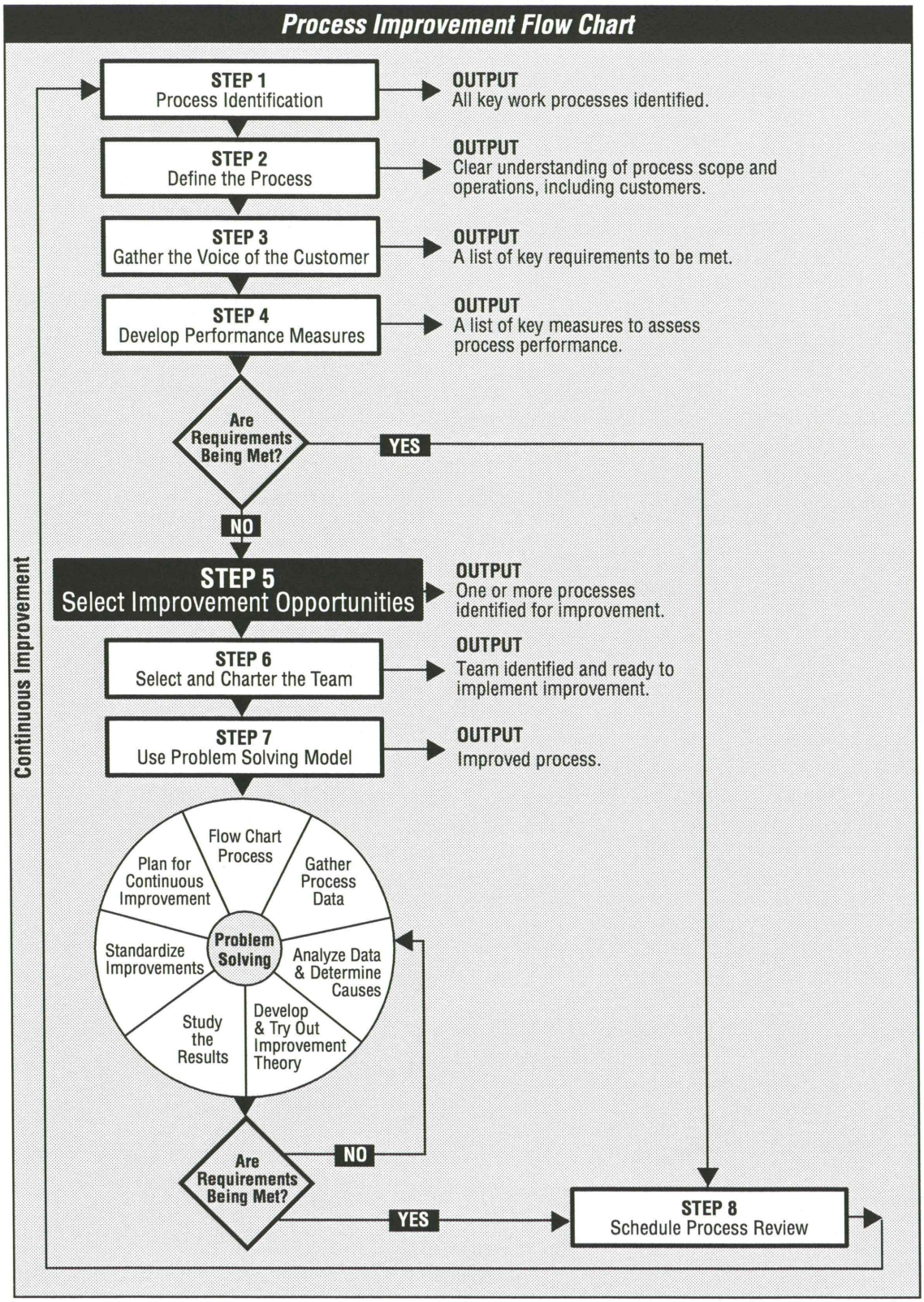
Not everything we do in state government can be easily quantified. In situations where you cannot gather data, or where information is subjective, you will want to ensure that there is continual dialogue with both internal and external customers. When measures are available, however, it is always best to base your improvement decisions on real data.

PROCESS MEASUREMENT WORKSHEET

Name of Process: Drivers License Issuance **Date:** 1/2/98

COLUMN A **Customer Requirement(s)** (Based on Need or Expectation) **or Regulatory Guideline(s)**	COLUMN B **Key Performance Measure(s)**	COLUMN C **Type of Measure:** **A.** Process Effectiveness **B.** Process Efficiency	COLUMN D **Current Process Performance Level**	COLUMN E **Success in Meeting Performance Measures**
I Receive valid license	1. % of error free licenses issued	(A) B	1. 99% of licenses issued error free	(YES) NO
	2.	A B	2.	YES NO
II Wait in line no more than 20 minutes	1. % of customers who wait in line 20 min.	A (B)	1. 93% of customers' wait time is 20 min. or less	YES (NO)
	2.	A B	2.	YES NO
III	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
IV	1.	A B	1.	YES NO
	2.	A B	2.	YES NO

CHAPTER 5
SELECT IMPROVEMENT OPPORTUNITIES



In Steps 1 and 2, you identified and inventoried your work processes. In Steps 3 and 4, you gathered the voice of the customer, developed performance measures, and measured the current level of process performance. You also identified processes that do not currently meet customer, stakeholder, or regulatory requirements. In Step 5, you will begin working on the key processes that need improvement.

Naturally, all of your processes are important to customers and stakeholders, so you will strive to improve them all simultaneously. Right? Probably not.

It is not reasonable to believe than an agency or division can improve every process. While it's certainly true that most processes can be improved in some way, you can't spare the time to do it all. There are other things that require your attention, such as the ongoing delivery of service. Because resources are limited, you will want to target your improvement efforts to achieve the greatest impact for customers. In Step 5, you will determine which processes to improve, and in what order.

Improvement needs are greatest when the process is obviously ineffective or inefficient.

Ineffective

- The output of the process fails to meet customer needs and expectations or regulatory and agency guidelines.
- The process does not achieve its intended purpose.
- The output provides insufficient value to customers and stakeholders.
- The inadequate result of the process is the last thing you think about before going to bed at night and the first thing you think about in the morning.

Inefficient

- The process is variable and yields unpredictable results in terms of quality, cost, accuracy, or speed.
- The process is characterized by rework, delays, excessive costs, or chronic frustration.
- The process is limited by inadequate methods or outdated equipment.
- The process is the bottleneck in the system that most restricts the rate at which output is produced.

If Column E of the Process Measurement Worksheet shows that a process currently meets customer requirements and agency guidelines, proceed to Step 8 - Schedule Process Review. But if one or more of your processes do not meet requirements, select your best improvement opportunity.

STEP 5 - SELECT IMPROVEMENT OPPORTUNITY

The choice of an improvement target begins with Strategic Planning, a method that combines objective data gathering techniques with the subjective, profound knowledge of employees. The results of the planning process are the identification of goals, objectives, and strategies that can help the agency, division, bureau, or work unit achieve its mission.

Key areas for improvement are typically identified during the planning process. Ideally, all improvement opportunities should be strategically linked, either directly or indirectly, to achievement of the agency's vision, mission and goals. For more information on this topic, please refer to the *Agency Strategic Planning* guidebook and the *Enterprise Strategic Planning Guidelines.*

Though there are many ways to identify which process to improve first, we will outline four methods.

TOOL

Method #1: A Subjective Data Approach

The **Process Improvement Selection Matrix** is a tool that utilizes "profound knowledge" of process performance in relation to effectiveness and efficiency. *Profound Knowledge*, a term coined by Dr. W. Edwards Deming, refers to the in-depth understanding of a process possessed only by those who work within it. This is an ideal approach to use when objective process data is either unavailable or difficult to obtain.

How To Use It

The selection matrix can be used by an individual manager or by a team of people who represent the system. In the left-hand column, list the key processes that were evaluated in Step 4. Next, rate each process in terms of:

- **Result.** Achievement of the intended purpose.
- **Effectiveness.** Quality of output in relation to customer, stakeholder, and agency requirements.
- **Efficiency.** Quantity of output relative to inputs.

You will use a scale from 1 to 5 in which 1 = Excellent performance and 5 = Unacceptable performance. Add the numbers in the first three columns.

Next, rank the impact or significance of the process in terms of the agency's mission. The most crucial processes are 4 = Vital and the least significant are 1 = Unimportant. Note that in the first three columns a low score is good, but that in this column a low score means that the process has some value to the organization, but its impact is low.

Now, multiply the sum of the first three columns by the weighting factor in column 4. The process with the highest score is the one that deserves immediate attention.

The high scoring process is probably the constraint in your agency, division, bureau, or work unit. If you take a systemic view, the *constraint* is the process that prevents the system from achieving the desired result. At the process level, the constraint may be something intangible—like a policy, budget, or management practice—that limits the process. Always begin your improvement effort by tackling the constraint.

The completed matrix below represents a hypothetical job placement system. In this example, the Counseling process received the highest score, so it is the first process to address. A blank Process Improvement Selection Matrix is located in the Forms section.

PROCESS IMPROVEMENT SELECTION MATRIX

Process	+ Result	+ Effectiveness	+ Efficiency	= Subtotal	X Agency Impact	= Total
Intake	1	1	2	4	4	16
Data Entry	3	3	4	10	2	20
Referral	3	3	3	9	4	36
Counseling	5	5	4	14	4	56
Job Search	2	2	2	6	3	18
Follow-Up	3	3	3	9	3	27

Scale
1 = Excellent 2 = Good 3 = Fair 4 = Poor 5 = Unacceptable

Scale
4 = Vital
3 = Important
2 = Necessary
1 = Unimportant

TOOL

Method #2: The Team Approach

The **Nominal Group Technique** encompasses two earlier tools—*Brainstorming* and the *Affinity Diagram*. The word nominal in the title refers to the nomination of candidates—they could be people, ideas, problems, or processes—for subsequent ranking. The technique allows members of a group to express opinions and arrive at a consensus. In the present context, the tool can be used to prioritize processes that should be improved.

How to Use It

Using a flip chart, list processes in random order or, if they are related, chronological order. Label the processes with capital letters. For example:

A	Intake
B	Data Entry
C	Referral
D	Counseling
E	Job Search
F	Follow-Up

Each team member will record these letter codes on a piece of paper and rank the items from most significant to least, with the highest number representing the most important choice. Because there are six processes in this example, 6 = Needs Most Improvement and 1 = Needs Least Improvement. One person's ballot might look like this:

A	1
B	3
C	4
D	6
E	5
F	2

When members have finished voting, the group leader or facilitator will collect the ballots and tally the scores. If there are five people on the team, the tally might look like this:

Item	Jean	David	Carol	Larry	Kim	Total
A	1	3	2	6	4	16
B	3	5	5	4	2	19
C	4	4	3	2	5	18
D	6	6	4	5	3	24
E	5	2	1	1	1	10
F	2	1	6	3	6	18

In this example, process D earned the highest score and is therefore "most in need of improvement." A note of caution is appropriate at this point. Even though choice D received the highest score, only two of the five team members chose it as the most significant, and process F garnered the same number of first-place votes. Also, four of the scores—18, 18, 19, 24—are not that far apart. The team could agree to work on process D, or call for a second ballot.

Multi-Voting involves a series of ballots. After each vote, the least popular choices are eliminated until a clear consensus emerges. If processes A and E are eliminated, for example, team members must reassess their sentiments and rank the remaining four. It's likely that the second ballot will show a stronger consensus for working on process D.

TOOL

Method #3: A Data-Based Graphic

The **Pareto Diagram** is a graphic tool that ranks items in a data set. If a survey was used to gather the voice of the customer, responses can be illustrated with this tool.

The Pareto Diagram is named for Vilfredo Pareto, an Italian economist who in 1897 recognized that the phenomenon he was studying, the personal wealth of human populations, was unevenly distributed. To illustrate his findings, Pareto used a bar graph. The first leg represents the most common occurrence, and other observations are graphed in descending order. To show how the categories add up, accumulating percentages are represented by a line above the bars.

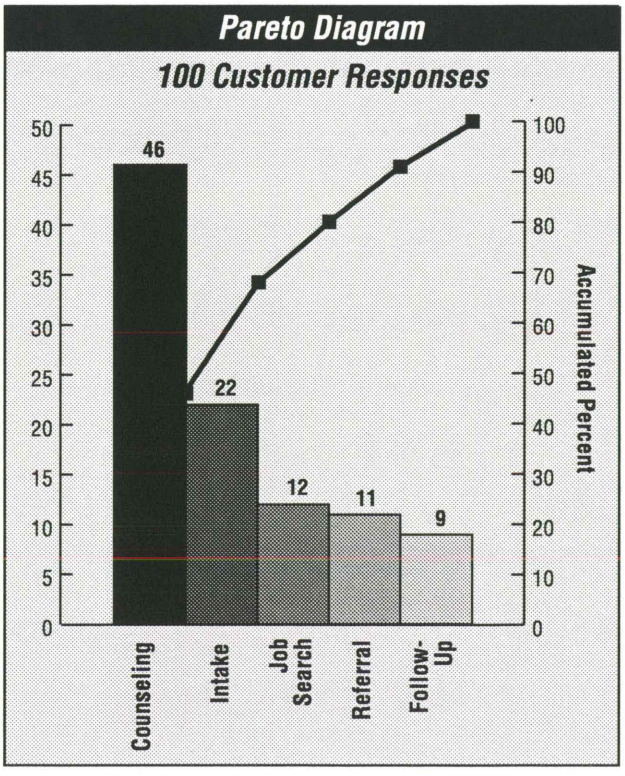
How To Make It

Draw horizontal and vertical axes on a flip chart or sheet of graph paper. Frequencies are counted on the left-hand vertical axis in equal numerical intervals, such as 5-10-15-20. Categories of data are listed on the horizontal axis in descending order from left to right. Label each bar according to the item it represents.

Percentages from zero to 100 are shown on the right-hand vertical axis. Plot a line showing the cumulative percentage reached with the addition of each category.

To show how the Pareto Diagram is constructed, let's assume that external customers of the Job Placement System were asked to rank the effectiveness of the processes they experienced—Intake, Referral, Counseling, Job Search, and Follow-Up. Data Entry is not included in this list because the customers of that process are internal.

If external customers were asked which processes are least effective, and therefore most in need of improvement, the results might look like this:



How To Use It

Pareto found that 80% of the wealth belongs to only 20% of the people. This observation led to the development of the *80-20 Rule*. In terms of agency processes, the rule translates: 20% of the shortcomings account for 80% of the dissatisfaction, or 80% of the problems are produced by 20% of the causes. The Pareto Diagram illustrates from most to least where problems are occurring.

The 80/20 Rule is a benchmark that does not apply to every set of data. In our Job Placement example, two of the five processes—40% of the total—account for 68% of the responses. Even though the ratio is 68/40 instead of 80/20, the underlying observation is still valid. Processes that account for the longest legs of the Pareto are *the vital few* that deserve your attention, and the longest leg is the system constraint.

By ranking from most to least the processes that need improvement, the Pareto Diagram helps you decide where to focus your effort. Removal of the constraint will have the greatest positive impact on the system as a whole.

TOOL

Method #4: An Objective Data-Gathering Approach

The **Theory of Constraints** was developed by Dr. Eliyahu Goldratt to explain how efficiency can be improved by focusing on the *bottleneck*. The theory holds that even though there are a number of key processes in your system, only one deserves immediate attention. You should concentrate your effort on the process within your agency or division that most restricts the rate at which output is produced.

The Theory of Constraints pertains to the productive capacity of the system—its efficiency rather than its effectiveness. Each process is dependent upon an upstream process—an internal supplier—and can therefore produce its output only as fast as inputs are delivered. The bottleneck is the slowest operation—the point of congestion where work piles up.

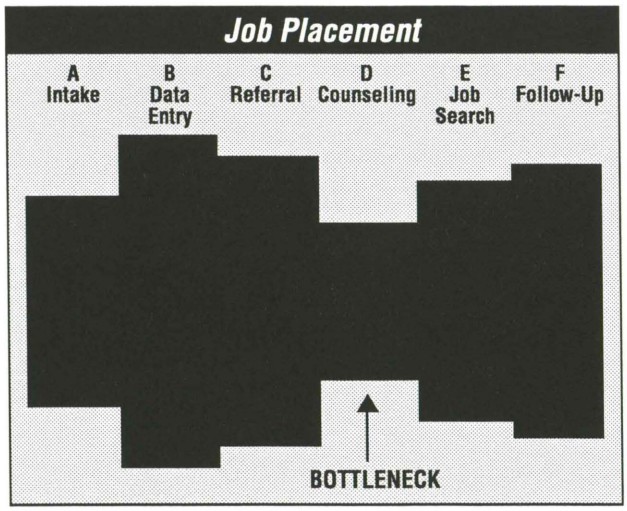
How To Use It

One way to apply the Theory of Constraints is to collect data on the productive capacity of each process in the system. In the Job Placement System, for example, the measure of process flow may be the number of cases handled daily. The data might reveal the following picture:

Process Capability

Process	Maximum Daily Caseload
A Intake	9
B Data Entry	15
C Referral	12
D Counseling	5
E Job Search	10
F Follow-Up	11

This data can be graphically illustrated with a simple diagram.



This diagram illustrates that services can flow no faster than the smallest aperture will allow. Case files will pile up on the left side of process D, while employees in processes E and F are waiting impatiently for the next file to arrive. Process D is holding up the parade.

If efficiency is the issue, your improvement effort should focus on expanding the capacity of the bottlenecked process. In fact, working on any process other than D will not benefit the system until this process is enhanced. This is what is known as focusing the effort on the constraint.

If the bottleneck is persistent, you may not need any data. Just walk around until you find the place where work is piling up. Sometimes, however, the bottleneck is elusive, so you may have to collect data from each process in the system.

Data collection, though time-consuming, is an important part of the improvement effort. The good news is that there are people working in the process who can access and assemble the information you need. Questions to ask include: How much elapsed time is required to complete this process? How many person-hours are invested?

To help identify improvement opportunities, look for the following:

- **Complexity.** How many steps are there, and how many people are involved in each step?
- **Slowdowns.** When efficiency is the issue, time is usually the critical factor. At what locations do the longest delays occur?
- **Backups.** How high are the piles in various locations?
- **Cycles.** Many processes exhibit cyclical peaks and valleys. High points and low points may occur seasonally, monthly, weekly, or daily. How long is the interval? If most slowdowns occur on Monday, you're on to something.
- **Rework.** How often does the output go back into the process for correction or repair? How much time is lost? Are other tasks interrupted by band-aid applications?

These are just a few of the criteria you can use to begin collecting data. In some cases you may be able to use or easily adapt historical data that has been collected for another purpose. If existing data does not give you a clear picture, you will have to collect some more.

Relieving Bottlenecks

One way to relieve a bottleneck is to shift assets from places where excess capacity exists to the place where more resources are needed. Another approach is to shift non-critical tasks from one process to another. These could be viable strategies, provided that you really understand what is happening at the bottlenecked location.

Bottlenecks tend to shift from one place to another, so beware of permanent solutions to temporary problems. Making one process better at the expense of the system as a whole is called *local optimization.* The wrong decision can lead you one step forward and two steps back. *Global optimization* occurs when process capabilities are evenly aligned.

Summary

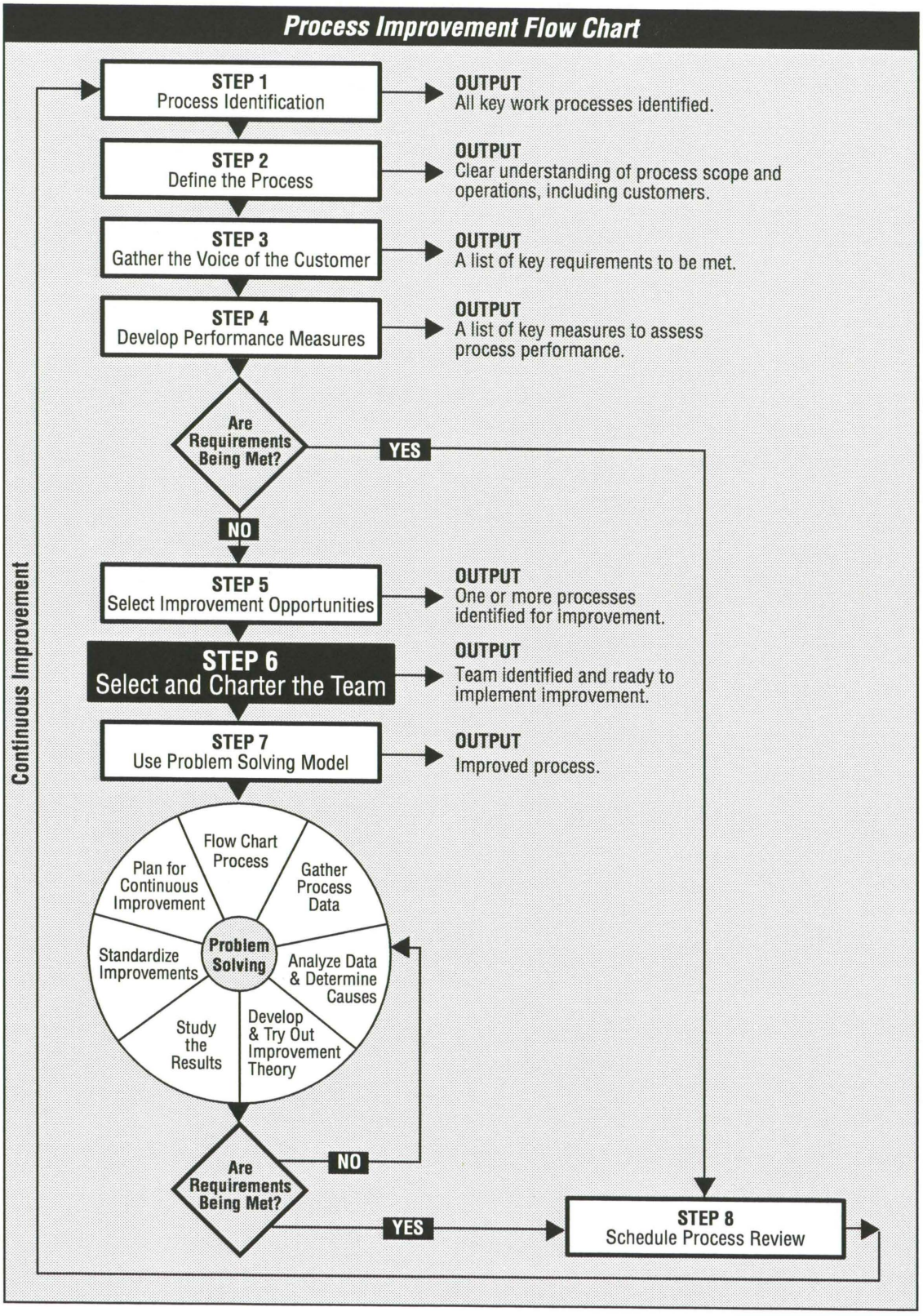
Four methods for prioritizing improvement opportunities were detailed in this chapter. The choice of an appropriate method will depend upon the type of system you are trying to improve, as well as the customer and agency requirements you have identified.

Subjective approaches are less time consuming, and may be appropriate if you know exactly what needs to be fixed. The team approach has the advantage of using the profound knowledge of those working inside the process.

Objective methods rely on process data and are therefore more reliable. Since all approaches stem from your agency's strategic planning process, each method will ensure that you address an opportunity that is critical to moving your agency toward its vision and mission.

NOTE: Even though a process is performing within standards and meeting requirements, you may still decide to have the process evaluated by the process manager or a process improvement team. If changes are not required, or if you choose not to implement an improvement initiative at this time, establish a regular process review schedule to assess the effectiveness of each process over time (see Step 8).

CHAPTER 6
SELECT AND CHARTER THE TEAM

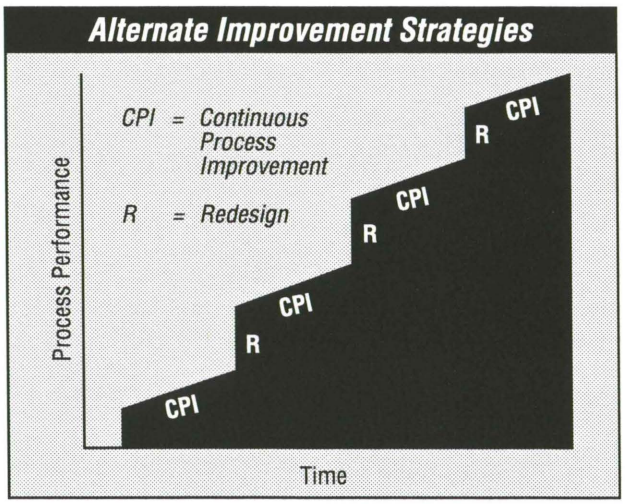


Processes, like people, are not static. A work process may get better or worse, but it seldom remains the same. Therefore, we must constantly assess how processes are performing and how well they achieve intended results. By now, you have identified at least one process to improve. As you begin to implement improvement efforts, you will find that there are two basic approaches.

A **Continuous Process Improvement** strategy is appropriate if you think the process that exists today is adequate, but that some level of incremental improvement is needed. The removal of bottlenecks and the lowering of variation will achieve the desired result.

A **Redesign** or **Reengineering** strategy is indicated if the current process is hopelessly outmoded. If the outputs and boundaries are no longer relevant, almost everything is open to change.

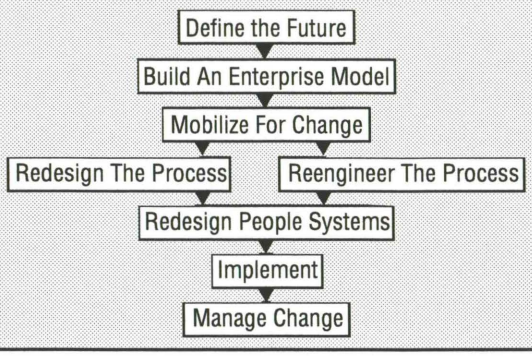
The following diagram shows that these important strategies can be alternately applied. Continuous Improvement is gradual and progressive, but Redesign is episodic and discontinuous. It entails rapid, radical, sweeping change, and can be resource-intensive.



You are always asking the question: "How can we do a better job?" When Continuous Improvement cannot take you to the next level, you may want to look to redesigning the entire system. When the new system is in place, you will return to the question: "How can we continuously improve it?"

Reengineering Business Processes And People Systems
by Robert F. Lynch and Thomas J. Werner

This is one of the best reference books on process change. The authors distinguish between "redesign"—which preserves desirable features of the current system—and "reengineering"—which represents a more radical departure. Reengineering, they say, may produce a totally new output and a fundamentally different result. The following flow chart illustrates their sequence of action strategies:



This guidebook focuses on Continuous Process Improvement, since this will encompass a majority of the agency's improvement efforts. When redesign is undertaken, be sure that mechanisms are included that allow for continuous improvement of the processes that comprise the new system.

The choice of an improvement strategy depends on how well your current processes are producing desired results. Regardless of which action plan is chosen, the basis for action is exactly the same. In general, teams of people with profound knowledge of processes work to gather and analyze data before deciding how to change their systems.

The Team Approach

A team is a group of people working together to achieve a common goal. There are many types of teams in state government today—work-unit teams,

project teams, self-directed teams, and process improvement teams, to name only a few. Why is the team approach so common? Because it works. Using a formal team to solve a problem is beneficial for a number of reasons:

- People who do the work know best how to improve it.
- Collaboration increases the buy-in and ownership of decisions.
- Teams capture multiple perspectives and expand the collective knowledge of Iowa State Government.
- Group settings help people look beyond established paradigms.

An old adage—"Two heads are better than one"—aptly describes the team concept. Another way of saying it is: "No one of us is as smart as all of us." The technical term for the team phenomenon is *synergy*. One person builds on another's contribution, so that the whole becomes greater than the sum of its parts.

A Process Manager can work individually to improve a process or charter a formal team to address the customer and stakeholder requirements that have been identified. The choice may depend on the type of process, the kind of improvement that is needed, or the degree to which profound knowledge of the process is important. Establishing a team is the best approach whenever the process or system is complex enough to require input from different work areas and technical disciplines.

The Individual Approach

If improvement does not require a team effort, identify the person who will be responsible for taking the necessary action. Usually it will be the Process Manager. Make sure the manager is familiar with the Problem Solving Model outlined in Chapter 7. If the needed action has already been identified—it's a matter of fixing the obvious—ask the manager to complete and implement an Action Plan.

TOOL

An **Action Plan** identifies the specific steps required to accomplish a particular task. In the Department of Corrections example below, an action plan was designed to standardize the "Use of Force" policy. The goal was to reduce injuries in correctional facilities.

How To Use It

Fill in the form by answering the following questions:

Agency. Who is doing this?

Purpose. What are we trying to accomplish?

Desired Results. Why are we doing this?

Resources. What resources are needed to complete this action? (Additional funds, time, removal of current barriers?)

ACTION PLAN

Agency: Department of Corrections

Purpose: To standardize the "Use of Force" policy

Desired Results: Consistent application of policy
1. Criteria for use of force
2. Methods of force
3. Incident reporting format

Resources: Written materials

Action	Desired Outcome	How	When	Who	Measurement
Implement Policy	All Staff Understand Policy	Distribute Written Policy	By January 1998	Policy Coordinator	Distribution Record
Conduct In-Service Training	All Security Staff Trained	Classes at Training Academy and Institutional Training Offices	At 3-Month Suspense Date	Academy and Training Office Personnel	Training Rosters
Add Training to New-Employee Orientation	All New Staff Trained	Class at Training Academy	At Orientation	Academy Staff	Training Rosters

Action. What actions are required? What do you intend to do?

Desired Outcome. What are the results you expect to achieve from the specific action?

How. What methods do you plan to use?

When. When must the action be completed?

Who. Who is responsible for completing the action?

Measurement. How will you know that the action is completed?

You may need to add other categories to the Action Plan matrix, such as Resources. For example, are additional funds needed? Is it necessary to remove current barriers?

After the Action Plan has been filled in, implement it. Remember, as you carry out the changes outlined in the Action Plan, study the effectiveness of the actions in terms of the desired results. If the actions do not achieve the planned result, you will want to revise the plan or consider using a different approach. An Action Plan form and instructions for your use are located in the Forms Section.

The Team Approach

If a process improvement team is chartered, you will need to address specific issues relating to the process to ensure the success of the team's efforts.

TOOL

The **Team Success Checklist** assures that the team gets started on the right foot. The matrix asks questions such as: "Is the process within the team's control or are there others that should be involved?" Answers to these questions will help prevent backtracking and wasted effort.

A Team Success Checklist form for your use is located in the Forms Section.

TEAM SUCCESS CHECKLIST	
Team Name _____	
Within Team's Control	❑
Appropriate Scope	❑
Clear Goal	❑
Not In Transition	❑
Resources	❑
No Solution In Mind	❑
Not A Sacred Cow	❑
Cooperation	❑

How To Use It

Place a check mark in the appropriate box if the process meets the following criteria:

Within Team's Control. If the process is within the team's ability to change, place a check mark in the box. If the process is outside the team's ability to control (i.e., another agency is responsible for the process), leave the box blank.

Appropriate Scope. Check this box if the team's assignment and authority is broad enough to encompass the expected results. Whoever has selected this team effort should understand the scope and estimate the time the team will need to complete the effort.

Clear Goal. The goal of the effort should be clear before the team begins. If the goal is clear, place a mark in the box.

Not In Transition. Teams are occasionally given issues to work on that are already being addressed somewhere else in the agency or that have recently been changed significantly by reorganization or management decision. If it is a process that has not undergone recent change, mark the box.

Resources. Is the agency or division prepared to devote the necessary time and resources to make the effort successful? Has someone from leadership been identified to support and be the "Champion" for the team? If the team will be supported, check the box. If there are no resources available, including time, do not mark the box.

No Solution in Mind. If this is a complex issue that needs a team approach and various views brought together to address it, mark the box. If you already know what to do to address this issue, or if one person can easily address it, do not mark the box.

Not a Sacred Cow. Is it politically unwise to address this issue? If so, leave this box blank. It may be something important to the top leaders, and they may wish to address it themselves. There may be issues related to a union-management agreement that teams should not address. If the issue is considered completely open for the team to address, check the box. If any of the team members or anyone else involved in this effort will experience negative repercussions, leave it unmarked.

Cooperation. Finally, the team effort will result in something in the agency being changed. Things will be different because of the team's work. If there is likely to be open acceptance and full cooperation, mark the box. If there is likely to be resistance to the recommended change, leave it blank.

If any box remains unchecked, meaning that a success criterion has not been met, discuss how this omission may impact the team's effort. You may still decide to proceed with a team effort, even if not all of the criteria have been met. You may also choose to weight the categories. Resources may be more important to your organization than Cooperation. Use this tool in the manner that best fits your organization's needs.

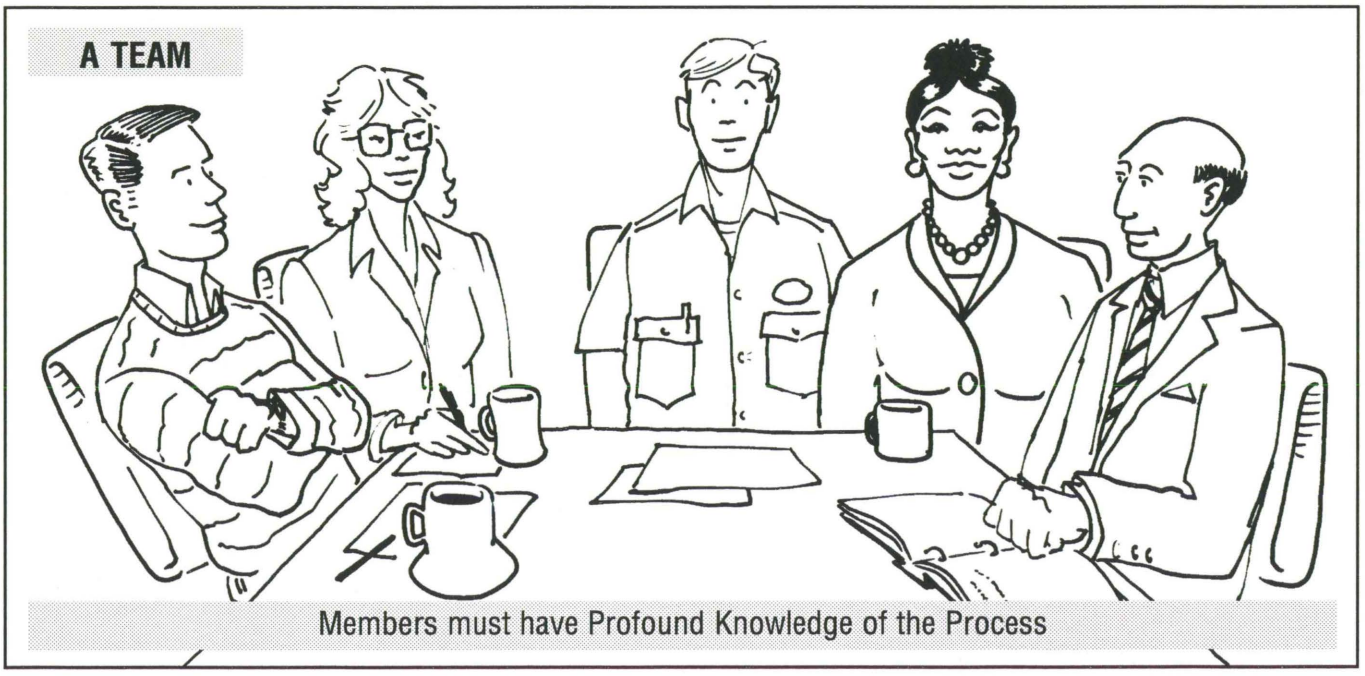
You have identified the need for a team and have answered important questions to help ensure their success. The next step is to appoint the team members. Remember, it's important to select only as many projects as the organization can comfortably support. Select the project first, then choose the team members accordingly.

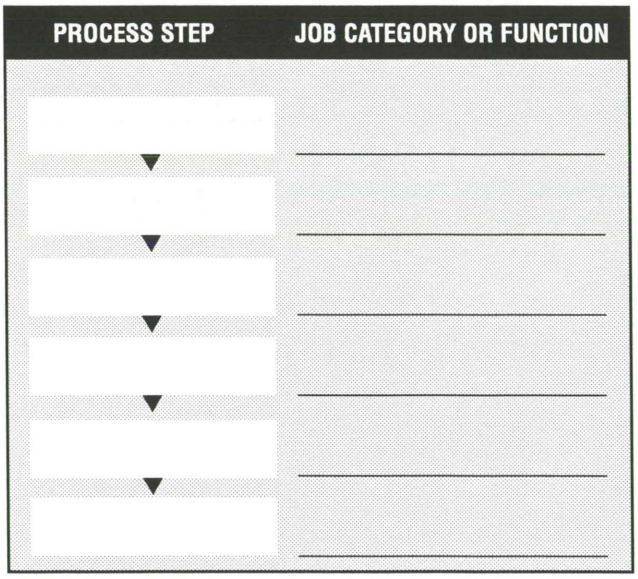
STEP 6 - SELECT AND CHARTER THE TEAM

The next task is to decide who should be on the team. There are two primary guidelines.

- The team should be made up of people who do the work.
- The team's membership should represent the entire process.

In Step 2, you identified the key steps or sequence of events that comprise the process. (See Process Inventory, item 5). Record these steps in the spaces on page 48, using as many of the boxes as you need.





Now that you know the major steps in the process, you understand the kind of functional knowledge the team needs. Next to each step, list an appropriate job category or staff function. At this point, refrain from identifying specific individuals.

You may find that a job category or function is responsible for more than one process step. In this situation, you may decide to have one team member represent both process steps, or you may ask two individuals to participate on the team.

The ideal size for a team is 5 to 8 members. If there are more than 8, it may be difficult to reach consensus. If there are fewer than 5, knowledge may be lacking and the potential for synergy is reduced.

Criteria for team membership include:

- profound knowledge of the process
- willingness to be a team player
- imagination and creativity
- the respect of peers and leaders

Team Roles and Responsibilities

Team members fulfill various roles and should therefore have a clear understanding of their responsibilities. Team roles and their accompanying responsibilities are outlined as follows.

Leadership Team

This team consists of the agency's leaders, such as the Director and the Division Administrators. The team's purpose is to do long-term planning and guide the agency's transformation to Continuous Quality Improvement. This team addresses issues relating to agency culture and works to align systems and processes using CQI to achieve the agency mission. Leadership should be knowledgeable about CQI principles and know how to use and teach the tools.

Guidance Team

This team generally consists of individuals with supervisory or management responsibility for the process being improved. Their purpose is to support the process improvement team's progress by providing the necessary resources and removing barriers to the improvement team's work. The Guidance Team meets on a regular basis with the team leader and facilitator to stay up-to-date on progress. They also provide feedback on proposed improvements and serve as the communication link to the Leadership Team. This team exists to provide support and experience, not to second guess.

The Guidance Team is usually involved in the selection of the improvement project. Members therefore have a genuine stake in the outcome of the project. They also have the authority to make changes in the process under study and are able to act with clout and courage.

The first actions of the Guidance Team will be to:

- Identify the project goals
- Determine needed resources
- Select the Team Leader
- Select Team Members
- Appoint a Facilitator
- Establish the Scope of the Project
- Charter the Team

They will then continue to serve as an ongoing resource to the team. The responsibilities of the Guidance Team are not complete until improvements have been implemented.

Process Team Leader

This individual is usually selected by the Guidance Team. The Leader should have knowledge of the targeted process, but is usually not the manager or supervisor. To lead the team through the problem solving model, he or she will also need good people skills and a thorough understanding of team dynamics.

The Team Leader chairs team meetings, proposes the agenda for the team's approval, arranges logistics, oversees assignments between meetings, and is the contact point for communication between the team and the rest of the agency. Though a designated Recorder keeps minutes, the Leader is the official custodian of the team's records. Unlike the Facilitator, the Team Leader actively participates and contributes ideas during team meetings.

Process Team Members

Team members are directly involved in, or work closely with, some part of the process under study. The role of the Team Member is to fully participate in the problem solving process to achieve the desired improvement goals. Team Members fully contribute their knowledge of the process, carry out assignments on schedule, give feedback about the team's progress, diligently attend team meetings, and support team decisions. Team members view the work of the team as "real work."

Two members of the team will be selected to perform specific ongoing tasks. In addition to other team duties, the Recorder takes notes and prepares minutes. It's important to keep an accurate record of tasks assigned and conclusions reached. The Timekeeper is a volunteer who notes the time allotted for each agenda item and reminds the team of approaching deadlines. When time is called, the team can decide to allocate additional minutes to an important discussion. The same team members can fulfill these responsibilities at each meeting, or the duties can be rotated.

Team Facilitator

The Facilitator is a person totally outside the process who is well versed in team dynamics and is able to teach the tools and concepts of CQI. The focus for this individual is on the group process only—helping to keep the team on track. The facilitator uses his or her expertise to encourage the full participation of all team members and help them reach consensus on decisions.

The Facilitator is trained in the scientific approach and helps the team become comfortable with statistics. The job involves teaching the techniques of data collection and analysis, as well as the interpretation of graphic tools. The Facilitator can recommend the type of data that will be most useful and how best to collect it.

The Facilitator also advises the Team Leader between meetings and helps the team prepare its findings for presentation to the Guidance and Leadership teams.

Team Roles and Responsibilities

TASKS	GUIDANCE TEAM	TEAM LEADER	TEAM MEMBERS	FACILITATOR	RECORDER
Sets Direction For The Team	P	S			
Prepares Agenda		P			
Provides Support And Help	P				
Shares Knowledge Of Processes	S	P	P		
Teaches Statistical Tools		S		P	
Teaches Improvement Concepts		S		P	
Carries Most Of The Discussion			P		
Takes Notes And Prepares Minutes					P
Maintains Team Records		P			S
Refocuses Team Meetings	S	P		S	
Makes Decisions For The Team			P		
Decides How To Present To Leadership		P		S	
Facilitates Meeting		S		P	

P = Primary Responsibility S = Secondary Responsibility

TOOL

An effective **Team Charter** (see page 51) clearly communicates the expectations of the Leadership and Guidance Teams. After reading the Charter, the team should be able to answer the following questions:

- Is it clear what the Guidance Team expects of us?
- Does our project cover an entire process or only part of a process? Where does our part of the process begin and end?
- Are the goals realistic?
- Is it clear why this project is important to the agency and this team? How does this project fit into the agency's overall improvement plan?

The completed Charter should be presented to the Team Leader by the member of the Guidance Team who is primarily responsible for the project.

How To Use It

The Team Charter (see page 51) is typically completed by the Guidance Team, but can be jointly filled out by the Process Manager and the Process Improvement Team. A Charter template for your use is located in the Forms Section.

Team Meetings

Process Improvement Teams typically meet once a week for no more than one hour. If team members are coming from different parts of the state, the team can elect to meet less frequently and for longer periods of time. The basic format is:

- Review the minutes of the last meeting
- Analyze data and information that has been gathered since the last meeting
- Discuss findings, make decisions
- Agree on new assignments
- Propose items for the next agenda
- Assess the meeting, adjourn promptly

In many cases, team members must visit process sites to make observations and collect data. Most of the real work occurs between meetings.

MEETING FLOWCHART

BEFORE MEETING	DURING MEETING			AFTER MEETING
1 PLAN ▶	2 START ▶	3 CONDUCT ▶	4 CLOSE ▶	5 FOLLOW-UP
• Clarify the purpose of the meeting • Choose activities and methods - brainstorming - information reports - analysis of data - ranking, voting - consensual decision making • Develop the agenda - allocate time for each topic	• Begin with a warm-up - social conversation - sports, weather, news events • Present and discuss the agenda - purpose - topics - activities - presenters - decisions expected - time allocations • Set or review ground rules • Clarify member roles - decision makers - recorder - facilitator - timekeeper	• Cover one agenda item at a time • Call on presenters • Open discussions • Direct traffic, maintain focus • Manage participation • Close discussions • Call for decisions	• Summarize decisions • Agree on action items - what needs to be done - by whom - by when • Solicit items for next agenda • Evaluate the meeting - what went well - how can we do better • Thank members for participating	• Write meeting minutes • File all documents • Carry out assignments • Plan the next meeting

TEAM CHARTER

1. **PROCESS**
   What process will the team address?

2. **MISSION**
   Is the team asked to improve an existing process, plan a new process, or solve a problem?

3. **REASON**
   What led us to the selection of this process? Why is this process important?

4. **EXPECTED RESULT**
   What is the desired outcome?

5. **PERFORMANCE MEASURE**
   How will we know that the team has improved the process?

6. **START-UP DATA**
   Is initial data available from the Guidance Team?

7. **BOUNDARIES**
   What is the scope of our authority? How much can we spend? Can we cross organizational boundaries?

8. **TIME FRAME**
   When should we start? How long do we have to complete this assignment?

9. **COMMUNICATION**
   Who do we report to? How often? Are written recommendations expected?

10. **TEAM APPOINTMENTS**

Team Leader	Facilitator	Leadership	Contact	Process Member	
Process Member	Process Member	Process Member	Process Member	Process Member	Alternate

Meeting Minutes

Minutes should be kept of each meeting. A sample minute-taking form is included in the Forms Section for your use. It is essential to establish a formal line of communication between the process team and its leadership. The quality of this management link can make or break an improvement initiative. Be sure to provide copies of meeting minutes to your leadership liaison.

Meeting Agenda

Each team meeting should have an agenda, preferably one shaped at the previous meeting and formally drafted in the interval by the team leader. A typical agenda includes the following:

- Presentation. Someone has collected data from the process, or information for a flowchart. What did they learn?

- Discussion. What question does the data answer? What new question does it raise? Do we know enough to make a decision?

- Decision. What changes are we prepared to recommend?

- Assignment. Who will collect the next set of data? Who will prepare the graphs? When will they be ready to present?

- Allotted Time. Activities usually expand to fill the time available for their completion. Keep things moving.

- Assessment. To continuously improve their own process, the team should always assess how well the meeting went.

The example shows how a typical agenda might look.

AGENDA

Department of Economic Development Team

January 19, 1998

1:00 - 2:00 p.m.

Department of Economic Development

ITEM	TOPIC	PRESENTER	TIME (minutes)
1	Warm Up	Team Leader	5
2	Review Minutes	Team Leader	5
3	Review Agenda	Team Leader	5
4	Economic Trends	Susan	10
5	Issues Affecting Iowa's Economy	Jennifer	15
6	Improving Workforce Availability	John	10
7	Set Next Agenda	Team Leader	5
8	Meeting Assessment	Team Leader	5

First Meeting Agenda

The agenda for the first team meeting might include the following items:

- Guidance Team Presents Charter
- Develop or Review Mission Statement
- Review Process Improvement Process
- Team Membership/Roles
- Select Recorder and Timekeeper
- Meeting Process and Logistics
- Develop Ground Rules
- Review Data
- Give Assignments
- Develop Next Meeting Agenda
- Assess Meeting

Meeting Assessment

To continuously improve how the team works together to accomplish their goal, it is important for teams to assess themselves and their progress. Team meetings are a process too, and assessment on a regular basis will allow them to gather important data (team members' perceptions) to improve how they work together. The team may answer such questions as:

- Are we following our ground rules?
- Are we meeting our project timeline?
- How are decisions being made?

There are two types of team assessments:

In end of meeting reviews the information gathered is incorporated into the next team meeting. This type of assessment typically focuses on how well the team worked together. It will answer questions such as: "Did we follow our ground rules?" or "Did all team members participate?" An example of this type of assessment is included on the minute-taking form located in the Forms Section of this guidebook.

A periodic evaluation of the team's performance may be used to assess project progress and adherence to the Problem Solving Model.

Team Ground Rules

A few simple rules will help the team stay on track and avoid arguments.

1. Be Considerate. Each individual brings profound knowledge to the table, so respect it. All members should be listened to with equal attention, and all opinions should be accorded equal value.

2. Empower Others. Some individuals offer ideas and suggestions without being asked, while others are quiet and reserved. Bashful members of the group should be encouraged to provide input. Collaboration must be inclusive.

3. Decide By Consensus. It's not necessary that everyone share the same opinion—different points of view are useful. When the time comes to make a decision, however, every member of the team must support the final outcome.

4. Rely on Data. Numbers prove things. Gut feelings, hunches, and educated guesses are not good enough. Conflicts arise when conclusions are not supported by facts.

5. Stick Together. Successes and failures must be equally shared. When the team moves forward, no one should be left behind. If a member does not understand the issue, discussion should continue until understanding is achieved.

6. Stay Focused. Teams meet, conduct business, and disperse. The team's job is to focus on the mission at hand and accomplish as much as possible in the time available. A clear understanding of the team's ground rules can help members know what is expected of them and successfully resolve conflict when it arises.

Project Timeline

The timeline for the improvement effort is developed jointly by the guidance and process improvement teams. Improvement efforts typically run from six to nine months with larger systems changes lasting up to one year. If a team extends beyond a one-year time frame, data should support the reason for doing so.

Additional Resources

An excellent resource on the operation of improvement teams is *The Team Handbook* by Peter Scholtes and other contributors. This book is available through the State Library, and most agency Quality Coordinators either have or can access a copy.

The State of Iowa also offers several excellent courses on Team Building through Personal Development Seminars (PDS). These courses are extremely helpful to teams just getting started and can have a dramatic impact on both the team process and the improvement results.

Creativity courses, also available through PDS, can contribute greatly to the work of the team. When the team begins to identify and implement solutions, the ability to think "outside of the box" or beyond traditional paradigms can be the difference between marginal and breakthrough improvements.

Once you have selected your improvement opportunity, identified members, and chartered the team, the team will begin to use the Problem Solving Model.

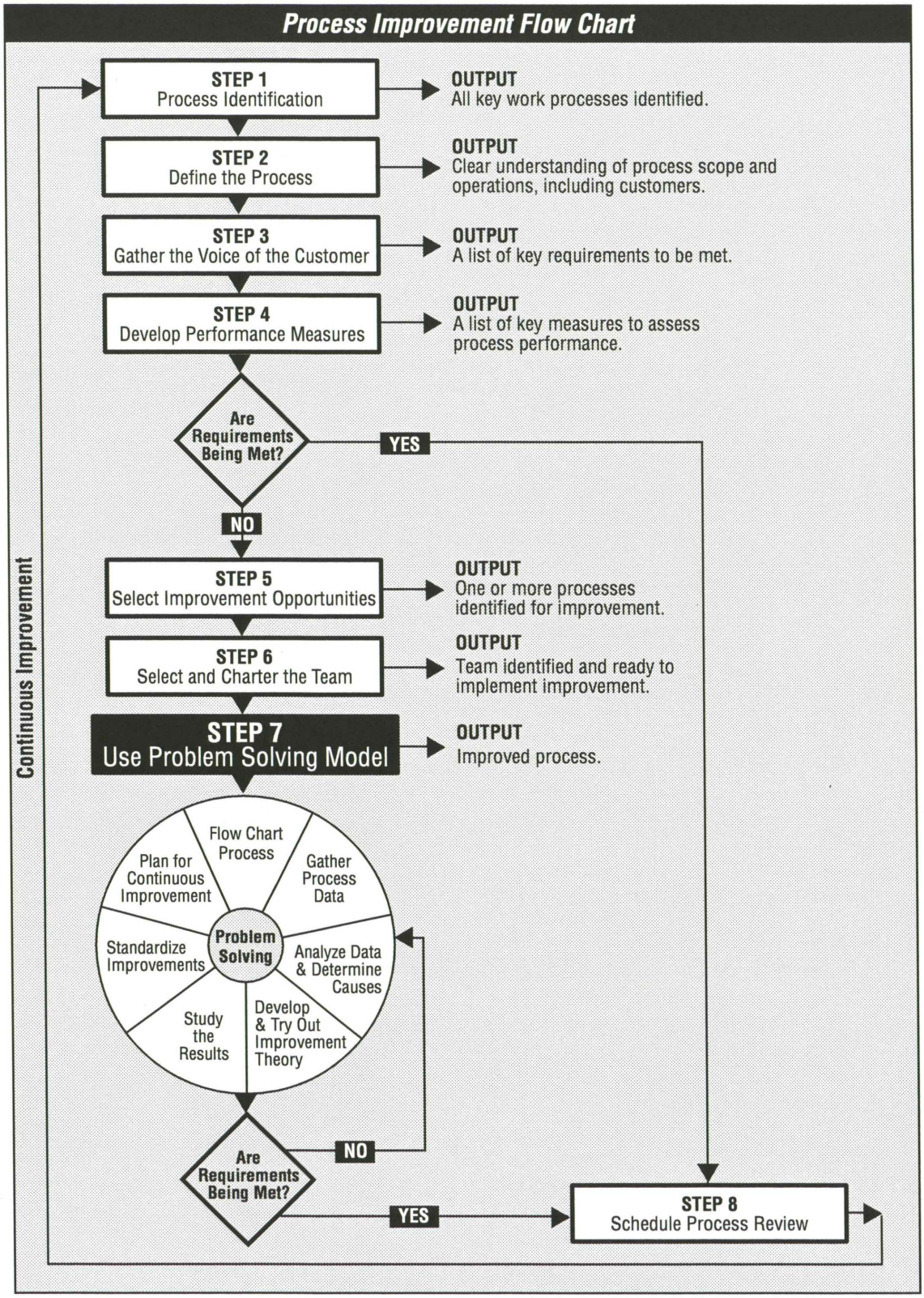
Summary

In this step, criteria were used to determine whether improvement action should be undertaken by an individual or by a team. Once this is determined, if the necessary improvement action is already known, a tool called an Action Plan can be used to implement the improvement.

If the improvement action is not known and will come from a team's effort, each team member, and each person supporting the team, needs to know his or her specific role and responsibility. The Team Charter is important in defining the scope of the work to be done as well as identifying expected results.

To help ensure that team meetings are both effective and efficient, a meeting format was outlined that includes an agenda, meeting minutes, and ground rules. Remember, good planning at the outset will help the team achieve the desired result.

CHAPTER 7
USE THE PROBLEM SOLVING MODEL



Value Added Work

Iowans expect their government to be more productive, efficient, and results oriented. To be successful, competitive, and innovative in an ever-changing global marketplace, your agency must be fast, flexible and responsive. The answer to the question, "Who can deliver the most value to the customer?" will determine who will provide tomorrow's products and services.

In Iowa State Government, Continuous Quality Improvement is becoming the way we do business. To be successful, we must constantly examine our processes to learn where value is created for customers and where cost alone is incurred.

The work of state government, or any organization, can be divided into three categories:

- **Value-Added Work.** This is the real, essential work of the process—the work your customers and stakeholders are willing to pay for. A value-adding step meets one or more of the following criteria:

  - Customers recognize it as important
  - The thing moving through the process is physically changed
  - The work is right the first time (rework does not add value)

- **NonValue-Added Work.** These processes support the value-added work and are therefore not mission critical (e.g. payroll processing, administration).

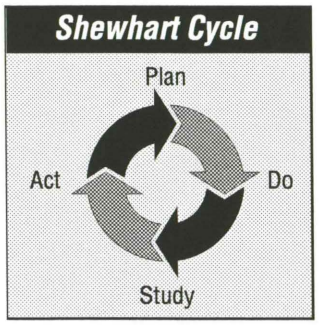
- **Waste Work.** These are activities that do not produce or support value. They may even reduce the value received by customers and stakeholders. The rework of defective output is a prime example.

One quality consultant notes that in most processes, only 10-15% of the work adds value, and that the time required to complete a process can often be reduced by 75%. Authorities agree, however, that processes cannot be improved by simply asking employees to work harder and faster. Successful improvement efforts optimize value-added work, minimize nonvalue-added work, and eliminate waste.

Sometimes our work produces intangible products such as recommendations or budget presentations. In these knowledge-based processes, nonvalue-added work is not as obvious as when tangible products are produced. Even so, these processes can also benefit from improvement efforts.

The Shewhart Cycle

The Problem Solving Model presented in this guidebook is derived from the pioneering work of Dr. Walter Shewhart, the statistician who invented the Control Chart. Shewhart believed that solutions should be tried and tested before rollout, so he proposed a simple sequence of activities: *Plan, Do, Study, Act.*



Plan
- Select the process that most needs improvement
- Flowchart the process
- Gather data from the process
- Identify the bottleneck or constraint
- List the possible causes and use data to identify the root cause

Do
- Develop an improvement theory
- Create an action plan based on improvement goals
- Test the solution with a small-scale experiment

Study
- Gather more process data
- Compare the levels of performance before and after the process change
- Evaluate the effectiveness and efficiency of the solution

Act

- If the value of the solution was confirmed, implement and standardize it systemwide
- If the tested solution failed to achieve the desired result, try again

Shewhart believed that when failure is possible, it's best to *fail small*. Another way to put it is: Look before you leap.

STEP 7 - USE THE PROBLEM SOLVING MODEL

After the process team has been selected and chartered, it's time to implement the Problem Solving Model. There are seven events in the sequence:

1. Flowchart the Process
2. Gather Process Data
3. Analyze Data and Determine Causes
4. Develop and Try Out an Improvement Theory
5. Study the Results
6. Standardize the Improvement
7. Plan for Continuous Improvement

Event #1 - Flowchart the Process

TOOL

As we have learned, one of the attributes of a process is a sequence of events. A **Flow Chart** is a graphic representation—a picture—of that sequence. A completed chart lets the team see how the various steps and activities relate to one another. Flowcharting is a good way to identify delays, bottlenecks, rework, and other barriers to effectiveness and efficiency. Internal customers are identified, process boundaries are defined, and improvement opportunities come into focus.

How To Use It

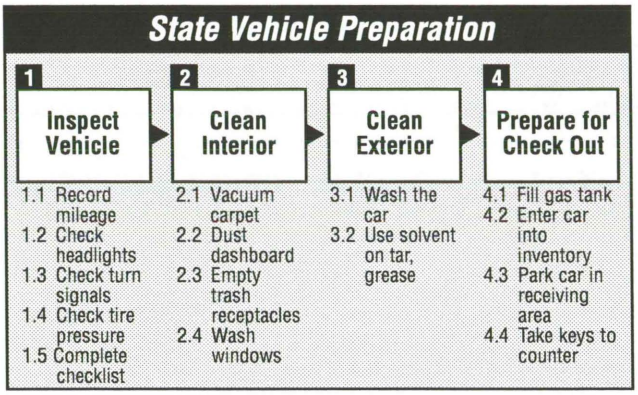
First you need an operational definition of the process. This is usually supplied by the team charter. Decide where the process begins and ends, then list all of the steps, activities, functions, and tasks that occur within these boundaries.

The team's members should have a complete understanding of the process. To draw a clear picture, however, it may be necessary to physically walk through the environment and talk to the people who work there. If you decide to do this, ask about the other three inputs—equipment, methods, and materials. Keep track of who does what and when, then make a rough sketch or outline of the process you see. Remember, the flow chart must represent the process that exists today, not some idealized view of how it should be structured. When you are finished, compile the completed flow chart and distribute it to all team members.

Top-Down Flow Chart

There are several types of flow charts. The simplest is the *Top-Down Flow Chart*, a diagram that briefly describes the steps in the process and connects them with arrows. Major steps are placed in boxes across the top of the page, then individual sub-processes are listed below each box. (See the diagram on page 58.)

You will usually find that processes can be divided into from five to ten obvious units. If you find that you have defined more than ten sub-processes, the operational definitions should be reconsidered. In the Top-Down listing, the team may include key words or phrases that help explain or characterize the major steps.



The Top-Down Flow Chart is not intended to convey much detail. Rather, it's designed to provide a first look at the way the process is currently operating. By visualizing the big picture, the chart helps the team narrow its focus to the individual inputs that produce the bottleneck or constraint. Once the input has been identified, the team can elaborate any portion of the chart that requires a more
complete description.

Detailed Flow Chart

The *Detailed Flow Chart* digs deeper to reveal more information. Symbols are used to denote certain events.

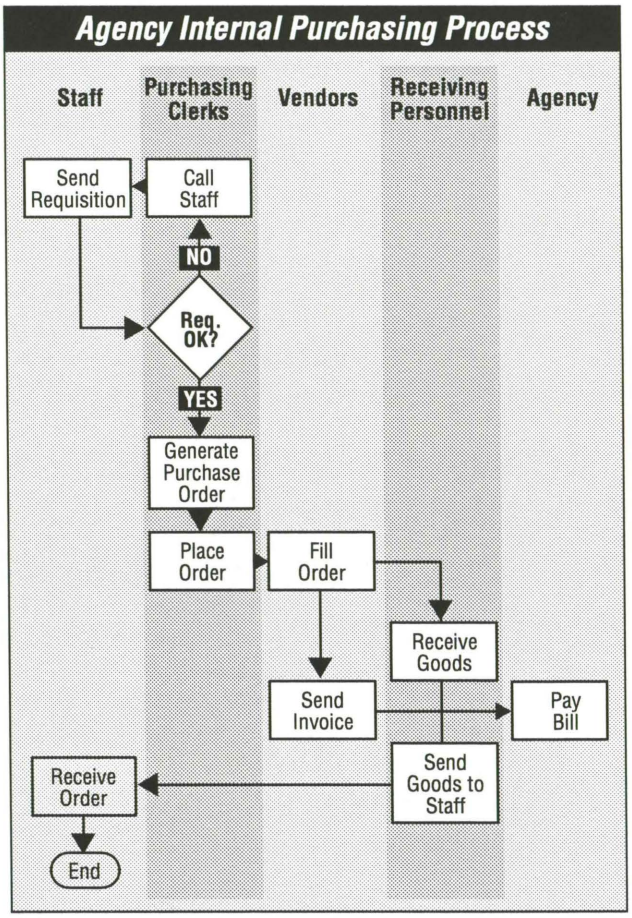
- **Oval -** the beginning or end of a process
- **Box/Rectangle** - the performance of a task
- **Diamond** - a decision-making step

If a yes/no decision must be made, the flow chart will usually show alternate paths coming from a diamond-shaped symbol. One series of events may begin if a yes decision is reached, while a different sequence unfolds if the answer is no. It may be desirable to include pertinent information, such as the five inputs or the cost and time expended, next to each step in the process.

Detailed Flow Charts sometimes list dozens of individual steps. To fit the information on a sheet of paper, you may have be creative. The example on page 59 shows that a chart can reverse its direction.

Deployment Flow Chart

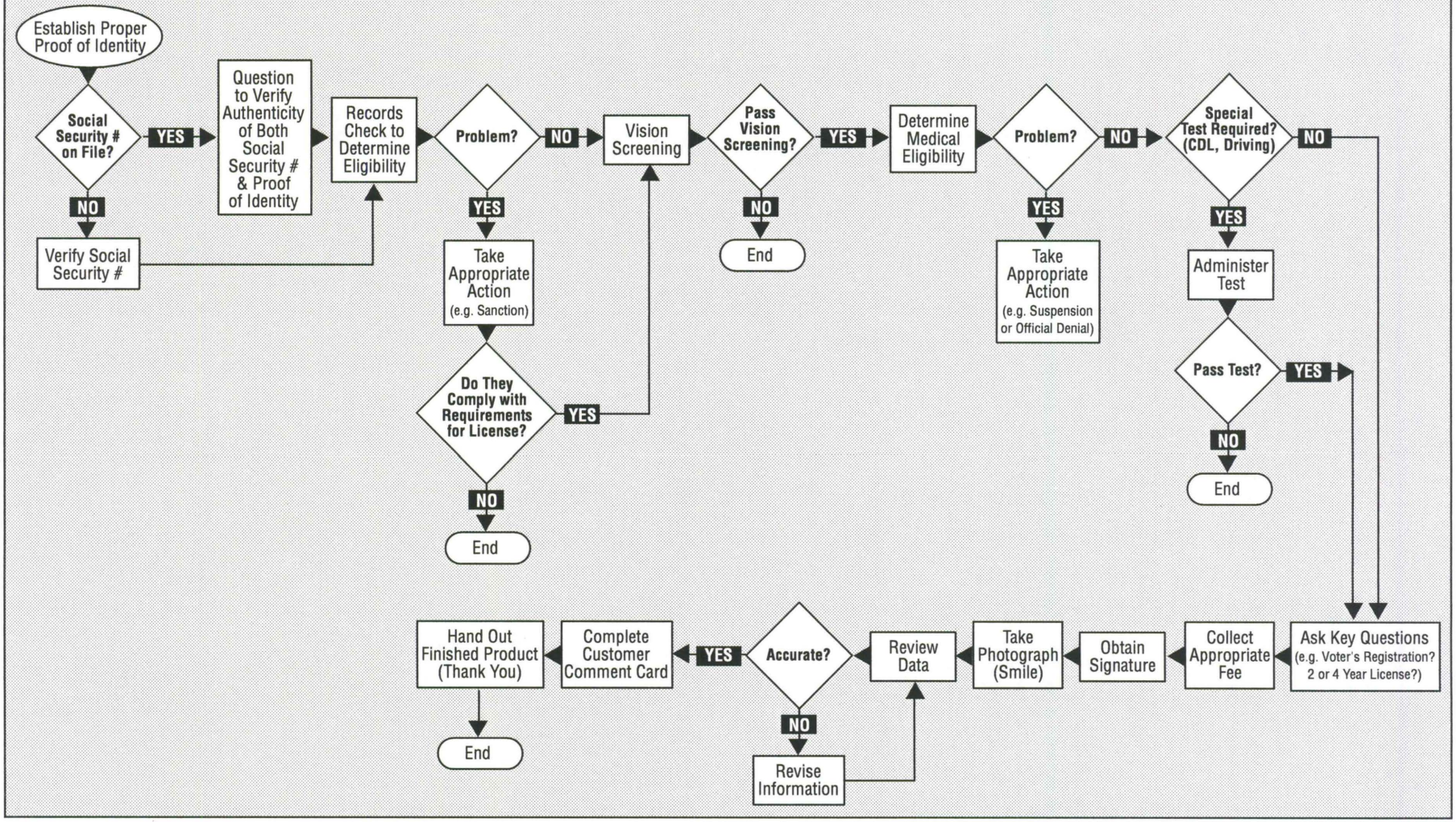
A *Deployment Flow Chart* combines the things that happen in a process with the people responsible for them. It provides information about who is supposed to do what, and how each person's responsibilities relate to the overall process. First, list the positions involved across the top of the chart, then diagram specific steps or tasks in appropriate columns.



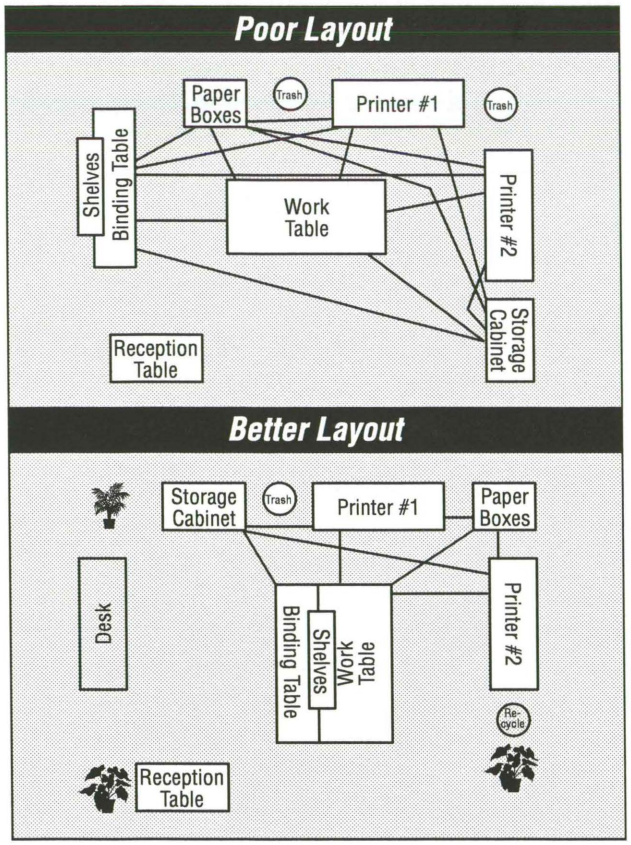
Workplace Flow Chart

Sometimes waste is caused, or complexity is created, by poor use of space. A *Workplace Flow Chart* is a map or bird's-eye view of the environment—the place where work occurs. The locations of boxes in the diagram correspond to the relative positions of work stations. Arrows trace the physical movements of inputs and outputs as they cycle from location to location or desk to desk. The purpose is to help spot environmental bottlenecks and identify ways to rearrange and simplify the physical logistics. (See the diagram on page 60.)

Driver's License Issuance Detailed Flow Chart



WORKPLACE FLOW CHART



Interpreting Flowcharts

Flow charts help teams discover where and when a process can be improved. It's usually best to include only as much detail as the team really needs. The team does not want to waste time trying to nail down exact details that do not help them understand or improve the process.

Though flow charts can help improve effectiveness, efficiency is usually the target. Many of our processes have lost all track of time, so that the amount of time that work is "in process" has nothing to do with the time required to accomplish the task. Several researchers have observed that as little as one-percent of the elapsed time is invested in actual work. For example, processing a claim usually involves about 30 minutes of work, but typically takes a month to complete.

One of your improvement efforts will probably involve reducing the cycle time. Taking time out of a process enables you to be fast, flexible and responsive in an ever-changing environment characterized by increasing customer demands. As you speed the process to completion, efficiency improves, but so does effectiveness. When less time is spent putting things down and picking them up again, there are fewer mistakes and less need for rework and inspection.

When you examine the flow chart you have created, look for unnecessary or out-moded steps, circle-back loops which may indicate re-work, and places where disparities between work time and elapsed time indicate complexity or bureaucracy. Also look for barriers that prevent the process from producing a high-quality output.

Remember that a flowchart MUST reflect today's reality, not someone's idea of the way the process should work. When the team diagrams how the process is actually working, they often discover things that have been nagging them for a long time. They may say: "Why are we doing it this way? It doesn't make any sense." The most common answer is: "Because that's the way we've always done it." This is an opportunity for the team to make an immediate recommendation for improvement. As important as it is to have supporting data before making a major decision, sometimes you just have to fix the obvious.

After creating a flow chart of the process, the team can apply these common-sense questions to spot improvement opportunities:

- Can this step be eliminated?
- Can this step be combined with others?
- Can the job be done in a different way?
- Can some steps be performed at the same time rather than in sequence?
- Can we complete one output at a time rather than batching at each step?
- Does this step occur at the right place in the sequence?
- Can a supplier or customer perform this task?
- What assumptions about process design led to this step?
- What can be done upstream to allow the elimination of this step?
- What can go wrong at this point in the process?
- What can happen to delay the output?
- If something goes wrong, how does it affect the output and result?
- How long does this step take?
- How much does it cost?

If, after completing this part of the problem solving sequence, desired results are achieved, proceed to *Step 8 - Schedule Process Review*. If more information is needed to improve the process, the team's next task is to collect appropriate data.

Event #2 - Gather Process Data

If one listens carefully, the process will tell the team exactly how well it is performing. The voice of the process is heard through the collection and analysis of process data. The team will study the flow chart to determine what data should be gathered and where. The needed data will generally be the same as the process and output measures identified as important in Step 4. The question is: What will the team be looking for in this data? The answer is: Process Variation.

One of the key principles of process improvement is that variation within a process is the opposite of quality. Variation among the inputs to a process will produce corresponding output variations. An easy way to understand this concept is to think about the thermostat that controls the temperature in your home. You set the thermostat for 72 degrees. If the heat doesn't turn off until the temperature reaches 76, and won't come on again until it drops to 68, you're not going to be very comfortable. There's too much variation.

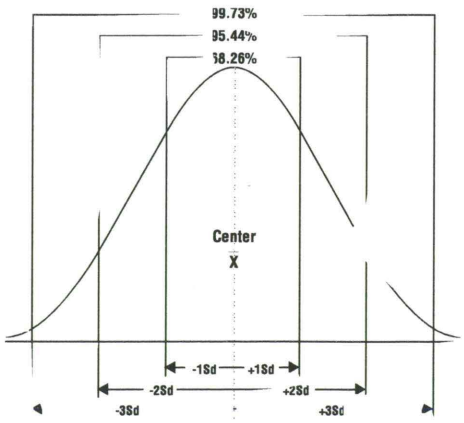
Variation in a process reduces the ability to predict its outcome. If a process has high variation, you are not sure what to expect, and lack of predictability is a lack of quality. If you receive a check for reimbursement in 14 days the first time and in 25 days the next time, you will be disappointed. Variation has robbed you of your expectations.

Although variation is not the only measure of quality, it is important to isolate and identify the causes of variation. There are two kinds of process variation:

- **Common Cause Variation** is that which is normal and expected—it's a natural part of the system. All processes involve some degree of variation related to the way the process is designed. This predictable variation will continue until the process is fundamentally changed in some way.
- **Special Cause Variation** is unusual and unexpected. It occurs when one of the inputs changes for some reason. Special causes can include a 100-year flood, new workers on the job, a prison riot, or equipment that breaks down. The consequences were not anticipated by those who designed the system.

Special cause variation is not always bad. Sometimes it actually improves the performance of the process. But if the special cause is not identified and built in as part of the process, the potential benefit of the special cause will go unrealized.

When a process is operating normally, only common causes of variation—those designed into the process itself—are occurring. With only common causes of variation operating, 99.7% of the observations will fall within a certain range from the numerical average of the process data. This is known as the "normal distribution" of data and is represented by a normal distribution curve. A normal distribution is symmetrical, meaning that the left half is a mirror image of the right half. You may have heard it called a bell-shaped curve.



If a process produces a normal data distribution, you can predict the performance with almost 100% accuracy. You can predict, for example, how long it will take for a check to mail, how many students will drop out of school, or the number of errors in a typical report. The data points will fall within plus-or-minus three standard deviations of the mean, or average, of the data.

A *standard deviation* is simply a measure of the spread of the data. Are data points clustered tightly or are they widely dispersed? Based on the data spread, one can statistically calculate the range that 99.7% of the data points will fall within.

When special cause variation is present, the process is said to be unstable and one cannot predict its performance with any degree of certainty. Performance will remain unpredictable until the special cause is removed—if it hinders performance—or is built into the process—if it improves performance.

Why is it important to recognize the kind of variation that is occurring within the process? Because the improvement strategies the team selects will depend very much on the type of variation present. Too often we respond to common cause variation as though it were special cause. We tinker with the process by manipulating the inputs, hoping something will work, when the variation is actually due to the process itself. This is known as "tampering".

Common cause variation cannot be managed. To reduce common cause variation you have to redesign one of the inputs—buy new equipment, create a new method, provide consistent training. So, if common cause variation is the problem, don't hover over the thermostat, buy a new one.

Types of Data

There are two kinds of data that the team can gather:

- **Attribute Data** is produced by counting things. The operational definition may be stated in terms of yes or no, pass or fail, hit or miss. Attribute data is expressed in whole numbers, because only a limited number of observations are possible. The delivery was either late or it arrived on time. The trash can at the campground was either emptied or it was not. The facility either passed the inspection or it failed.

- **Variable Data** is produced by measuring things. The quality-defining feature may be size, strength, time, or any characteristic exhibiting a range of measurable values. One person renewed their driver's license in 17.5 minutes. The next customer received the desired result in 19.1 minutes. If there is reason to do so, variable data can be converted into attribute data by dividing measurements into categories—those who had their license renewed in 10-15 minutes, 15-20 minutes, 20-25 minutes, and so on.

The kind of data you need will depend upon the individual process and the nature of its output. Once the variation to be studied has been determined—such as customer wait time—the team is ready to gather data. If a data collection system does not already exist, you will need to design a measurement instrument such as a check sheet and begin gathering data.

TOOL

A **Check Sheet** makes it easy to compile and analyze attribute data so that patterns and trends can be clearly detected. Often it is used to record how often an event occurs within a designated period of time. Information is usually collected as events happen. Less frequently, check sheets are used to record events that have already occurred. Although data gathering sheets are intended mainly to track rather than to analyze data, a quick glance often indicates why a problem is occurring.

Various kinds of data can be recorded with a check sheet:

- Number of times something happens or does not happen
- Length of time it takes to get something done
- Cost of a certain operation over a period of time
- Impact of an action over a period of time

The example shown on page 63 represents the length of time customers spend waiting in line. From the time notations shown, it appears that the team is only concerned about customers who arrive during the first hour of the day.

CHECK SHEET

Process: Driver's License Issuance
Process Attribute: Wait In Line
Person(s) Gathering Data: John Sullivan

Date	Arrived	Served	Minutes	Comments
3/3	8:00	8:10	10	
	8:10	8:12	2	
	8:15	8:20	5	
	8:16	8:30	14	
	8:22	8:32	10	
	8:30	8:35	5	
	8:33	8:42	9	
	8:40	8:50	10	
	8:46	8:59	13	
	8:54	9:15	21	computer delay
3/4	8:00	8:01	1	
	8:00	8:10	10	
	8:15	8:30	15	
	8:20	8:32	12	
	8:30	8:40	10	
	8:35	8:42	7	
	8:42	8:55	13	
	8:55	9:10	15	
	8:56	9:12	16	
	8:58	9:20	22	computer delay

How To Use It

There are two questions that must be answered when setting up a data gathering sheet:

- What does the team want to know?
- What is the best way to collect the data?

Check sheet data is usually collected by categories, such as work unit, division, date, shift, and so on. When creating a data gathering sheet, make sure that the categories are logical and easily understood. This is important not only for the people who will be interpreting the data, but also for those who use the sheet to collect it. They should not have to make difficult judgments about when and where to enter information on the form. To plan the data collection activity, develop a format like the example shown.

Data Gathering Format

Data: Minutes from the time a customer enters the office until he/she is served by a representative, rounded to the nearest minute

Person: Receptionist will record data

Equipment: Desk clock

Method: Observe customers, observe clock

Material: Check sheet

Environment: Reception area

Duration: Four weeks, Monday through Friday, from 8:00 to 9:00 a.m.

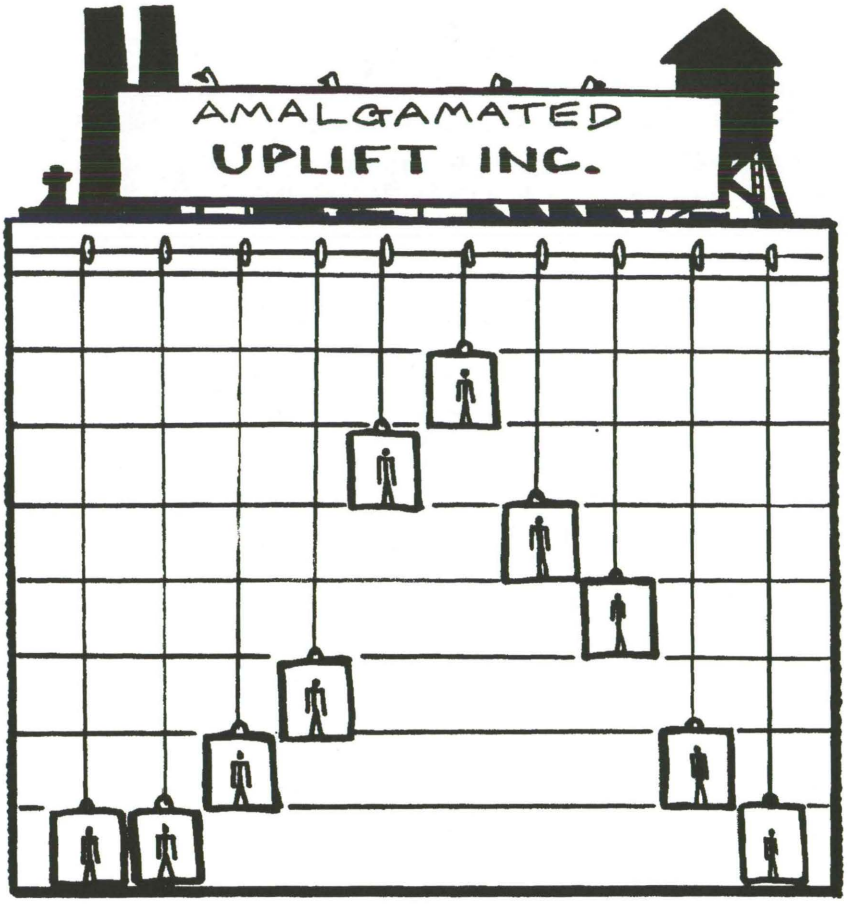
Remember, design a check sheet that is clear, complete, and easy to use. Then make sure that the data is collected consistently and accurately.

Sample Size

One question the team may ask is: How much data do we need? The general rule is to measure or count at least 10% of the population, if that's possible. A *population* is defined as the universe or entirety of something, such as all of the outputs produced in a given period of time. If 1,000 claims are processed every week, for example, you should ideally gather data on 100 of them.

The 10% rule does not work in every situation. If the population is 1,000,000, for example, a 10% sample is both unrealistic and unnecessary. National public opinion surveys, representing the views of 250 million Americans, are frequently conducted with fewer than 2,000 interviews. That sample size is less than 1% of 1%, yet the statistical margin of error is less than 4%. Even if you are working with a very large population, a sample of 200 should be adequate.

In terms of percentage, small populations require larger samples. If the population is 100 or less, a one-third sample should give you a fairly good picture. In any case, to make any kind of valid statistical analysis, you will need at least 20 observations. Remember that data collection is not necessarily a one-time event. You may have to go back for more.



A data point outside the normal range of the histogram represents a special cause of variation.

Random sampling is the only correct way to gather data. A random sample is one in which every item in the population has an equal opportunity to be selected. You cannot, for example, extract a random sample of files in a drawer by pulling every 10th file. Most people close their eyes and pull files from different parts of the drawer, and that's a reasonably good method. If you want to be mathematically correct, use a random number table. Your team facilitator will tell you how it's done.

Various types of charts and graphs are used to display data in ways that allow for its analysis. A histogram is one such graph.

TOOL

A **Histogram** is a statistical tool that helps identify the kind of variation that is occurring within a process. Constructed from a data distribution, it's a graph that shows the relative frequency of certain occurrences.

How To Use It

Example #1 - Attribute Data

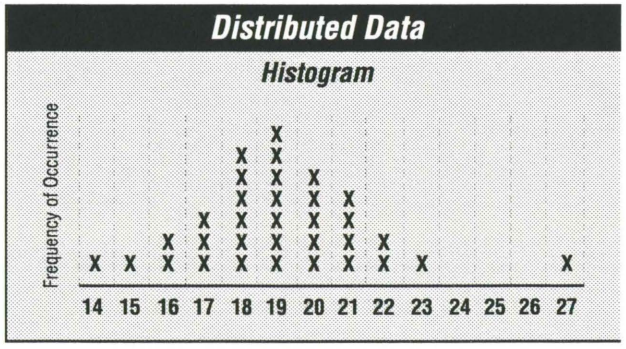
Histograms are made from attribute data, or from variable data that has been grouped into attribute categories. For the purposes of this example, let's suppose that the following data set represents the number of elevators inspected on each of 33 days. It could be the number of manure lagoons permitted in each of 33 weeks, or the number of days required to close each of 33 case files.

Elevators Inspected Daily

RAW DATA

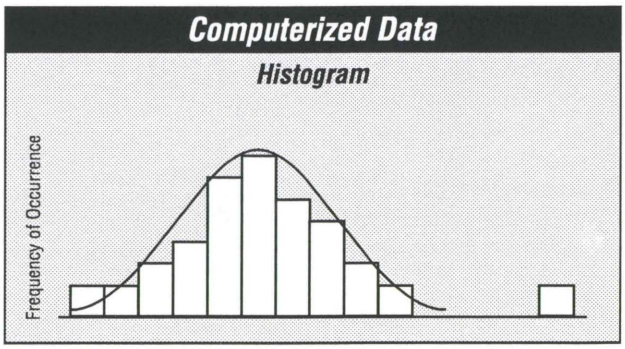
19	15	20
18	19	19
21	21	16
17	23	18
20	17	27
19	20	19
16	14	21
22	18	17
18	21	20
20	19	18
22	18	19

You can use a sheet of ruled paper to make a simple histogram of this data. Turn the paper sideways so that the lines form columns. Scan the data to determine the smallest and largest numbers—they are 14 and 27. Write each number from 14 to 27 in a separate column below a baseline, then start plotting Xs in the columns as you cross off the numbers in the data set.



Distributed Data

The picture you have created, produced by stacking Xs, is commonly referred to as a frequency plot. A formal histogram is a bar graph that conveys the same information—the height of each column represents the frequency of the observation. When produced by a computer, your histogram will look more professional.



Example 2 - Variable Data

Histograms are always made from attribute data—the kind produced by counting. If the team gathered variable data—the kind produced by measuring—it will be necessary to divide the measurements into a number of classes. Suppose, for example, that we encounter the following set of measurements:

5.31	5.57	5.78
5.39	5.61	5.80
5.42	5.62	5.83
5.45	5.66	5.83
5.47	5.69	5.84
5.48	5.73	5.86
5.50	5.74	5.88
5.51	5.75	5.92
5.54	5.76	5.95
5.56	5.77	6.00

To make this example easier, the 30 data points have been arranged in ascending order from 5.31 to 6.00. The range of the data is the difference between the highest and lowest values.

Data Range = 6.00 - 5.31 = .69

The range of the Histogram is always the range of the data plus one unit.

Data Range	.69
Histogram Range	.70

The reason for this strange arithmetic will be apparent in a moment. The next step is to divide the histogram range into equal-size classes, if possible. Conveniently, .70 is a number equally divisible by both .07 and .10. Because more classes provide a sharper image, we will use the .07 range to create ten classes.

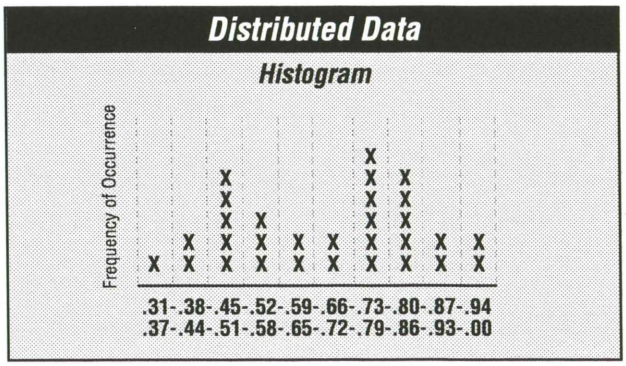
5.31 - 5.37	5.66 - 5.72
5.38 - 5.44	5.73 - 5.79
5.45 - 5.51	5.80 - 5.86
5.52 - 5.58	5.87 - 5.93
5.59 - 5.65	5.94 - 6.00

At first glance this may be confusing, because the range of each class appears to be .06 rather than .07. If you count each possible value, however, you will see that there really are seven possible measures within the data range of .06.

1	5.31
2	5.32
3	5.33
4	5.34
5	5.35
6	5.36
7	5.37

By adding one digit to the data range, we have divided .69 into ten uniform classes of .07. If the histogram range had been .73—a prime number not divisible by anything but itself and .01—there would have been ten classes of .07 and one of .03.

This is getting tedious, but hang on, we are finally ready to plot the histogram, and it looks like this:



Interpreting Histograms

These two examples give us entirely different pictures. In the first example, we have a neat pyramid of numbers with only one data point loitering by itself on the right edge of the histogram. In the second example, there are no loiterers, but there are two peaks and a valley in between. What does it all mean?

To help understand these pictures, we need to find the centers of the two distributions. There are four measures of *central tendency*. The *mode* is the number which appears most often, the *median* is the physical center of the data, the *mean* is the numerical average, and the *mid-range* is half way from the high to low.

The mode is easy—it's the tallest column of the histogram. In example #1, it is 19, and in #2, it is class 5.73-5.79. To simplify the comparison, we'll average the class range for example #2.

	Example #1	Example #2
Mode	19	5.76

The median is found by dividing the distribution into two equal parts. In example #1, there are 33 data points, so there must be 16 on one side, 16 on the other, and one in the middle. Counting from either end of the histogram, number 17 is the middle X in the 19 column. In example #2, there are 30 data points, so the median is the average of the 15th and 16th numbers—5.69 and 5.73.

	Example #1	Example #2
Mode	19	5.76
Median	19	5.71

The mean is the average of the raw data. In example #1, the numbers in the distribution add up to 631, so that sum is divided by 33. In example #2, the measurements add up to 170.22, so that total is divided that by 30.

	Example #1	Example #2
Mode	19	5.76
Median	19	5.71
Mean	19.12	5.67

The mid-range is easy to find. In example #1, the data ranges from 14 to 27. In example #2, the range is from 5.31 to 6.00. All that needs to be done is to split the difference. And now we're finished.

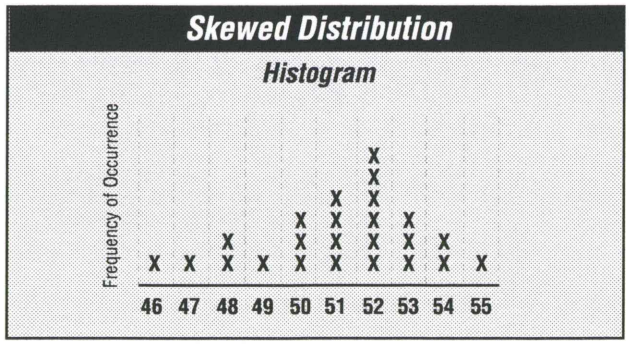
	Example #1	Example #2
Mode	19	5.76
Median	19	5.71
Mean	19.12	5.67
Mid-Range	20.5	5.66

Whenever the four measures of central tendency are nearly the same, it is usually safe to conclude that you are looking at a *normal distribution*. That's because normal distributions are symmetrical—the two halves are almost the same. If a distribution is really normal, it means that only common causes of variation are occurring. However, numbers by themselves can sometimes be deceiving. The only way to actually understand what is going on inside the process is to construct a histogram and look at it.

In example #1, the value of 27 is sitting by itself on the right edge of the histogram. It could be a random occurrence, but it's more likely that this observation represents a special cause of variation.

Example #2 is *bimodal*—the graph has two peaks with a valley in the middle. It's as though two normal distributions have been squeezed together. There must be two of something in this process—two groups of persons, or two kinds of equipment, or two types of material, or two methods, or two environments. And whatever it is, one input is better than the other. Whenever a histogram looks like #2, we can be certain that one of the inputs is a special cause.

In addition to normal and bimodal distributions, there is a third histogram shape worth noting—the *skewed* distribution. In the following example, the mode is located near one edge of the range, and the data points trail off in the opposite direction.



A small amount of a skew may be normal, particularly if the sample is small. Whenever the shape is pronounced, however, it indicates that a special cause of variation is at work. One possibility is that the process changed while the data was being collected. In that case, the variation is normal, but the center of the process moved and left a trail behind. Another possibility is that the center is stable, but a special cause is tossing extreme values in one direction.

We now have three ways to detect special variation.

- A normal shape with one or more points outside the normal range
- A bimodal shape
- A skewed shape

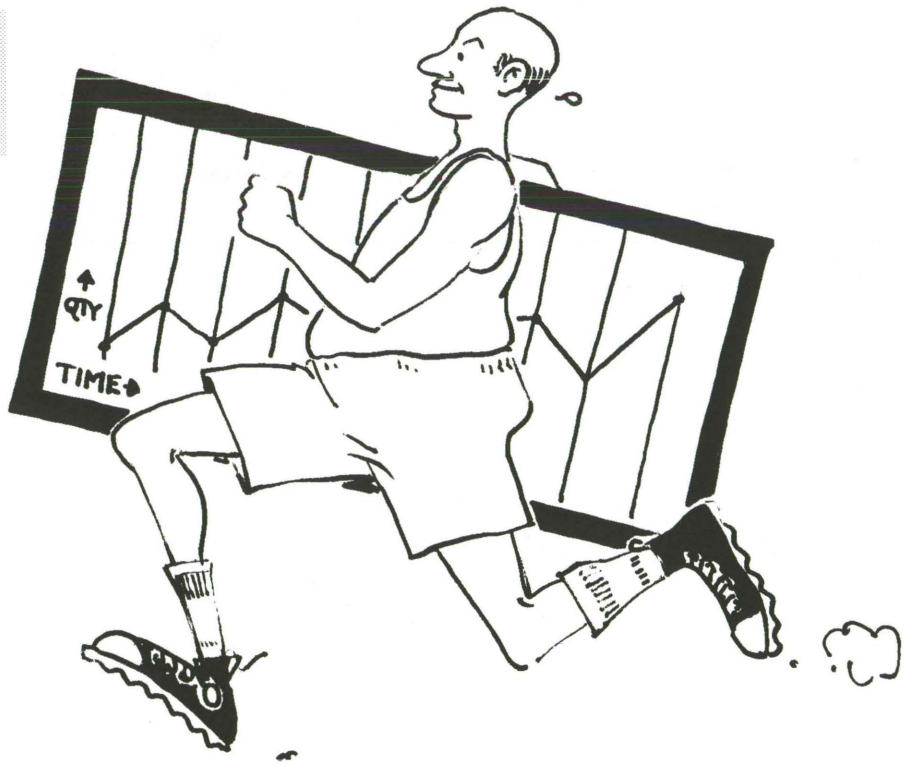
TOOL

A **Run Chart** is a tool that displays trends over a period of time. You might think of the histogram as a snapshot—a composite view representing a week, month, or year. By comparison, the run chart is like a movie—you can see the action unfold.

How To Use It

A run chart is a line graph formed by connecting a series of dots. The dots could represent attribute data, like the number of late arrivals each day or week. If the data is variable, each dot could represent the average of the data collected during each time period. The unifying concept is that things take place, and data is collected, at intervals.

The Run Chart is not part of a fitness regime.



To construct a run chart, you will need about 25 data points. The skewed histogram shown earlier was made from 25 pieces of data, so let's use that set of numbers to test a hypothesis. One explanation for the skewed histogram is that the center of the process shifted during the time represented by the sample. The histogram snapshot does not reveal if that's really the case, but the run chart will. Here is the sequence of observations:

RAW DATA

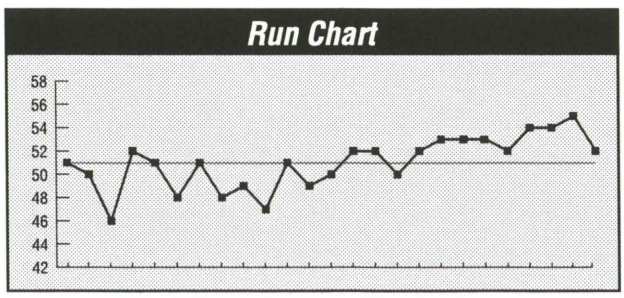
51	47	53
50	51	53
46	49	53
52	50	52
51	52	54
48	52	54
51	50	55
48	52	52
49		

- On the vertical axis, plot a scale that encompasses the range of the data—in this case, from 46 to 55. If you want to continue using the run chart by adding more observations in the future, make the vertical scale larger. You may encounter values that are higher or lower than those already observed, so be sure there is room on the scale to plot those numbers.

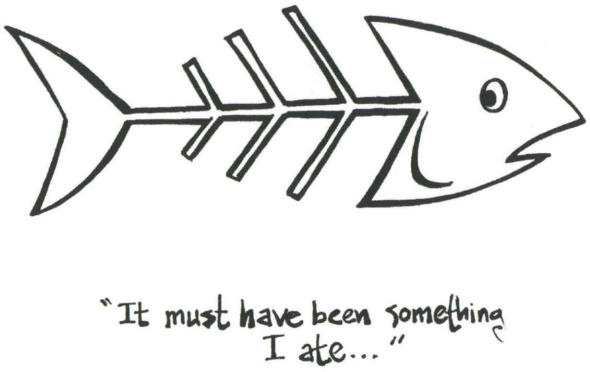
- Plot the time scale—in this case, 25 intervals—on the horizontal axis, leaving room for more intervals if desired.

- Now plot the data points on the graph and connect them. The data must be entered on the chart in the order collected.

- Finally, calculate the numerical average of the data points—the mean—and plot that as a horizontal line through the middle of the graph. In this example, the mean is 51.



The Fishbone Diagram helps isolate the cause.



Interpreting Run Charts

The run chart reveals trends and shifts over time. In our example, it's easy to see what happened. If the process were stable, we would expect to see a random pattern of data points falling above and below the line. But that's not what happened.

The chart shows that 12 of the first 13 data points are at or below the mean, while 11 of the final 12 points are above the mean. When seven or more points "run" on one side of the mean, it is probably not a random occurrence. When 11 of 12 are one side of the mean, you can be 99.9% certain that the process shifted during the time period represented by the skewed histogram. A special cause of variation has been detected, and special causes should always be investigated. If the shift is favorable, its cause should be made a permanent part of the process. If it is unfavorable, the cause should be eliminated.

A string of points above or below the mean is one indicator of special cause variation, but there are others. For example, a run of seven or more points increasing or decreasing, with no reversals, is seldom a random event.

Event #3 - Analyze Data and Determine Causes

If there is a bottleneck in the process, or if it exhibits high variation, there must be a cause.

TOOL

The **Cause & Effect Diagram** helps the team identify all possible causes that may be contributing to the variation or bottleneck. The discipline imposed by the construction of the diagram forces the team to leave no stone unturned in its search for the leading cause. Looking at the histogram they have created, the team will ask: "What inputs might be responsible for the variation we observe?" Brainstorming techniques will be used to help the team capture the profound knowledge of its members.

How To Use It

To construct the diagram, place the effect represented by the long leg of the Pareto in a box on the right hand side of the writing surface. Allow plenty of space. On the left, pointing to the effect, draw an arrow for each of the five inputs categories, one or more of which must be causing the problem. On lines running out from each arrow, list the brainstormed or data-based causes in the appropriate categories. The team should continue brainstorming possible causes of the effect until everyone has run out of ideas.

The resulting picture is sometimes call a "fishbone diagram" because its branching lines resemble the skeleton of a fish. The example (shown on page 70) represents the "Getting Ready for Work" process described in Chapter 1.

The cause & effect diagram should be as inclusive as the team can make it. The process being studied may involve a number of methods, or a single method with a variety of features. There may be several kinds of materials, and the process may operate under a number of environmental conditions that could influence the output.

The cause & effect diagram requires the team to think logically and comprehensively. Team members must sift through their knowledge of the process for all the possible causes, not just the most obvious ones. In the absence of this tool, teams have a tendency to focus on the Person and Equipment. The cause & effect diagram assures that nothing is overlooked.

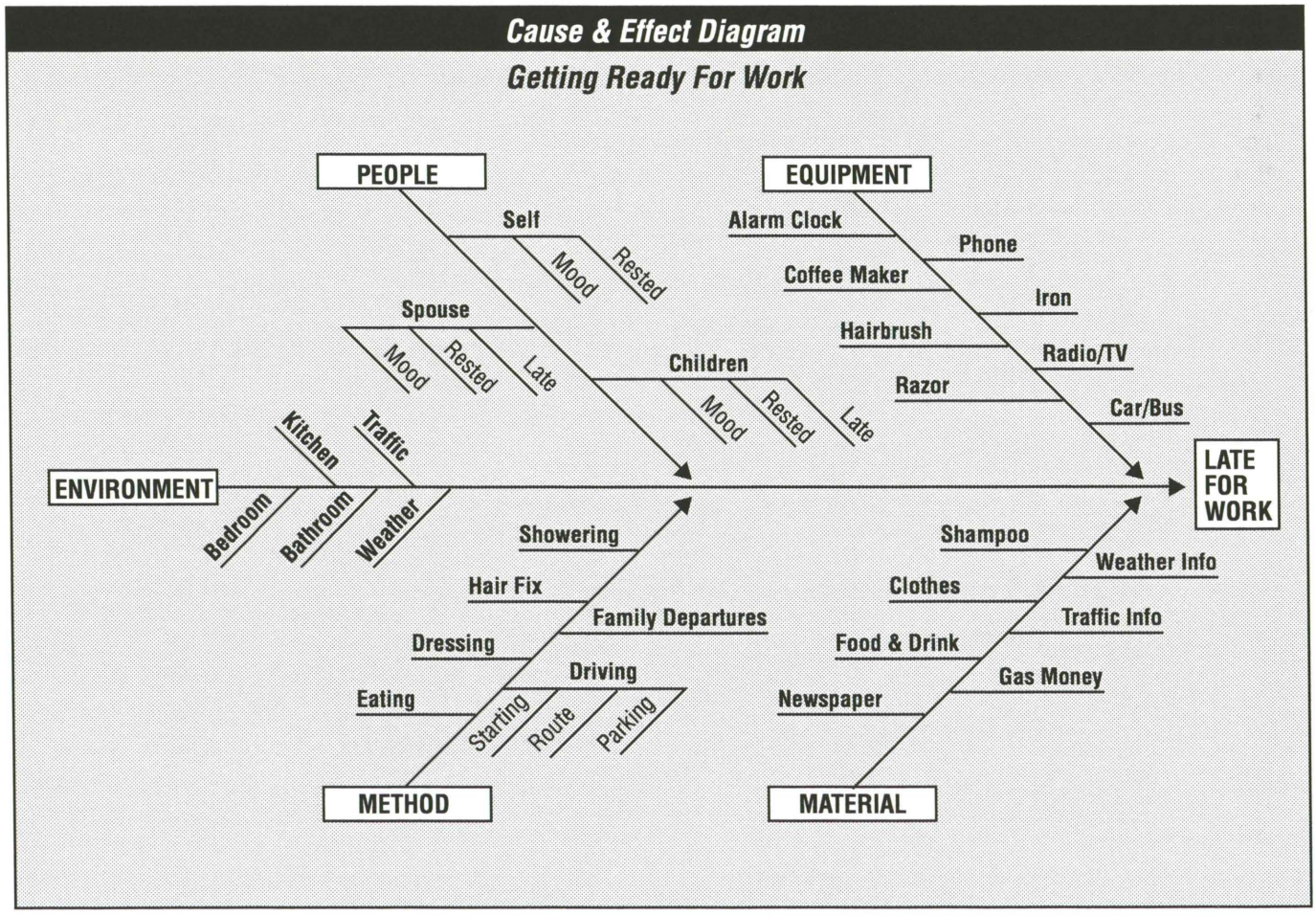
When all possible causes have been listed, the team will select what it believes to be the most significant or most likely cause of the problem. When the team leader has assigned a letter code to each branch of the cause & effect diagram, multi-voting begins.

Here is an appropriate method:

- Count all of the items on the branches and divide by three (N/3)
- Assign N/3 votes to each team member
- Members can vote by raising their hands or by listing letter codes on slips of paper. If you prefer, have members come forward and put hash marks next to items on the posted diagram.
- Tally the votes for each item. List the leading vote getters on another sheet and vote again.

Before the final vote is taken, the team may want to discuss the preliminary results. On the first ballot, certain causes were judged more significant than others. Do team members want to give their reasons for choosing particular causes? Perhaps the leader should encourage members to express their views. The strategy may depend on the dynamics of the group. If there is an open discussion, it is important that all team members be heard. Refer to page 39 for more information about multi-voting techniques.

When the final ballot is tallied, the team should construct a *Pareto of Consensus* using the method described on page 40. The top five or six causes are listed from most likely or significant to least likely or significant. The team must then reach a consensus that the long leg of the Pareto is the cause that should be investigated first.



TOOL

The **Why? Technique** is another tool that can help a team discover the root cause of a problem. By asking "Why?" a number of times in succession, you can peel back the layers of the problem to discover the underlying cause. Keep probing until the cause becomes obvious.

How To Use It

State the problem or the effect the team is addressing. Write it on a flip chart and place it where everyone can see it. Ask the team why this problem or situation exists. For example:

Why? #1. Why are supply orders not filled on time? Because the supplies are not in stock.

Why? #2. Why aren't the supplies in stock? Because the supply shipment has not been received.

Why? #3. Why hasn't the supply shipment been received? Because the order was placed late.

Why? #4. Why was the order placed late? Because it takes three weeks to get a supply request approved.

Why? #5. Why does it take three weeks to get a supply request approved? Because five approval signatures are required and the form is in transit for 12 days going from one approval authority to another.

Once the team has identified the root cause, they can begin to develop strategies to remove the cause if it hinders performance, or build it into the process if it improves performance.

Event #4 - Develop and Try Out an Improvement Theory

The Pareto diagram helped isolate the process bottleneck, the histogram documented undesirable process variation, and the cause & effect diagram helped pin down the probable cause. It's now time for the team to initiate constructive action.

Respond to Special Cause

Remember, the team will respond differently depending on the type of variation--common cause or special cause--the process exhibits. The first action step is to remove the special cause of variation if it exists, or build it into the process if it improves performance. Special cause variation occurs when one of the inputs changes for some reason, so resolving it will make the system stable and predictable. It's also easier to identify than common cause variation and easier to eliminate because the process does not have to be redesigned.

An example of a special cause solution is to repair a piece of equipment that periodically breaks down. The team will know that the special cause has been removed when the histogram displays a normal shape. The process is now in control and predictable.

Respond to Common Cause

When special causes have been removed or incorporated, the team is ready to tackle the common cause variation produced by the process. Common causes represent inputs functioning normally at their present levels of capability. Suppose, for example, that instead of breaking down, which is an assignable and therefore special cause, the equipment continues functioning as it always has, but five percent of the output is defective.

Common cause variation can be hard to pin down. Perhaps it's not the machine's fault. What if the culprit is the material fed into the machine? It may take an experiment--a pilot test--to uncover the root cause. If the equipment yields the same performance regardless of the material used, a new machine is needed. To reduce common cause variation, fundamental changes in the process are required.

It's also important to note that when common cause variation is addressed, all data points are relevant, not just those that fall at the extreme edges of the data distribution. It's easy to detect that five percent of the output is defective. The problem is harder to solve when all of the output is good enough to ship, but none is as good as it should be. Reducing common cause variation often requires making all of the output a little better.

Basic methods for improving a stable system include:

- Disaggregate the Process. If you are not sure exactly where the problem lies, rely on the team's best guess--the top vote getter from the cause & effect Diagram. Divide the operation into sub-processes and change the most likely candidate. Whatever you change will involve stratification.

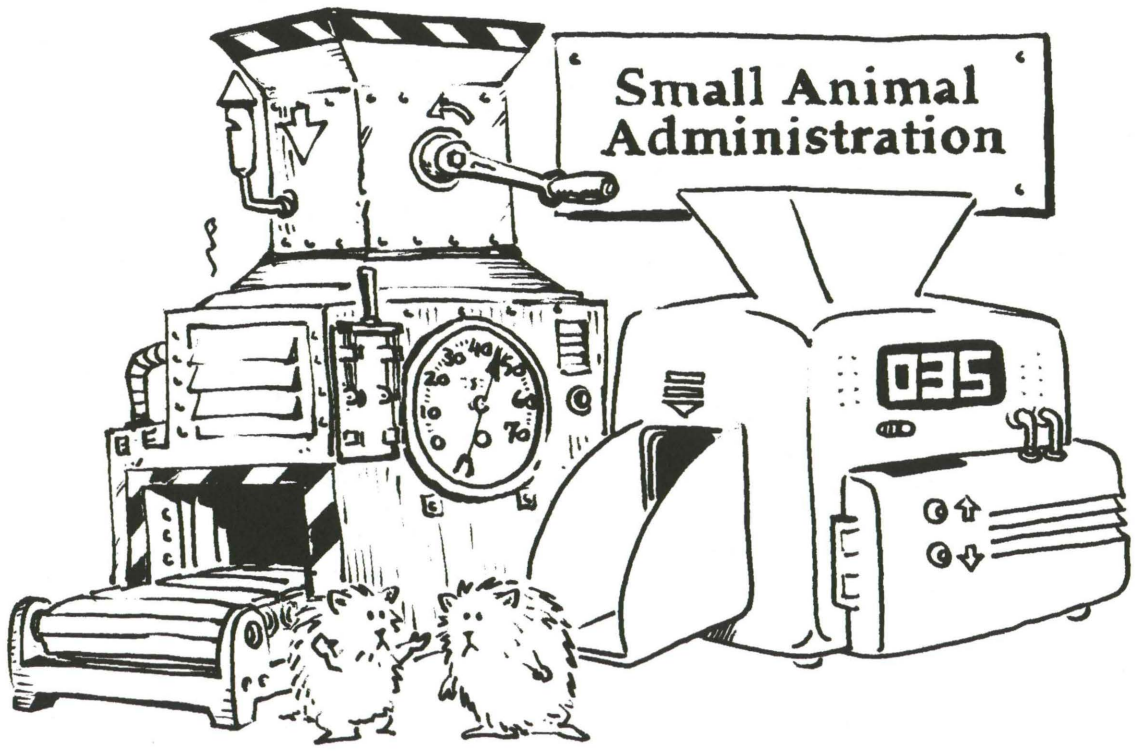
- Stratify the Inputs. Stratification requires the comparison of two competing inputs. You might try two types of material, for example, or similar material from two vendors. Does one of these produce a better result with the old equipment? Alternatively, you could borrow a new machine from a vendor and run it alongside the old machine using the current stock of material. Is the new input better?

- Try a New Method. People, equipment, and material cost money, but methods are sometimes free. If it doesn't cost much to test, compare a new method with the old. If failure is possible, however, plan to fail small.

Common causes can be subtle and elusive, which is why experiments are useful. You may never know exactly why one thing is better than another, so you'll have to rely on the data. Your pilot test will either justify the change, or launch you in pursuit of the second longest leg of the consensus Pareto.

When conducting an experiment, remember that you are looking for two statistical measures. One is the center of the data distribution and the other is its variation. Suppose, for example, that the service-counter waiting time averages 19 minutes with a range of plus-or-minus 6 minutes. That means some people wait 13 minutes and others 25. Perhaps by changing the process you can lower the average to 16 minutes. That's good, but if the range is now plus-or-minus 10, some people are waiting 26 minutes--a minute longer than before. Even though the center moved in a desirable direction, the variation increased. You may decide this is a desirable trade-off, but it is not a globally optimized solution.

Stratification compares output from alternative inputs.



Analog vs. Digital Gerbil Fluffers

Solution Identification

In their book *Reengineering Business Processes and People Systems*, Robert F. Lynch and Thomas J. Werner outline ways to identify solutions and include specific questions the team can ask as it looks at data from the process.

Does Team Composition Support Process Operation?

- Is the process owner identified?
- Is team composition appropriate to accomplish the process steps?
- Do we have smooth interaction and communication among team members?
- Do we have smooth hand-offs and information flow with the suppliers and customers of the process?

Do We have Accidental Bureaucracy?

- Do our policies and procedures support goals?
- Do we have redundant inspections or unnecessary sign-offs?
- Do we have task interference, where bureaucratic requirements prevent people from accomplishing their true mission?

Are We Duplicating Our Work?

- Would it help to have owners in charge of specific process steps?
- How about owners for particular process measures?
- Can we establish or improve central files?

Can We Simplify?

- Can we simplify our language, particularly when communicating with customers and suppliers?
- Can we keep paperwork simple, such as putting forms on one page with instructions on the back?
- Can we avoid asking for data, reports and responses we don't need?
- Can we eliminate completely unnecessary steps?

Can We Save?

- Do we have bottlenecks or delays? Do we know where they are?
- Can we perform steps in parallel rather than serially?
- Have we collected data on the causes of our delays?
- Have we challenged ourselves to cut process cycle time in half?

Can We Standardize?

- Do we have templates or boilerplates for the routine, repetitive aspects of our work?
- Have we defined how we are going to communicate with each other in terms of content, method, and frequency?
- Have we benchmarked ourselves on the best ways to do our work?

Can We Better Utilize Tools And Equipment?

- Is there any equipment that would reduce time, reduce mistakes, or help us better help our customers?
- Would new computer software, or training on existing software, help?
- Would new computer hardware, such as modems or scanners, help?
- Would tracking process performance in a spreadsheet or database help to improve the process?
- Have we only partially embraced the electronic world, causing our processes to remain inefficient?
- Is there sufficient availability of tools, checklists, and other job aids?
- Can we upgrade people's skills in the use of our equipment?
- Does the physical layout of equipment facilitate the work?

Write Improvement Theory

Once the team has decided on a cause, it will develop an improvement theory in the format: If _____, then _____. For example: "If we change the form and make it simpler, then fewer errors will occur." Or: "If we update customer information that has changed instead of reentering old data each time, then customer wait time will be reduced."

Having phrased the improvement theory, the team will develop detailed plans for carrying out the actions necessary to test the solution. A good tool to use here is the Gantt Chart.

TOOL

A **Gantt Chart** helps the team plan and implement its proposed solution. It documents what needs to be accomplished, by whom, and when. This tool can also be used later when the team is working to standardize an improvement.

How To Use It

- Brainstorm all the tasks that need to be carried out as part of the implementation.
- Assign responsibility for each task to a team member or other designated person, such as the process manager.
- Determine how much time each task will take, when it can be started, and when it should be completed.
- Enter this information on the chart, sequencing and overlapping the various steps as appropriate.

The example represents a team's test implementation of a new procedure manual. The Gantt chart can also be used as a tracking tool once implementation is underway. Notice the volume of information you can quickly absorb simply by looking at the chart.

Try Out Improvement Theory

With the Gantt chart in hand, the team is ready to try out its improvement theory. It's important that the solution is not rolled out through the entire agency until it has been adequately tested. The team will pilot the improvement theory on a small scale first.

Be sure to carry out the tests according to plan. This may involve training people on the use of new forms, new materials, or new methods. Be sure that those involved in the test know why it is being carried out and the importance of closely adhering to the plan.

Event #5 - Study the Results

Did it work? Is there less variation now? Did the center of the process move in the right direction? To answer these questions, you'll need fresh data. When evaluating for improved effectiveness and efficiency, be sure to use the same measures and data gathering methods that were used when the initial data was collected.

To prove that the improvement theory was correct, you want to be sure that the suspected cause did, in fact, produce the effect originally observed. This is done by showing that the effect does not occur, or is substantially reduced, when the cause is removed.

If the experiment was not a success, the team will return to the cause & effect diagram, reconsider its choices, and generate a new theory. If statistical evidence shows that the process was improved, the next step is to standardize the solution.

Gantt Chart

Schedule		Week Number								
Task	**Assigned To**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Submit draft for review	Team Leader									
Review draft	Review Committee									
Submit comments	Review Committee									
Revise manual based on feedback	Team									
Create camera-ready materials	Team Leader									
Print 100 copies of manual	Print Shop									
Circulate 100 copies to employees	Team Leader									

Event #6 - Standardize Improvements

It's time for the big rollout. The team will use the now familiar tools--top-down flow chart, detailed flow chart, deployment flow chart, Gantt chart--to communicate the necessary changes.

Document the performance measures you expect the new process to achieve and get input from those working in the process as the standards are developed. Make sure everyone understands how the new or revised process is supposed to work. If workers are expected to change things, they must have the necessary resources at their disposal. Make sure that measures are put in place at the appropriate spots to ensure that the process continues to achieve the new, improved standard.

Remember that employees work in the system, management works on the system. The leadership team must give the new process its full support. Communications from leaders must take into account the impacts that people in the agency will experience.

The tree diagram is also a useful tool at this stage. Its graphic representation of the new structure may help to showcase the broad objective. In this context, the tool can be used to display specific actions that can be taken to accomplish the goal.

Finally, provide appropriate training. People must know how to use the new equipment, methods, or materials. Make sure that they understand how to interpret the measures and how to respond if performance deteriorates. When group training is completed, be prepared to provide individual coaching if necessary.

Questions that will need to be answered include:

- Who is responsible for monitoring the new process?
- Whose responsibility is it to help those working in the new process?
- How will the leadership team get feedback if problems arise?
- Whose responsibility is it to respond to problems?
- How will incremental improvements continue to be made?

When a system is changed, some inputs are supportive and others act as barriers. The following tool helps analyze the contending forces.

TOOL

The **Force Field Analysis** identifies two sets of current forces--those that support or drive the implementation of change, and those that work against it. The tool helps reinforce the positives and eliminate the negatives. (See the diagram on page 76.)

How To Use It

- At the top of a large sheet of flip chart paper, define the ideal situation that you are trying to achieve.
- Divide the sheet in half vertically. On the top of the left-hand column, write "Driving Forces." Label the right-hand column "Restraining Forces."
- Brainstorm the forces that are driving the system toward the ideal situation, then list the forces that restrain movement toward that goal. The forces may be internal or external.
- Conduct an open discussion, then use a voting technique to prioritize the forces. It's usually best to focus on removing some of the barriers before pushing the positives. Investing too much energy in the driving forces at the outset can be counterproductive. That's because opponents may raise their level of resistance in response to your initiative. Answer the question: Which restraining force, if eliminated, will move us closest to the ideal state?

Force Field Analysis

Desired Change:
Improve the Effectiveness of Meetings

Driving Forces (+)		Restraining Forces (-)	
PRIORITY		PRIORITY	
3	Clear understanding of meeting objectives	6	No one trained in meeting management
2	Many are interested	7	People can't get away from their real work
2	People are frustrated with current meeting effectiveness	4	No clear purpose for meetings
2	Adequate meeting facilities	4	Insufficient meeting space
6	Management support	1	Not enough equipment
4	Training on how to conduct effective meetings	1	All meetings viewed as a waste of time
4	Availability of meeting facilitators		

Actions

1. Conduct training on effective meetings
2. Develop a clear purpose for each meeting
3. Purchase new PowerPoint equipment

- List the actions to be taken. Begin with strategies to reduce, eliminate, or reverse the effects of restraining forces, then discuss how the high-priority driving forces can be deployed to smooth the path toward change. Finally, implement the listed actions.

Some changes are easy to implement, but many are not. Implementing change often requires a series of actions that increase the chances that the desired change will occur. When the change has been standardized within the agency, leadership will establish a procedure by which the process can be continuously improved.

Event #7 - Plan for Continuous Improvement

The final step in the Problem Solving Model is to plan for continuous improvement. Both the improvement team and the guidance team will identify any additional steps that need to be taken and then implement them. An important part of continuous improvement is to share the team's learning throughout state government. A culture of continuous improvement is nurtured every time Iowa State Government takes another step toward becoming a learning organization.

A tool that will help pass knowledge on to others is the *RESULTS Book Template*. For a copy of this template, refer to the Forms Section of this guidebook. The team's information will be used to tell the agency's improvement story. Submit your completed template to your agency Quality Coordinator and a copy to the State Quality Coordinator for inclusion in the State's *RESULTS Book*.

Last But Not Least

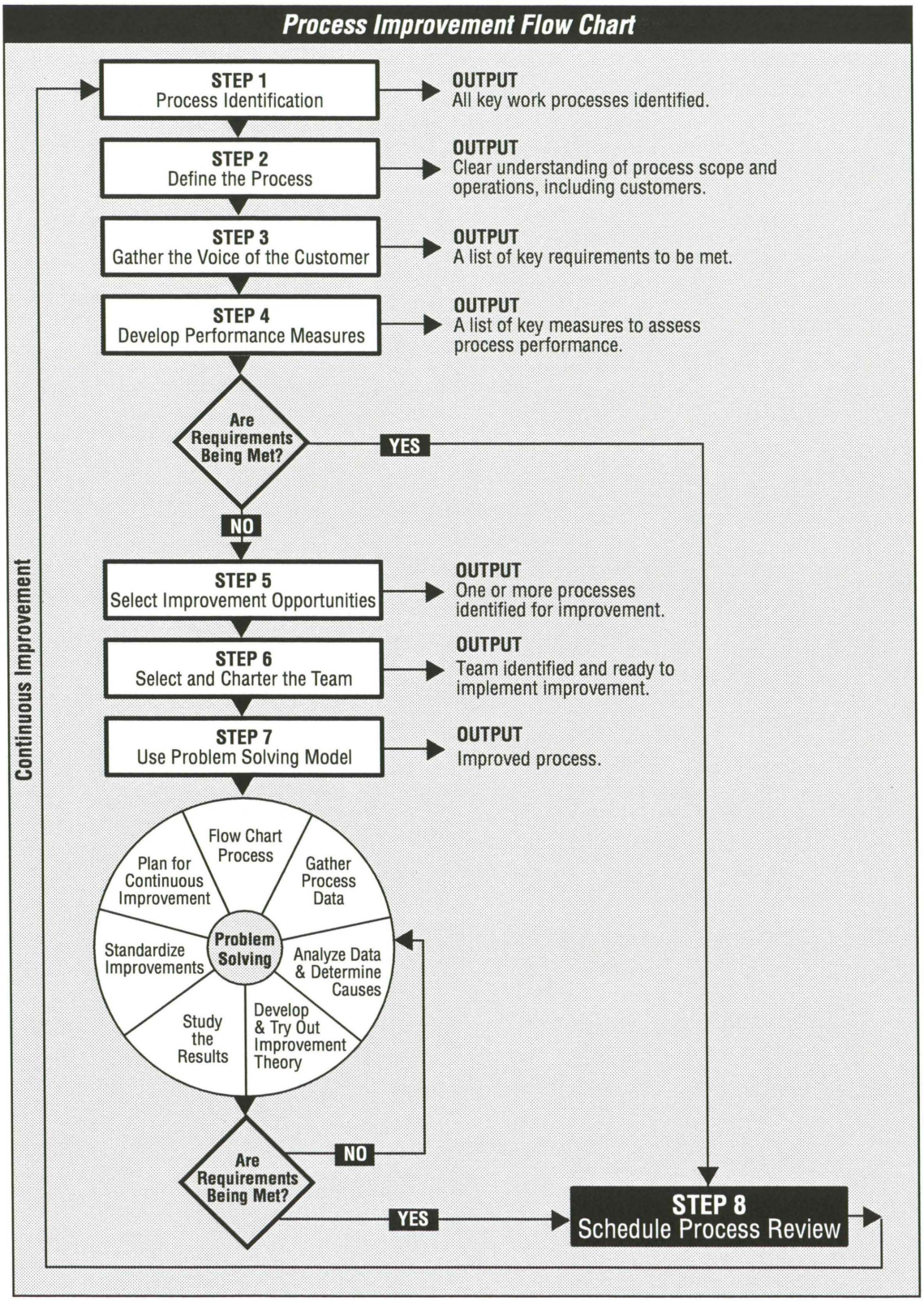
Though it's not an official part of the Problem Solving Model, one of the most important steps in process improvement is to CELEBRATE!!! For weeks or months, state employees have dedicated their time, talent, and energy to improving the services and products we provide to Iowans. Take time to celebrate the team in a manner that will recognize both their outstanding efforts and the critical impact they have made on improving services in Iowa State Government.

Summary

Using the Problem Solving Model described in this chapter, the improvement team gathered process data, analyzed causes, developed and tested an improvement theory, conducted a small scale test, and studied the results. When the pilot achieved the desired results, the improvement action was standardized agencywide.

For continuous improvement of the services and products of state government, it is important to periodically review the processes that produce them. *Step #8 - Process Review* will help ensure that processes continually meet or exceed customer and stakeholder requirements.

CHAPTER 8
SCHEDULE PROCESS REVIEW



To continuously improve your agency's products and services, it is important that you periodically review the processes that produce them. Set a schedule for review of each process based on the needs of your stakeholders, customers, agency, division, bureau or work unit.

The frequency of process review should be in direct relationship with the impact the process has on the agency. Time is a precious resource and should not be unnecessarily expended. A sample timeline for process review might look like this:

- Critical processes are reviewed monthly.
- Important processes are reviewed quarterly.
- Necessary processes are reviewed annually.

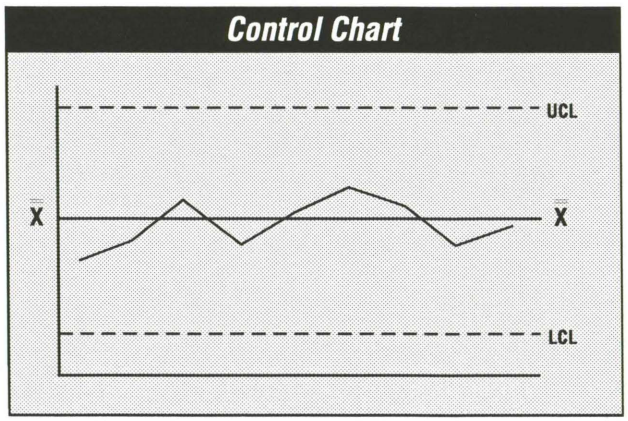
This is just one example of how often processes could be reviewed. Actual review schedules are developed by each agency, division, bureau or work unit based on their specific needs and available resources.

When reviewing a process, consider using a team approach that includes the process manager, the supervisor, others who work in the process, and both internal and external customers. The review should include an analysis of ongoing performance data.

The Forms Section includes examples of two review forms. The first form can be used to schedule process review for each individual work process, while the second form can be utilized to set a review schedule for all processes within an agency, division, bureau or work unit. This review will help ensure that the process is still adding value and that its effectiveness and efficiency are maintained over time.

There is one statistical tool that can be effectively used as part of an ongoing review process.

A **Control Chart** is similar to a run chart, but there are some differences. Run charts are usually drawn from attribute data representing complete populations, meaning that the values plotted encompass 100% of the things that happened, or that were available for measurement. Control charts, on the other hand, are derived from periodic samples that are much smaller than their populations.



One feature of the control chart is a pair of lines--the upper and lower control limits (UCL and LCL)--that are based on the *standard deviation*. This perplexing statistic is defined as the *square root of the mean of the squared deviations from the mean*, and even advanced college text books do not fully explain its theoretical basis. The important thing to know is that the standard deviation is the universal yardstick of process variation.

Mathematicians have proven that when a distribution is completely normal--meaning that only common cause variation exists--99.73% of the data will fall within three standard deviations of the mean.

If a piece of data is outside one of the control limits, there is less than one chance in 400 that it represents a random, and therefore meaningless, event. It almost always represents a special cause of variation.

When process teams begin their investigations, control charts are seldom used. That's because they are nothing more than detection devices, and a simple histogram can provide the same basic insight with much less arithmetic. Control charts are typically used when a process has been improved and management wants to monitor its progress over time. As more data is plotted, observers can spot unwanted causes of special variation that may be sneaking into the process. When the process loses stability and predictability, the control chart blows the whistle and the problem-solving team is reconvened.

How To Use It

There are many types of control charts. The choice of an appropriate chart depends on the type of data that is available--either attribute or variable--and by the quantity of data that can be conveniently and reliably collected.

Charts from Attribute Data

There are four basic kinds of attribute charts--*p, np, c, and u*--which can be grouped in pairs. p and np charts require that each unit of output be rejected or accepted, while u and c charts require only that defects be counted. Attribute charts can also be grouped in pairs according to the consistency of sample size--p and u charts permit variations is sample size, while np and c charts do not.

An attribute control chart would be an appropriate tool with which to monitor the number of customers who wait in line longer than the acceptable limit. To design a chart, an operational definition must be written to establish what constitutes a defect or rejection.

Charts from Variable Data

Control charts made from variable data incorporate two graphs--one representing the mean of the sample, the other its variation.

There are several basic kinds of variable control charts, three of which are commonly used. The $\overline{X}$-R chart (pronounced X-bar-R) requires that five pieces of data be collected at each monitoring interval. The five data points are averaged ($\overline{X}$ stands for mean) to provide a measure of the distribution's center. The range of the five points--R--is used as a measure of variation and is displayed on a separate graph.

The X-Sd chart is similar, but the standard deviation replaces the range as the measure of variation. Instead of 5 data points at each interval, samples of 15 or more are collected. Single points on the center chart represent the mean of the sample, and the standard deviation of each group is plotted on a separate graph. This chart is most often used by scientists and engineers.

The Mo-R chart (pronounced Mode-R) requires only one data point at each interval. There is no range per se, so the moving range--the difference between a data point and the one that precedes it, is used instead. Because this "individuals chart" uses so little data, it is chosen when single-point samples are the only kind available. That situation arises in manufacturing when for any unit of bulk commodity there is only one measure of strength, weight, acidity, etc.

Control Limits

A control chart cannot be constructed until at least twenty periodic samples have been taken. That's because a threshold of data is required before control limits can be calculated. The purpose of the chart is to observe process performance from that point on as each new sample is plotted.

Upper and lower control limits--UCL and LCL lines--are based on mathematical concepts associated with the standard deviation. In practice, however, Sd values are not calculated. Instead, limits are derived from simplified formulas based

on *control chart constants*. Though the formulas are fairly easy to use once you understand them, they are not easy to understand. For that reason, team members are encouraged to consult their quality coordinators or facilitators. The team's job is to apply its profound knowledge to the problem the control chart signals.

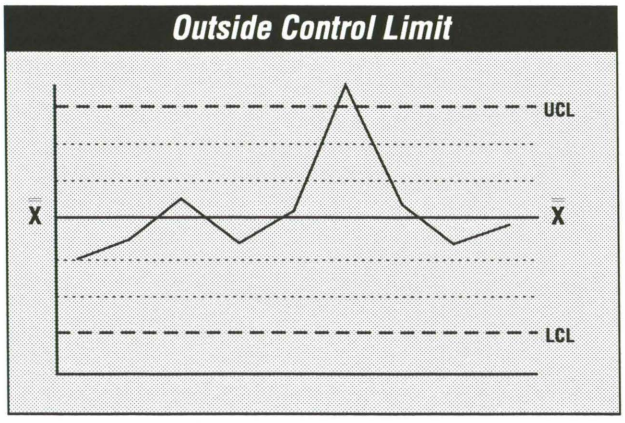
Interpreting Control Charts

A process that produces normally distributed data is said to be *in control*, meaning that no special causes of variation exist. The purpose of the control chart is to signal the occurrence of statistically uncommon events. When the observer detects something with a chance probability of less than one-half of one-percent, it should be investigated as a special cause.

Rules of Control

To apply some of these rules, divide the distance from the mean to each control limit into thirds representing one, two, and three standard deviations.

An "out of control" condition exists if any of the following are detected.



#1 If one point falls outside the UCL or LCL, the chance probability is .0027.

#2 If seven or eight consecutive points are all above or all below the mean, the chance probabilities are .0078 and .0039.

#3 If seven or eight consecutive points move up or down, the chance probabilities are less than one percent.

#4 If two consecutive points are more than two standard deviations from the mean, the chance probability is .0025.

#5 If five consecutive points are more than one Sd from the mean, the chance probability is .0039.

#6 If 14 consecutive points are within one standard deviation of the mean, the chance probability is .0055.

If conditions approaching these are detected, such as four points out of six beyond one standard deviation, the operation of a special cause is likely.

Management authors warn that control charts must be used with caution. They do not actually explain why things happen, so observers should not jump to hasty conclusions. If a control chart is posted on a wall and a new point is added weekly, the manager may be encouraged to tamper with the process when an unfavorable run appears. Rather than seeking to understand what is happening, the boss may simply exhort employees to work harder. "We've got to turn this situation around!" And that's not the right response.

Remember also that control charts are based on statistical measures, not value judgments. Just because a process is in statistical control does not mean that it meets expected requirements. To make that determination, you must set some specifications.

GOOD NEWS. Though some of the steps and tools described in this chapter can be time consuming, there are many software programs that can create charts and graphs for you. The State of Iowa uses SPCIV developed by Quality America Inc. This package will produce Pareto diagrams, run charts, histograms, and control charts. It will also compute the mean, the mode, and the standard deviation of the process. Most agencies have purchased either a LAN or individual version of this software program and have employees trained on how to use it.

Specifications and Standards

When conducting a periodic review of your key processes, you will ask:

- Does process performance fall within the desired range? Does the output conform to established specifications, goals, and performance standards?

- Do the specifications and performance standards continue to reflect customer, stakeholder, and agency needs?

Performance standards are not derived from the process itself. Rather, they are imposed upon it. A decision is made by someone in a position of authority and the chosen measure is targeted.

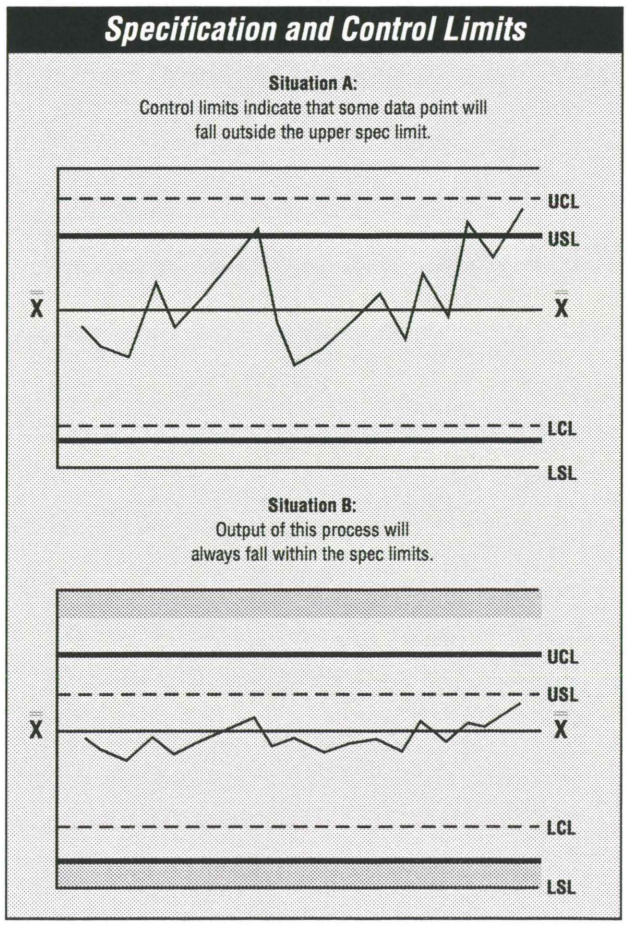
Specifications are common to all manufacturing-type processes. When state roads are built, for example, the concrete that is poured must be of a certain composition and density. The reinforcing rod must be of a certain diameter and tensile strength. Failure to achieve specifications may result in a roadway that fails under load.

Service delivery processes may not be subject to the same dire consequences, yet they, too, have certain specifications. If it is determined by management that customers should wait no longer than 15 minutes before being served, that is a kind of specification against which performance can be judged.

When applied to a control chart, specification limits let observers evaluate the extent to which customer requirements are achieved.

Specification Limits are lines added to a control chart that represent the standard of performance assigned to the process. By itself, the control chart says nothing about how a process is supposed to perform or what the organization hopes to achieve. It only indicates what the process is currently producing.

Control limits are derived from process data and relate solely to the types of variation observed. Specification limits are subjectively established in relation to budgets, targets, goals, objectives, needs, and expectations. Control limits are important from a process improvement standpoint, but specification limits are important to the agency and its customers.



A *capability analysis* is one that compares the locations of the various lines. If control limits--representing the boundaries of normal variation--are within the specification limits, everything is fine. The process is fully capable of satisfying its customers. If a control limit exceeds a specification limit, some portion of the output is not acceptable.

There are two basic ways to achieve process capability. One is to move the center of the data distribution, the other is to reduce its variation. Both strategies require an attack on the common causes of variation.

A *centering adjustment* is appropriate if the process range is smaller than the specification range. In that case, the variation is acceptable, but the average level of performance must be improved. If the process is correctly centered, normal variation must be reduced to bring its range within the range of the specification limits. In each case, one or more of the inputs must be fundamentally altered.

When setting a specification, such as a maximum waiting time of 15 minutes, it is essential that the goal be achievable. It should not be an arbitrary standard that reflects someone's wishful thinking or the simple notion that we ought to do better. A performance standard should be based on a realistic appraisal of current input capability. If you want better performance, you have to provide the necessary resources.

Standards should be based on something provable, which is why benchmarking is so useful. A benchmark gives you a realistic target to shoot for as well as an appropriate method. Unlike arbitrary goals, the benchmark is doable because someone else is already doing it.

Summary

This chapter focuses on process review. It is important to set a schedule for regular process review based on the needs of your customers, stakeholders, and agency. Control charts and specification limits can be an important part of status monitoring. Continual review will help ensure that the process is still adding value and that its effectiveness is maintained over time.

GUIDEBOOK SUMMARY

Process improvement is designed to assist an agency in effectively managing and improving its processes to produce value-added services and products. In some instances, the need for redesign is warranted. Process Improvement provides a sequenced eight-step process that guides an agency from process identification through to the establishment of a process review schedule.

As with all systems and processes, you will want to periodically review the process improvement system to ensure it is meeting your specific needs in the most effective and efficient way possible. Key questions to consider might include: 1) Is using this guidebook an effective means to manage the processes of our agency, division, bureau or work unit? and 2) Does the system need to be modified (i.e., is every step in the guidebook being used or is each step necessary)?

By integrating federal, state and local requirements with the needs of the particular agency and its customers, CQI provides an organization with a never-ending feedback loop interlocking government guidance, organizational desires and customer needs.

GLOSSARY

Action Plan
A graphic tool that helps a team plan, implement, and monitor a series of process-improving actions.

Affinity Diagram
A tool that helps teams divide brainstormed ideas into logical categories. Multi-Voting may follow.

Attribute Control Charts
Four kinds of charts—designated p, np, u, and c—produced from attribute data.

Attribute Data
The type of data produced by counting rather than measurement. The categorical definition may be stated in terms of yes or no, pass or fail, hit or miss. Raw data are expressed in whole numbers, so there are no decimal points unless percentages are calculated.

Benchmark
A goal or standard of achievement based on what someone else is already doing.

Benchmarking
The process of setting a goal for your process based on what a similar process in another organization is already achieving.

Bimodal
The shape of a histogram in which data is grouped around two peak values. A special cause of variation accounts for one of the two modes.

Bottleneck
The restriction that most limits the efficiency of the process and the volume of output produced.

Brainstorming
A team process in which members identify, and the leader records, all possible problems, causes, questions, answers, or ideas. The creation of the list is usually followed by an Affinity Diagram and Multi-Voting.

Budgeting For Results
An approach that defines desired results and ties an appropriation of resources to the intended benefit.

Cause & Effect Diagram
A graphic tool that helps a team analyze a process. Pointing to the effect are arrows representing the five inputs. On lines extending from the arrows, all possible causes of the effect are listed.

Center
One of the descriptive properties of a data distribution, expressed as either the mean, median, mode, or mid-range. These statistics are also referred to as measures of central tendency.

Check Sheet
A data gathering form designed for a specific process. Attribute counts or variable measures are recorded.

Classes
Equally-sized sub-ranges of a data distribution used to construct a histogram.

Common Cause Variation
Normal variation produced by inputs operating at current levels of capability. Also, variation that is random and not attributal to specific causes.

Constraint
The problem or condition that most limits the effectiveness of the process and the quality of the output produced.

Continuous Quality Improvement (CQI)
The art, science, and philosophy of improving the quality of outputs and the efficiency of processes.

Control Chart
A line graph produced from periodic data samples whose purpose is to detect special causes of variation.

Control Limits
Lines on a control chart—designated UCL and LCL—that represent the outside boundaries of normal variation.

Customer Requirements
The needs and expectations of customers. A physical product may be evaluated objectively in terms of performance and reliability, but services are judged on seven subjective criteria—Availability, Responsiveness, Timeliness, Comprehensiveness, Pleasantness, Reliability, and Satisfaction.

Data
Measurements and observations expressed numerically.

Data Distribution
A set of data points, distributed within a range, from which a histogram is produced.

Deviation
The difference between one data point and the mean of the distribution.

Effectiveness
The quality of the process in terms of the value of the output and the satisfaction it produces.

Efficiency
The ratio of inputs to outputs, or the amount of time and money invested in relation to the quantity of output produced.

Environment
One of the five inputs. The setting, location, or context within which the process operates.

Equipment
One of the five inputs. The machines and physical tools used to produce output.

External Customer
A customer outside the system who receives the final output.

Facilitator
A team member from outside the process who is trained in CQI methods. The job involves teaching the use of problem-solving tools to other members of the team.

Fishbone Diagram
Another name for the Cause & Effect Diagram.

Flow Chart
Any of several diagrams that illustrate the steps and operations comprising a process.

Focus Group
An opinion-gathering method in which customers are asked to provide insights, criticisms, and suggestions.

Force Field Analysis
A tool that facilitates change by identifying the driving and restraining forces that currently exist within an organization.

Gantt Chart
A tabular chart that helps plan actions and arrange them in sequence. Individual responsibilities are assigned to certain time frames.

Guidance Team
A group of managers and supervisors who take their cues from the Leadership Team. Duties include drafting charters, appointing members to process teams, and supporting teams with appropriate resources. When a process team reports its recommendations, the Guidance Team may implement action or, depending on its charter, refer the decision to the Leadership Team.

Histogram
A bar graph that reveals one of the descriptive properties of a data distribution—the shape. It may also include a frequency curve that represents the theoretical shape of the population.

Inputs
The five things that combine to produce output—People, Equipment, Method, Material, and Environment.

Internal Customer
A person inside an organization who receives a product, service, or other output from an upstream process.

Key Work Processes
The most important processes directly related to customer requirements.

Leadership Team
Those with final authority and the responsibility that goes with it. The Leadership team's purpose is to do long term planning and guide the agency's transformation to Continuous Quality Improvement.

Material
One of the five inputs. The physical component consumed, transformed, or incorporated by the process.

Mean
The numerical average and therefore the mathematical center of a data distribution. This statistic is the most useful measure of central tendency.

Median
The value that divides a data distribution into two equal parts and therefore represents the physical center of a data distribution. In some applications it is a better measure of central tendency than the mean.

Method
One of the five inputs. The procedures or techniques by which output is produced.

Mid-Range
The numerical center of the range of a data distribution.

Mode
The value or class of values that occurs most frequently in a data distribution.

Mo-R Chart
A variable control chart in which each point represents a single piece of data.

Multi-Voting
A sequential balloting procedure used by a team to select one item from a list of choices. Along with brainstorming, it is part of the Nominal Group Technique.

Nominal Group Technique
A team procedure that lists problems, or suspected causes of problems, and narrows the scope of inquiry. It encompasses Brainstorming, Multi-Voting, and graphic tools such as the Cause & Effect Diagram.

Normal Distribution
A data distribution that produces a symmetical histogram with a single mode. The interpretation is that the process exhibits only Common Cause Variation.

Optimization
As defined by Dr. Elijahu Goldratt, Local Optimization is the enhancement of one process at the expense of others. Global Optimization is achieved when all processes maximize their contributions to the system.

Output
Whatever is produced by a process or system, which may include products, services, and intangible benefits.

Pareto Diagram
A bar graph in which data categories are arranged in descending order from most to least. A line above the bars displays cumulative percentages.

P-D-S-A Cycle
A sequence of steps—Plan, Do, Study, Act—by which a team conducts a small-scale experiment to test a proposed improvement. It is also known as the Shewhart Cycle.

Performance Measure
A measure of what the process is currently doing in relation to what it is supposed to do.

Person
One of the five inputs. The employees who work within a process.

Population
All of the inputs, or all of the outputs, or the entirety of that which is being sampled for statistical analysis.

Process
A series of steps, or a sequence of events, that uses inputs to produce outputs.

Process Improvement Selection Matrix
A tool that helps teams decide which process to improve first. Numerical scores are based on profound knowledge of the system.

Process Inventory Worksheet
A 9-part form that allows you to record important process information. Categories include Inputs, Key Steps, Outputs, Customers, Stakeholders, and Suppliers.

Process Manager
The supervisor or other individual responsible for working on the process, as distinct from working in the process.

Process Measurement Worksheet
A 5-column form that lets you record customer requirements and key performance measures.

Process Review
Periodic re-examination of processes on a regular schedule.

Process Stability
The extent to which a process does not exhibit Special Cause Variation.

Profound Knowledge
Knowledge gained from working in a process that those outside the process do not have.

Qualitative Research
A semi-structured information gathering method whose purpose is to develop hypotheses that help explain why problems occur.

Quality
A degree of excellence associated with better products and services. It is produced by processes that exhibit low variation.

Quantitative Research
The development of numerical measures from the population of customers and stakeholders.

Random Sample
A sample gathered in such a way that every item in the population has an equal chance of being selected for counting or measurement.

Range
The difference between the lowest and highest values in a data distribution.

Recorder
The member of a team who takes notes, writes minutes, and prepares agendas.

Redesign
A significant overhaul of the current system, but one in which fundamental features and processes are retained.

Reengineering
A radical alteration and reshaping of an old system into something entirely new. Not only are processes replaced, the outputs themselves may change. It usually requires "starting with a clean sheet of paper."

Rules of Interpretation
Rules pertaining to runs of data points on control charts whereby the existence of Special Cause Variation can be inferred.

Run
A series of points on a control chart that by its pattern reveals an out-of-control condition.

Run Chart
A line graph in which each of the connected points represents data collected during an equal unit of time, such as an hour, week, or month. In most cases the data represents an entire population rather than a sample.

Sample
A portion of a population collected for counting or measurement, or a set of data points resulting from such measurement.

Sequence of Events
The steps in a process that produce output, and therefore one of the elements that defines a process.

Special Cause Variation
Variation that is unexpected and non-random, and therefore assignable to a specific cause. The cause must relate to an input that changes for some reason or that routinely exhibits high variation.

Specification Limits
Lines added to a control chart that represent the acceptable range of process variation.

Specification
A numerical statement of acceptability. Specifications are not derived from the process, but are subjectively imposed upon it and should ideally represent customer requirements.

Stakeholder
An individual who does not receive output from a process, but who has a vested interest in the effectiveness and efficiency of the process.

Standard Deviation
The universal yardstick of process variation. This statistic is calculated from the data points in a distribution. Any data point falling more than three Sd from the mean is presumed to represent a special cause of variation.

Supplier
An individual, organization, or process that provides inputs.

Support Process
A process that enables or facilitates a key work process.

Survey
A series of questions for customers to answer. Methods include personal interviews, telephone interviews, and written questionnaires. Data can be collected on the perceived value of products and services, and on overall customer satisfaction.

Synergy
A feature of group dynamics by which individuals build on each other's ideas so that the collective contribution is greater than the sum of its parts.

System
A network of inter-related processes that combine to produce output.

Systematic Diagram
A graphic illustration whose branching lines illustrate relationships and organizational structures. More often known as a Tree Diagram.

Team
Generally, a group of people working together to achieve a common purpose. In formal CQI application, a group of employees organized to study a specific process and recommend improvements to management.

Team Charter
A document given to a Process Team by a Guidance Team that outlines the mission, desired result, resources furnished, and timeframe for completion.

Team Leader
Someone other than the Process Manager who is chosen by the Guidance Team and made responsible for organizing and conducting team meetings.

Team Meeting Record
A form that helps the team's recorder take minutes and prepare future agendas.

Team Meeting Agenda
An outline of presentations, discusssions, and decisions for the next team meeting.

Team Meeting Assessment
In general, the process by which the team evaluates itself. More specifically, a form that allows members to assess the group's progress.

Team Members
Individuals appointed by the Guidance Team who work within the process, or who are internal suppliers or customers of the process.

Team Rules
A set of rules designed to make group processes more congenial and effective.

Team Success Checklist
A quick series of reality checks that, if the answers are positive, reassures the team that its time will be well spent.

Theory of Constraints
A theory by Dr. E. Goldratt which states that the constraint or bottleneck—the problem with the greatest negative impact or restrictive effect—must be eliminated first.

Tree Diagram
Also known as a Systematic Diagram, its branching lines illustrate relationships and structures.

Variable Control Charts
A group of three charts—Mo-R, X-R, and X-Sd—produced from variable data.

Variable Data
The result of measurement rather than counting. The quality-defining feature may be size, weight, strength, duration, or any characteristic exhibiting a continuous range of possile measures.

Variation
Differences among inputs and outputs. The greater the process variation, the poorer the quality. All variation is produced by the five inputs.

Why? Technique
A series of questions and answers that peel away layers of uncertainty to reveal the root cause of a problem.

X-R Chart
The most commonly used variable control chart. X represents the mean of five pieces of data collected at one time. R is the range of the five measures.

X-Sd Chart
A control chart that uses the Standard Deviation as the measure of variation instead of the Range.

FORMS SECTION

PROCESS INVENTORY WORKSHEET

1 NAME OF PROCESS

2 DATE FORM COMPLETED

3 PROCESS MANAGER(S)

Phone Number(s) (_____)_____
(_____)_____

4 PROCESS PURPOSE

5

INPUT(S)	→	KEY PROCESS STEPS	→	OUTPUT(S)
People:		1.		1.
		2.		2.
Equipment:		3.		3.
		4.		4.
Materials:		5.		5.
		6.		6.
Method:		7.		7.
		8.		8.
Environment:		9.		9.
		10.		10.

6 VOICE OF THE CUSTOMER

Stakeholders

Internal Customers

External Customers

VOICE OF THE CUSTOMER

Regulatory/Agency Guidelines

7 Suppliers and Others Who Assist in the Process

NAME	ROLE

8 Process Drivers

❑ Customer Needs ❑ Regulatory Guidelines ❑ Agency Needs

9 Process Impact

__ Critical (4 pts) __ Necessary (2 pts)
__ Important (3 pts) __ Unnecessary (1 pts)

PROCESS MEASUREMENT WORKSHEET

Name of Process: **Date:**

COLUMN A	COLUMN B	COLUMN C	COLUMN D	COLUMN E
Customer Requirement(s) (Based on Need or Expectation) **or Regulatory Guideline(s)**	**Key Performance Measure(s)**	**Type of Measure:** **A.** Process Effectiveness **B.** Process Efficiency	**Current Process Performance Level**	**Success in Meeting Performance Measures**
I	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
II	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
III	1.	A B	1.	YES NO
	2.	A B	2.	YES NO
IV	1.	A B	1.	YES NO
	2.	A B	2.	YES NO

PROCESS IMPROVEMENT SELECTION MATRIX

Process	+	Result	+	Effectiveness	+	Efficiency	=	Subtotal	X	Agency Impact	=	Total
Intake												
Data Entry												
Referral												
Counseling												
Job Search												
Follow-Up												

Scale
1 = Excellent 2 = Good 3 = Fair 4 = Poor 5 = Unacceptable

Scale
4 = Vital
3 = Important
2 = Necessary
1 = Unimportant

ACTION PLAN

Agency: Purpose: Desired Results: **Resources:**

Action	Desired Outcome	How	When	Who	Measurement

ACTION PLAN

Agency: Purpose: Desired Results: **Resources:**

Action	Desired Outcome	How	When	Who	Measurement

TEAM CHARTER

1. **PROCESS**
   What process will the team address?

2. **MISSION**
   Is the team asked to improve an existing process, plan a new process, or solve a problem?

3. **REASON**
   What led us to the selection of this process? Why is this process important?

4. **EXPECTED RESULT**
   What is the desired outcome?

5. **PERFORMANCE MEASURE**
   How will we know that the team has improved the process?

6. **START-UP DATA**
   Is initial data available from the Guidance Team?

7. **BOUNDARIES**
   What is the scope of our authority? How much can we spend? Can we cross organizational boundaries?

8. **TIME FRAME**
   When should we start? How long do we have to complete this assignment?

9. **COMMUNICATION**
   Who do we report to? How often? Are written recommendations expected?

10. **TEAM APPOINTMENTS**

Team Leader	Facilitator	Leadership	Contact	Process Member	
Process Member	Process Member	Process Member	Process Member	Process Member	Alternate

PROCESS REVIEW SCHEDULE

FOR ALL PROCESSES

NAME OF AGENCY - DIVISION - BUREAU - OR WORK UNIT _____

Name of Process	Review Interval	Last Review Date	Next Review Date

Column 1.
What is the name of the process for which you are developing a review schedule?

Column 2.
How often is the process to be reviewed (weekly, monthly, quarterly, semi-annually, annually)?

Column 3.
When was the process last reviewed?

Column 4.
Based on how often the process is to be reviewed, what is the next review date?

PROCESS REVIEW SCHEDULE

FOR INDIVIDUAL PROCESSES

NAME OF AGENCY - DIVISION - BUREAU - OR WORK UNIT _____

PROCESS NAME _____

Review Interval	Last Review Date	Next Review Date

TEAM MEETING RECORD

MEETING NUMBER _____ **DATE** _____ **LOCATION** _____

PROJECT NAME _____

MISSION STATEMENT _____

1. CHECK TO INDICATE IF MEMBER IS PRESENT

- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____
- ❑ Member _____

2. AGENDA

Enter key words indicating the agenda topics. Check off an item when it is completed. Items you do not complete should be carried over to the next meeting.

- ❑ 1. Review agenda
- ❑ 2. _____
- ❑ 3. _____
- ❑ 4. _____
- ❑ 5. _____
- ❑ 6. _____
- ❑ 7. Set agenda for next meeting
- ❑ 8. Review meeting

3. BRIEF SUMMARY

On the next page, summarize topics, decisions, conclusions, and next steps.

4. FUTURE FILE

Items for future consideration but not for the next meeting.

_____

_____

_____

_____

_____

_____

5. MEETING REVIEW

Using a scale from 1 to 6, average the individual evaluations of team members.

	AVERAGE
QUALITY	_____
EFFECTIVENESS	_____
EFFICIENCY	_____
FOCUS	_____
METHOD	_____
ENERGY	_____
ATTITUDE	_____

6. NEXT MEETING

Date _____ Time _____

Location _____

Recorder's Signature _____

TEAM MEETING RECORD

BRIEF SUMMARY

Take notes during the meeting. Focus on capturing the main ideas associated with each topic.

TOPIC 1 _____

- Main Points _____
- Decisions/Conclusions _____
- Next Steps _____

TOPIC 2 _____

- Main Points _____
- Decisions/Conclusions _____
- Next Steps _____

TOPIC 3 _____

- Main Points _____
- Decisions/Conclusions _____
- Next Steps _____

TEAM MEETING EVALUATION

TEAM NAME _____

MEETING DATE _____

CRITERIA

- **Quality.**
  How was the meeting? Wonderful? Lousy?
- **Effectiveness.**
  Are we doing the right things? Asking the right questions? Tackling the right problem?
- **Efficiency.**
  Are we doing things right? Making progress or wasting time? Spinning our wheels or investing resources wisely?
- **Focus.**
  Did we stay on target or ramble aimlessly?
- **Method.**
  Did we rely on data or shoot from the hip? Did we follow the rules? Reach consensus?
- **Energy.**
  What about the tempo? Were we enthused or lethargic?
- **Attitude.**
  Were we cooperative or devisive?

	← BEST				WORST →	
QUALITY	1	2	3	4	5	6
EFFECTIVENESS	1	2	3	4	5	6
EFFICIENCY	1	2	3	4	5	6
FOCUS	1	2	3	4	5	6
METHOD	1	2	3	4	5	6
ENERGY	1	2	3	4	5	6
ATTITUDE	1	2	3	4	5	6

COMMENTS_____

TEAM MEETING EVALUATION

TEAM NAME _____

MEETING DATE _____

CRITERIA

- **Quality.**
  How was the meeting? Wonderful? Lousy?
- **Effectiveness.**
  Are we doing the right things? Asking the right questions? Tackling the right problem?
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	← BEST				WORST →	
QUALITY	1	2	3	4	5	6
EFFECTIVENESS	1	2	3	4	5	6
EFFICIENCY	1	2	3	4	5	6
FOCUS	1	2	3	4	5	6
METHOD	1	2	3	4	5	6
ENERGY	1	2	3	4	5	6
ATTITUDE	1	2	3	4	5	6

COMMENTS_____

RESULTS BOOK TEMPLATE

Use this template for submitting an improvement as a possible addition to the RESULTS Book. Use everyday language that all readers will be able to understand.

NAME of person completing form:	**AGENCY:**
PHONE:	**DATE** this template was completed:

DIVISION/BUREAU/OFFICE/UNIT WHERE IMPROVEMENT TOOK PLACE:

NAME of person to call for more information. (In most cases, the team leader serves as the contact person.)

PHONE NUMBER of contact person:

TOPIC (1-2 words): Write a description of the function of service that team members addressed.

TEAM NAME (If Applicable):

HEADLINE (7 words maximum): Write a catchy headline that will attract readers' attention.

PROBLEM (50 words maximum): Describe in simple, understandable terms the problem that led to formation of an improvement effort. Avoid technical jargon known only to people who work in the functional area.

RESULTS BOOK TEMPLATE

IMPROVEMENT: (50 words maximum): Explain the specific improvements that were implemented as a result of the team's work. Use simple, everyday terms that all readers can understand.

MEASURABLE RESULTS In the space below, please write up to four bullet-point results. Be specific, and use terms that all readers will understand. Most importantly quantify the results. For example, indicate the percentage of errors reduced, number of dollars saved, amount of time reduced, extent to which satisfaction was increased. See the team reports in The RESULTS book for examples.

-
-
-
-

TEAM MEMBERS AND AGENCY: List each person on the team.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

TEAM LEADER:

TEAM FACILITATOR:

YEAR the improvements were implemented: