

REPORT OF THE COAST GUARD-AWO QUALITY ACTION TEAM
JULY 14, 1995

Introduction

In the fall of 1994, RADM J. C. Card, Chief of the Coast Guard's Office of Marine Safety, Security, and Environmental Protection, and Thomas Allegretti, president of the American Waterways Operators (AWO), began a series of discussions aimed at strengthening and improving the working relationship between the Coast Guard and the barge and towing industry. As a result of those discussions, the two agreed to establish a Coast Guard-AWO Quality Action Team (QAT) tasked with developing a framework to facilitate Coast Guard-industry cooperation and dialogue and to advance the two organizations' common goals of enhanced marine safety and environmental protection. The work of this process-oriented QAT was intended to foster the development of a true working partnership between the Coast Guard and AWO, and to lay the procedural and cultural groundwork for continuing cooperation between the Coast Guard and the barge and towing industry on specific issues of mutual interest.

The decision to establish the QAT was rooted in the belief that both the Coast Guard and the barge and towing industry share a common interest in improving marine safety and environmental protection, and that these causes are best served by a cooperative approach which emphasizes open dialogue and results-oriented action through partnership. This vision is embodied both in *AWO 2000*, the strategic plan adopted by AWO's Board of Directors in April 1994, which calls on AWO to "be a leader in promoting marine safety, working in partnership with its members to promote sound operating principles and practices, and working in partnership with the federal government to implement safety improvements," and in the Coast Guard's Marine Safety, Security, and Environmental Protection Business Plan, which emphasizes the twin goals of "Prevention Through People" and "Quality, Safety, and Environmental Protection Through Partnership."

The work of the QAT is premised on the belief that cooperative action in the service of marine safety and environmental protection benefits the Coast Guard by enabling the agency to more efficiently meet key mission demands in an era of increasingly constrained governmental resources, and benefits the industry by avoiding unnecessary regulation, improving productivity, and reducing the significant costs which result from accidents and claims. The Coast Guard reports that some 80 percent of marine casualties are attributed to human factors. Given that human error cannot be regulated away, reducing the frequency of these casualties requires the cooperative efforts of government and industry at all levels. Finally, this cooperative approach is also consistent with the "regulatory reinvention" initiative announced by President Clinton in his March 1995 memorandum to Executive department and agency heads, which urges federal agencies to "reward results, not red tape," "negotiate, don't dictate," and "create grassroots partnerships" with industry groups.

5. Creating awareness and encouraging the use of these processes.

Between February and June 1995, the QAT met four times and conducted extensive work by facsimile and mail. On June 20, the QAT held a final meeting to brief the project sponsors on the results of its work and obtain their comments and suggestions prior to the development of a final report. The results of the QAT's work are summarized briefly below and discussed in greater detail in the pages which follow.

Overview

The cooperative framework outlined by the QAT contemplates the establishment of an informal system of processes to address issues of marine safety and environmental protection. Coast Guard-AWO "Quality Steering Committees" (QSCs) would be established at the headquarters, regional, and local levels to provide coordination and support to subject-specific quality action teams. The national QSC would provide overall coordination and support to both the regional and local QSCs. The primary function of the QSCs would be to receive and review suggested "opportunities for improvement" from industry or Coast Guard personnel and to identify candidate issues for cooperative Coast Guard-industry attention via the formation of a subject-specific quality action team. Any issue relating to marine safety or environmental protection and potentially involving both Coast Guard and industry action (outside the regulatory process) might be identified as a proposed opportunity for improvement.

Subject-specific QATs would conduct their work using a quality process to analyze the issues and develop recommended process improvements. (The report of the Coast Guard-AWO Quality Action Team provides a generic template for use by subsequent agency-industry problem-solving teams.) This process would include defining the scope of the problem or process improvement needed -- i.e., determining the baseline -- utilizing statistical data, case studies, etc., as available; analyzing available data to determine root causes of the problem; identifying solutions to the problem or improvements to the process based on analysis of available data and evidence; identifying the measures by which the success of proposed solutions can be evaluated; and developing a specific implementation plan outlining Coast Guard and industry actions necessary to implement the proposed solutions or process improvements.

The Quality Steering Committee would review the results of each subject-specific QAT's work and assist in disseminating its work product to the appropriate target audience. The QSC would also play a role in measuring the results of QAT-recommended improvements and targeting for recognition outstanding QAT results.

The Coast Guard-AWO QAT believes that building a successful track record of cooperative action and results will be essential in creating a non-threatening environment and encouraging Coast Guard-industry use of the QAT mechanism. Accordingly, the QAT recommends that the first subject-specific quality action team to emerge from this initiative be convened in late summer or early fall 1995 to address the issue of deckhand fatalities on inland towing vessels, a priority issue targeted in both the

The cooperative problem-solving process envisioned by the QAT is not intended to subvert the legitimate role for government regulation in establishing minimum standards necessary to ensure the safety of U.S. waters, vessels, and crews; nor is it intended to supplant the important role that has been and continues to be played by existing federal advisory committees to the Coast Guard (including the Towing Safety Advisory Committee, Chemical Transportation Advisory Committee, etc.). Rather, the informal but structured problem-solving process recommended by the QAT is intended to complement these processes by providing a flexible, user-friendly mechanism for joint Coast Guard-industry action and to facilitate improvements in communication and safety in a results-oriented, non-regulatory environment.

Mission and Participants

Chartered in February 1995, the QAT was comprised of nine senior Coast Guard and industry representatives designated by the Coast Guard and AWO, respectively. Coast Guard participants on the QAT included: Mr. Ed Ziff, Chief, Planning Staff (G-MP); CAPT Ken Ervin, Chief, Merchant Vessel Personnel Division; CAPT Mike Slack, Commanding Officer, MSO Morgan City; CAPT Mike Williams, Chief, Merchant Vessel Inspection Division; and CDR Mike Schafersman, Marine Environmental/Port Safety Division, Second District. Industry participants included: Ms. Jennifer Kelly, Director - Government Affairs, AWO; Mr. Mark Buese, Vice President - Administration, Kirby Corporation; Mr. Mike Khouri, Senior Vice President - Corporate and Legal Affairs, American Commercial Lines, Inc.; and Mr. Tom Vorholt, Assistant Vice President - Dry Cargo Sales, Ingram Barge Company.

At an organizational meeting held February 16 at AWO headquarters in Arlington, Virginia, QAT members refined the group's mission and identified five major tasks facing the team. The mission of the group was defined as follows:

To serve as a joint Coast Guard-industry coordinating group to develop a non-regulatory process for communication and problem-solving, and to foster the use of that process to advance common goals.

The specific steps necessary to accomplish this mission were identified as:

1. Developing a process/processes for identifying issues/opportunities for improvement;
2. Developing a process/processes for analyzing issues and facilitating improvements;
3. Developing a process/processes for communicating and facilitating the implementation, measurement, and recognition of improvements;
4. Creating a non-threatening environment; and,

Coast Guard's marine safety office business plan and the agency's new "Prevention Through People" initiative.

A Framework for Cooperative Problem-Solving

Issue Identification

The Coast Guard-AWO QAT's first task was to develop a process for the collection, sorting, and prioritization of proposed "opportunities for improvement," or OFIs (i.e., subjects to be addressed by issue-specific, follow-on QATs comprised of Coast Guard and industry representatives), at the national, regional, or local level. The attached flow chart (Figure 1) depicts graphically the major steps involved in that process as recommended by the QAT.

As shown in Figure 1, the process would begin with the identification of a proposed "opportunity for improvement" as a candidate subject for joint Coast Guard-industry attention. OFIs might be generated at the local, regional, or national level, and might arise from any number of Coast Guard or industry sources. At the local level, for example, a towing company might identify the lack of adequate waste reception facilities as a subject for joint Coast Guard-industry attention. A Coast Guard field officer might propose an OFI based on his experience as a boarding officer or marine inspector. At the national level, an idea might be identified by AWO following discussions within the association's internal committee structure (say, the incidence of deckhand fatalities on towing vessels or transfer spills from tank barges). Similarly, the Coast Guard might propose an OFI based on agency Business Plan objectives or internal reviews of industry casualty data. (Issues of regional or national scope submitted at the local level, or issues of local or regional scope submitted at the national level, would be routed to the appropriate level via the issue evaluation and sorting process described below.)

Issue Transmittal and Collection Mechanism

Proposed opportunities for improvement would be transmitted, preferably in writing, to a designated point of contact at the local, regional, or national level as appropriate. To ensure proper consideration and routing, suggestions would be sent to the attention of the "Coast Guard-AWO Quality Steering Committee." At the local level, the respective Coast Guard Captain of the Port (COTP) would designate an individual to receive these proposed OFIs; at the regional level, suggestions would be sent to one of the four AWO regional offices (New York, New Orleans, St. Louis, or Seattle); and at the national level, suggestions would be forwarded to AWO headquarters.

On a quarterly or triennial basis, a "Quality Steering Committee" would convene at the national, regional, and local levels to evaluate proposed opportunities for improvement and identify those issues warranting cooperative Coast Guard-industry action in the near term. Each QSC would consist of a small group of Coast Guard and industry participants (perhaps 6-8 individuals). Coast Guard participants would be appointed by the Captain of the Port, District Commander, or Chief, Office of Marine Safety,

Security, and Environmental Protection, as appropriate; industry participants would be recommended by AWO. Individual participation in a Quality Steering Committee would be rotated at some regular interval mutually acceptable to the Coast Guard and to AWO. To help the program take root and to underscore Coast Guard and industry commitment to the initiative, QSC members would be selected, particularly in the early stages of the program, from the ranks of senior Coast Guard and industry personnel. The national QSC would also serve a coordinative function, providing guidance, coordination, and support to regional and local Quality Steering Committees.

Issue Evaluation and Sorting

Each Quality Steering Committee would meet regularly to review proposed opportunities for improvement and to consider the value of joint Coast Guard-industry action via the formation of a subject-specific quality action team. While the evaluation process is inherently subjective, the committee would consider such factors as the relationship of the issue to marine safety or environmental protection, the perceived importance and scope of the issue, the existence of a role for both the Coast Guard and the barge and towing industry in addressing the issue, the relationship of the issue to Coast Guard Business Plan goals and *AWO 2000* objectives, and the relative priority of the issue given competing issue demands and resource constraints. As a result of the steering committee's evaluation, a proposed OFI would either be rejected and returned to the generator of the idea with suitable acknowledgement and an appropriate explanation, held for potential future action pending availability of additional resources or completion of ongoing projects, or accepted as a subject for near-term Coast Guard-industry attention. Issues which appear to warrant the formation of a QAT but would be more appropriately handled at a different level (say, national instead of regional or regional instead of local) would be referred to the appropriate Quality Steering Committee for consideration.

Formation of a Subject-Specific QAT

Once a Quality Steering Committee had agreed on the need for cooperative Coast Guard-industry action on a proposed OFI, the committee would generally recommend the formation of a subject-specific QAT. (In some instances, an existing body -- say, the River Industry Action Committee or a local Ice Committee -- might be identified as the most appropriate group to address a given issue.) At least one member of the QAT must have training or experience in the use of quality processes. To enable the national Quality Steering Committee to more effectively discharge its oversight and coordinative functions, local and regional QSCs would regularly notify the national QSC regarding the formation of subject-specific QATs. This would assist the national QSC in monitoring the volume and subject matter of QAT work nationwide, bringing potentially duplicative efforts to the attention of local or regional QSCs, and identifying broader national implications of local or regional QAT efforts.

Analyzing Issues and Facilitating Quality Improvements

The subject-specific QAT would be charged with solving the problem and/or identifying necessary process improvements in response to the OFI. A quality process must be

utilized in this step of the problem resolution process. However, recognizing that there are many different Total Quality Management (TQM) process improvement models in use within the Coast Guard and the industry (e.g., the Crosby method, the Demming method, etc.), no particular quality method is prescribed. Rather, a quality process which the subject-specific QAT is most comfortable employing may be followed to identify the root causes of the problem and to identify appropriate process improvements. At a minimum, such a process should include the following steps:

1. Define the scope of the problem or process improvement needed (i.e., determine the baseline), utilizing statistical data, case studies, etc., as available;
2. Analyze the data/identify root causes of the problem;
3. Identify solutions to the problem or improvements to the process based on analysis of available data/evidence;
4. Identify the measure(s) by which the success of proposed solutions will be judged and check the validity of the proposed solutions by measuring initial results;
5. Refine proposed solutions as necessary; and,
6. Develop an implementation plan for submittal to Quality Steering Committee.

While no specific format for the results of the QAT's work is prescribed, emphasis in the implementation plan should be given to developing a complete and user-friendly work product which lays out clearly and in some detail how and by whom the proposed quality improvements should be effected. To facilitate subsequent QSC review, the implementation plan should identify the target audience for the proposed improvement and recommend a means by which to communicate the recommended improvement to the target group.

Appendix 1 provides a sample quality process that can be followed by a subject-specific QAT if team members have no other quality method preference.

Quality Steering Committee Review

With the identification of a proposed solution and development of an implementation plan, the process would return to the QSC that commissioned the subject-specific QAT. At this point, the QSC would review the QAT's work to determine that all necessary steps (e.g., analysis of root causes, measurement and validation of proposed solution, etc.) had taken place, that proposed solutions and quality improvements were supported by the underlying analysis, and that the proposed implementation plan was complete and understandable. At the local or regional level, the QSC would also consider the potential applicability of the QAT's work to audiences beyond the locality or geographic

region in question. Issues and recommended solutions with potentially broader impact would be forwarded to the national QSC for review and possible action (though implementation of the proposed solution at the local or regional level could proceed in the meantime.) As a general rule, issues with broad industry-wide impact should be handled from the outset via the formation of a national-level QAT.

Having thus validated the QAT's work product, the QSC would endorse the team's result and communicate the proposed improvement to the target audience identified in the QAT's implementation plan. For example, the QSC might endorse and transmit to the local Coast Guard Aids to Navigation branch chief a QAT's recommendation that a particular light or buoy be relocated. Similarly, the QSC might transmit to AWO for publication and dissemination to association members a QAT recommendation that companies modify their operational practices to improve safety or environmental performance in some target area. While the QSC would have no independent authority to implement proposed improvements recommended by a QAT, selecting QSC members from the ranks of senior Coast Guard and industry personnel will increase the likelihood that its recommendations will be heeded and facilitate the implementation of recommended improvements.

Measurement and Recognition of QAT Results

The Coast Guard-AWO QAT expects that the QSCs at all levels would play an ongoing role in monitoring the implementation of recommended process improvements and overseeing the measurement of quality results. While each subject-specific QAT will be expected to measure and validate its proposed improvement in preliminary fashion before transmitting its completed work product to the QSC, a broader-based measurement process will be important in determining whether QAT-recommended improvements have in fact been successful in producing the desired results. In some cases, depending on the cycle time of the process involved, definitive measurement may not be possible until several years of relevant data have been collected. (Determining that a QAT recommendation for enhanced entry-level training had in fact led to a reduction in crew fatalities might be a multi-year process, for example.) The means by which improvements would be measured and the time interval necessary before a reliable measurement could be obtained would vary with the nature of the improvement involved, but the QSC would be expected to act as the catalyst to ensure that the measurement process is carried out at the appropriate time.

Finally, the Coast Guard-AWO QAT believes that recognition, both for participation in the quality problem-solving process and for the achievement of outstanding results via that process, will be important in encouraging widespread Coast Guard and industry use of this system. While building a successful, substantive track record of cooperative action and results will be perhaps the most critical component in fostering the use of this system, publicizing cooperative successes and recognizing outstanding contributors to the process will also be important in creating a non-threatening and positive climate which encourages participation. The QAT recommends that the national Quality Steering Committee oversee the production of a regular report of subject-specific QAT activities at the national, regional, and local levels, with emphasis on program successes,

and develop a mechanism for joint Coast Guard-AWO recognition of outstanding QAT initiatives.

Conclusions and Recommendations

The Coast Guard-AWO QAT believes that the informal but structured system of processes outlined herein will foster both meaningful improvements in marine safety and environmental protection and a closer, more productive partnership between the Coast Guard and the barge and towing industry, the largest segment of the U.S.-flag commercial vessel fleet. Accordingly, the QAT recommends that the following steps be taken to implement the cooperative problem-solving process outlined in this report:

1. **Approval and Validation.** The Coast Guard and AWO should endorse the QAT's recommendations and agree to proceed with the establishment of the cooperative, problem-solving model recommended herein. Throughout the summer and early fall, each organization should take responsibility for promoting the QAT's recommendations within the organization via appropriate channels (e.g., AWO Executive Committee and Board of Directors meetings, Coast Guard Operations Coordinating Council, etc.) High-level Coast Guard and industry support for the program will be critical in ensuring that the program takes root and ultimately attracts the degree of participation necessary to achieve meaningful results.
2. **Infrastructure Development.** While the quality partnering process is meant to be an informal and flexible one, an appropriate support structure will be important in ensuring that this initiative is effectively launched and implemented. The Coast Guard and AWO should begin this process by agreeing on the composition of the national-level Quality Steering Committee and putting the QSC in place no later than September 15.
3. **Implementation and Roll-Out.** The QAT recommends a two-step process for initial implementation and roll-out of the program:
 - a. To begin immediately to build the track record of success which will foster increased use of the QAT mechanism, the national Quality Steering Committee should establish by October 1 a subject-specific quality action team to address the issue of deckhand fatalities on inland towing vessels, a priority issue targeted for attention in the Coast Guard's Marine Safety, Security, and Environmental Protection Business Plan, as well as the agency's new "Prevention Through People" initiative.
 - b. To ensure a smooth and manageable roll-out of the program and to test the utility of the QSC mechanism at the regional and local levels, the Coast Guard and AWO should initially establish regional Quality Steering Committees in no more than two Coast Guard

districts by October 1. By November 15, the two regional Quality Steering Committees should select no more than two Captain of the Port Zones within each district for establishment of local Quality Steering Committees. The Coast Guard and AWO should assist in identifying initial projects for the formation of subject-specific QATs in each district and COTP zone targeted for initial participation in the program.

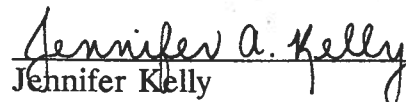
- c. Once approval to proceed is granted, members of this Coast Guard-AWO QAT should meet with Coast Guard district, AWO region, and industry representatives in regions targeted for initial roll-out of the program to brief them on the quality partnering process.
4. **Reinforcement.** The Coast Guard and AWO should work together and individually to promote use of the QAT mechanism and begin to build a track record of cooperative success. AWO and Coast Guard publications; presentations at Coast Guard Industry Days, Pilot Days, and AWO national and regional meetings; and overtures to local and regional industry groups (e.g., Greater New Orleans Barge Fleeting Association, River Industry Action Committee, etc.) should all be used to promote the program and encourage greater Coast Guard and industry participation in the QAT process. (Ongoing)
5. **Expansion.** Additional districts and COTP zones should be targeted for establishment of Quality Steering Committees pending evaluation of the regional and local pilot programs. The national Quality Steering Committee should review the results of these pilots and issue a recommendation on potential expansion of the program no later than September 1996.



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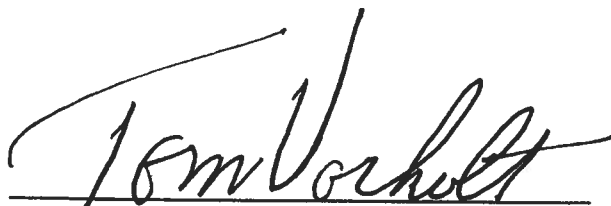
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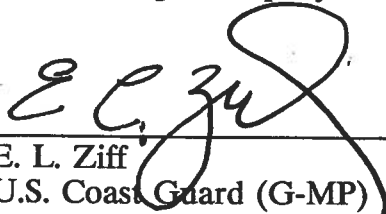
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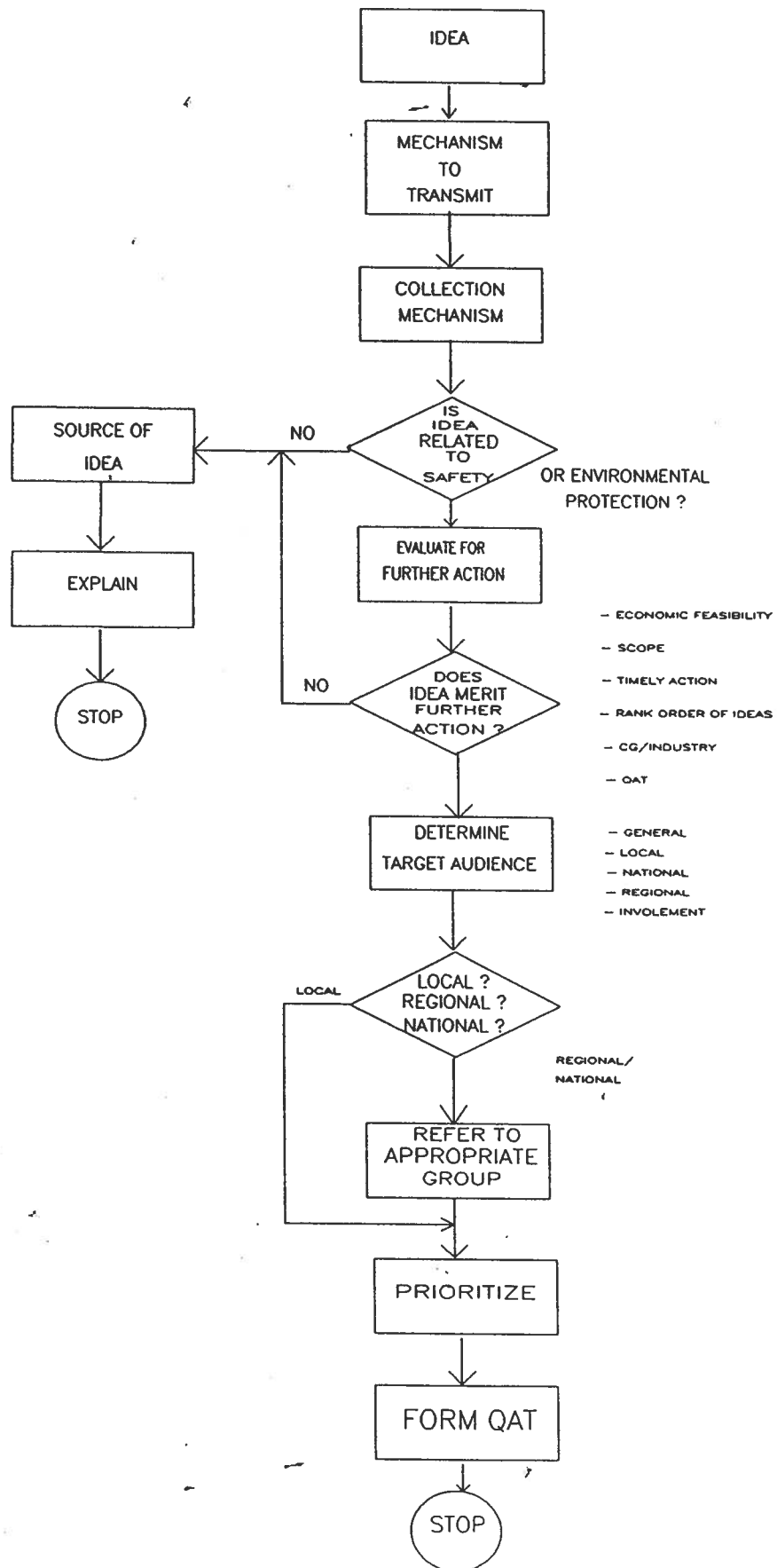


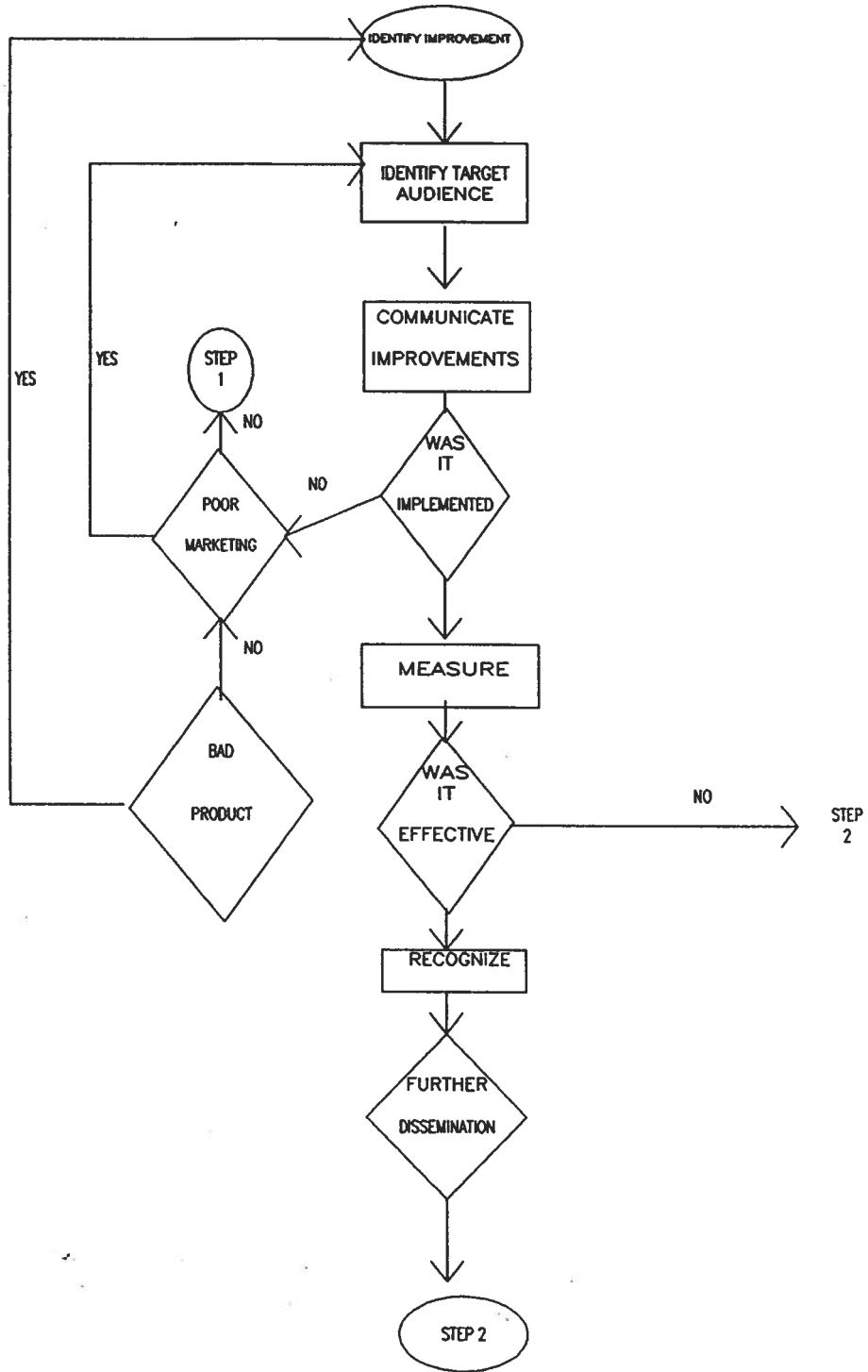
CAPT Mike Williams
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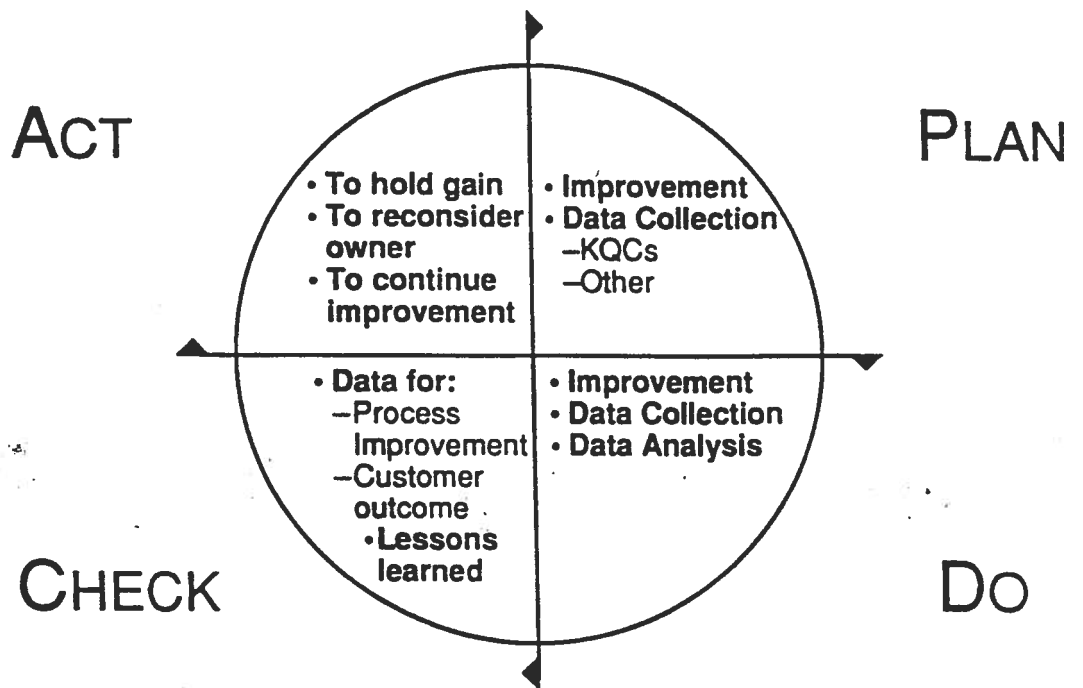
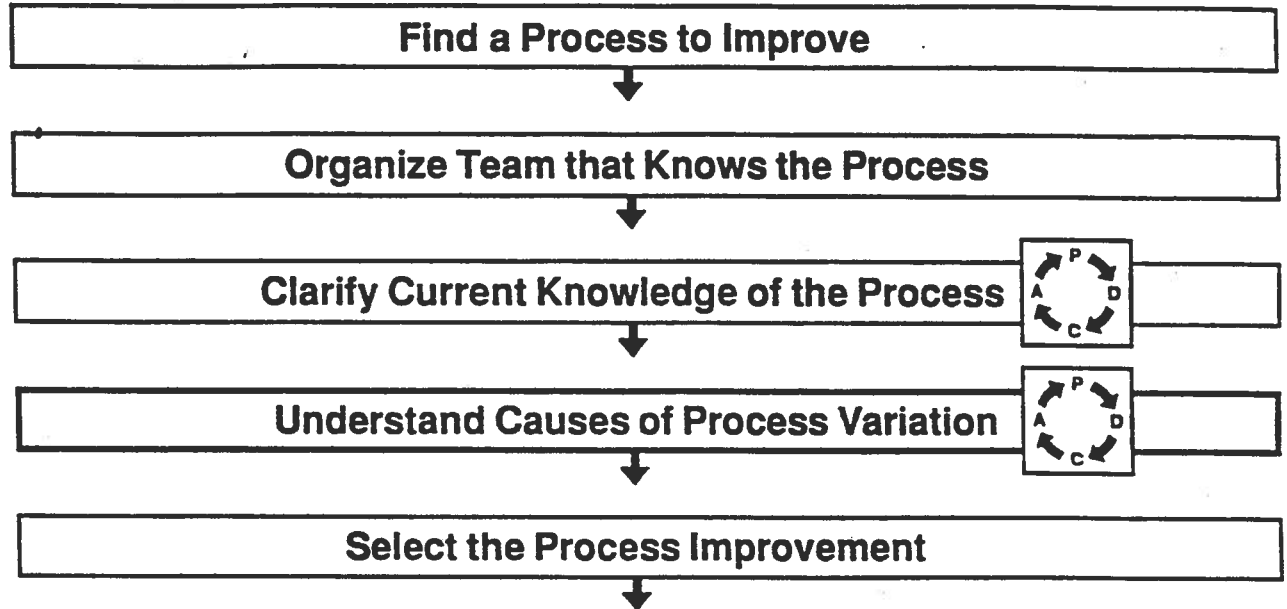
FIGURE 1





COMMUNICATE IMPROVEMENTS IDENTIFIED BY THE PROCESS ANALYSIS GROUP, MONITOR IMPLEMENTATION, ANALYZE RESULTS, PROVIDE RECOGNITION AND DETERMINE EXTENT OF FURTHER ACTION.

FOCUS-PDCASM



FOCUS on Continuous Process Improvement

Find process improvement opportunity.

1. What situation yields an opportunity for improvements?
2. Which processes should be addressed first?
 - A. Does the process reflect rework, barriers, or excessive costs?
 - B. Is this process a priority of the hospital?

Organize a team that knows the process.

1. Is there representation from the suppliers, customers and people who work in the process?
2. Are the employees who work closest to the customer part of the team?

Clarify current knowledge of the process.

1. Is the process well defined, including the customers and their needs and expectations?
2. Do our perceptions of the process relate to the actual process? How do we know?
3. What is the baseline data on the current situation? What does it tell us?
4. Have we clarified our initial opportunity?

Uncover root causes of process variation.

1. What are the major causes of process variation?
2. Are they the root causes or just symptoms of the problem.
3. What are the root causes that have the greatest impact in priority order?

Start improvement cycle based on theory.

1. What new knowledge have you acquired about the process?
2. What change needs to be made to improve the process?

The PDCA Improvement Cycle: Plan, Do, Check, Act

Plan

* Improvement

1. Who, what, when, where, and how are we going to change in the process?

* Data collection

1. Who, what, when, where, and how are we going to track the process change?

Do

* Improvement

* Data collection

* Data summary

Check

* Results

1. Do results match the expectations?

* What was learned?

1. What does the team want to continue to do?
2. What would the team do differently?

Act

* On process

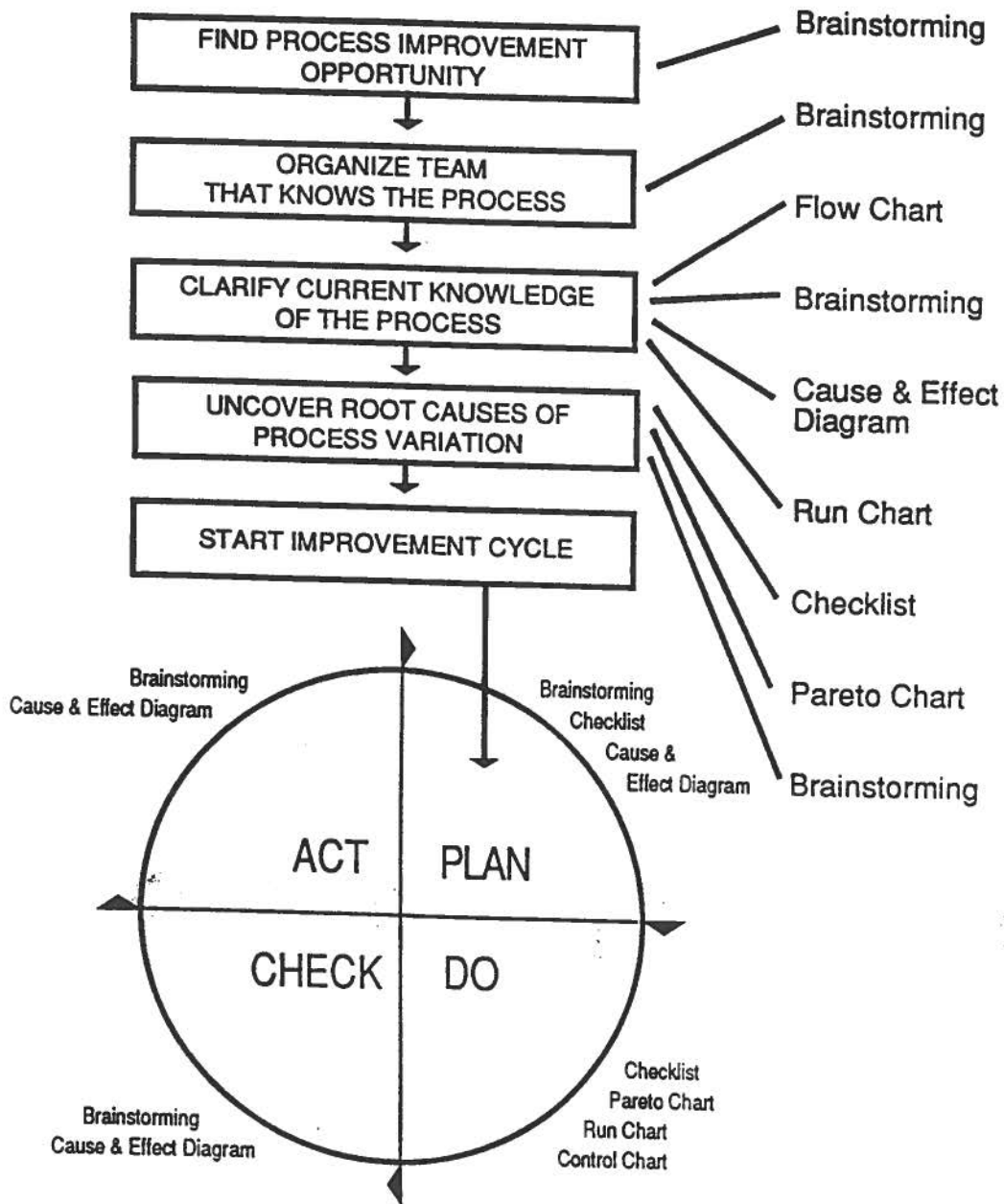
1. What part of the process needs to be standardized?
2. What policies/procedures need to be revised?
3. Who needs to be trained?

* On theory

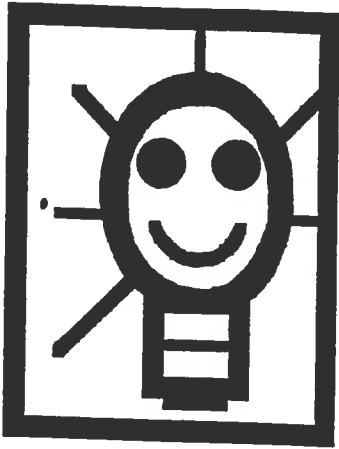
1. Does the theory need to be revised?
2. Is a new theory needed to continue the improvement cycle?

Repeat Improvement Cycle (PDCA)

PROCESS IMPROVEMENT STRATEGY



Tools of the New Quality Technology



Brainstorming

Definition: A group process technique to encourage creative thinking.

Purpose: To elicit ideas from all team members equally.

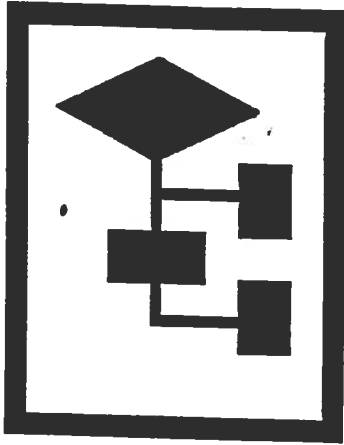
Guidelines for Brainstorming:

1. Generate a large number of ideas.
2. Freewheeling is encouraged.
3. No criticism.
4. Encourage everyone to participate.
5. Record all ideas.
6. Let ideas incubate.

After Brainstorming:

1. Prioritize by ranking.
2. Reach consensus.

Flow Diagram



Definition: A detailed chart showing the flow of all steps in the targeted process.

Purposes: To identify redundancy, inefficiency, or misunderstanding of the actions in a process by examining actual vs. perceived process flow.

Guidelines for constructing a Flow Diagram:

1. List all steps in the process in the order they occur.
2. Use ovals to indicate the beginning and end of the process, rectangles to represent steps of the process, and diamonds to indicate yes/no decision points of the process.
3. Brainstorm for causes of disruption of flow at each step in process.
4. View process from several different perspectives—management vs. staff, patient vs. nurse vs. physician.

FLOWCHART

Definition A pictorial outline of the sequence of steps that make up a process.

Purpose To provide information about the movement of a process' key elements so that the process can be understood and improved.

- Steps*
1. Select a process.
 2. Briefly describe the process.
 3. Set the beginning and ending boundaries of the process.
 4. Decide on the level of detail for the flowchart.
 5. List sequentially the steps in the process.
 6. Draw the flowchart using the appropriate flow-charting symbol for each step.

STANDARD FLOWCHARTING SYMBOLS

START/STOP



Horizontal oval

Symbol for the beginning and end of a process. Each process has only two: one for indicating start and the other for indicating stop.

FLOWLINE



Arrow

Symbol that connects the steps of a process. The arrowhead indicates the direction in which the steps flow.

PROCESS STEP



Rectangle

Symbol that indicates a transformation or movement in the process. Inside the rectangle should be a brief description of the transformation or movement.

DECISION



Diamond

Symbol for making a decision or choice in the process. These can be either attribute type or variable type decisions. The decision is stated in a question inside the diamond.

CONNECTORS

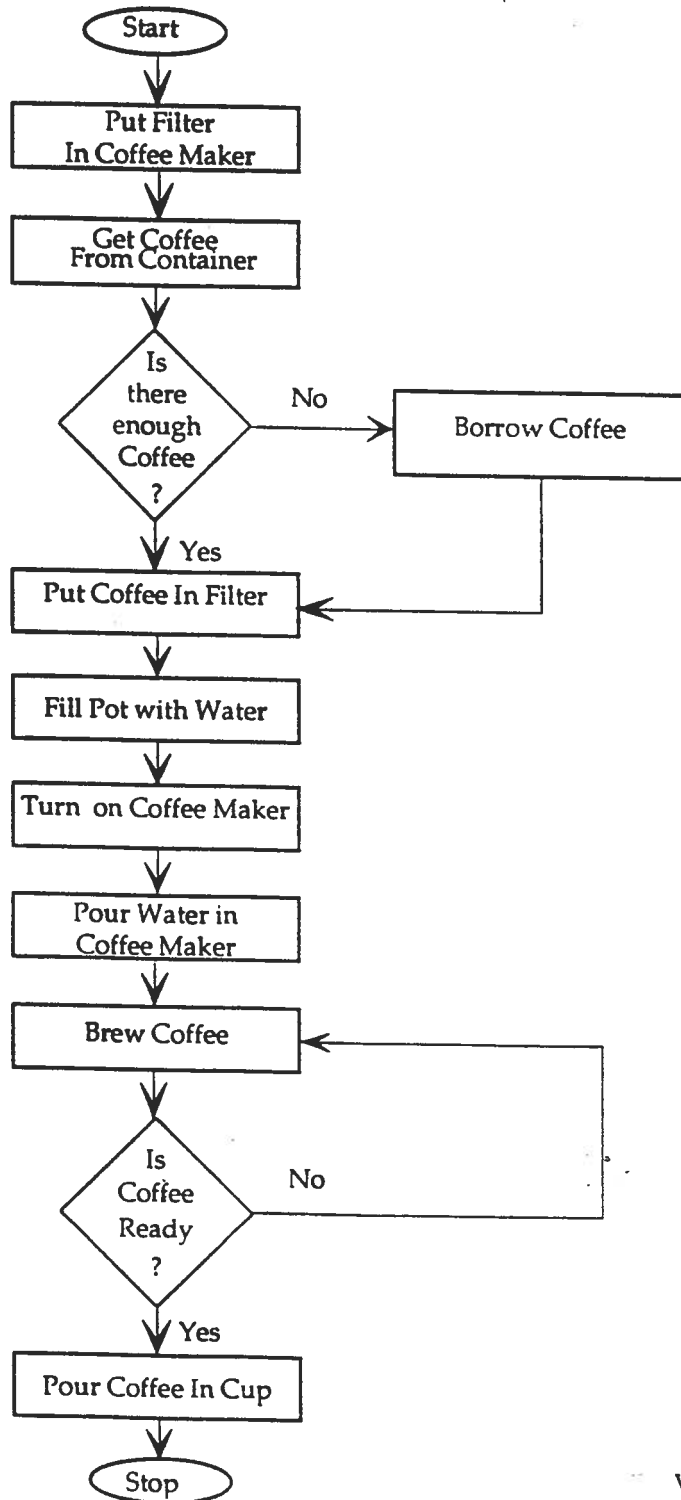


Small Circle

Symbol that indicates the continuation of a flowchart. The two corresponding circles that connect a flowchart are labeled with the same letter inside of them.

FLOWCHART EXAMPLE

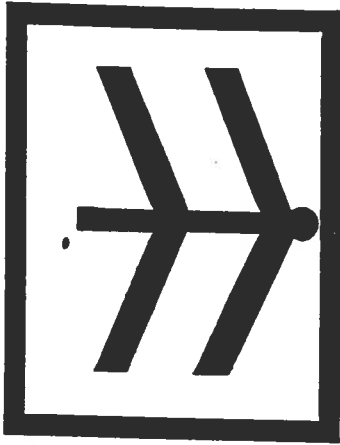
Flowchart for making Coffee with Drip Coffee Brewer.



FLOWCHARTING TIPS

1. Decide if the flowchart will reflect the way the process *actually* functions or should *ideally* function. Developing both can be helpful in making process improvements.
2. Start with a flowchart that reflects the key actions and decision points in the process. Further detail can be added later if needed.
3. Answering the *Process Focus Questions* (see next page) can be helpful in describing the process prior to developing the flowchart.
4. Use of Post-it™ Notes makes it easy to interchange the sequential order of the steps and decision points until the final sequence of the flowchart is determined.

Cause and Effect Diagram



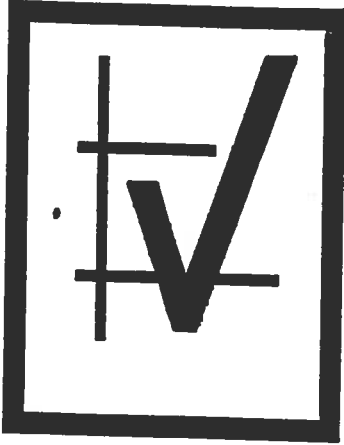
Definition: A graphic tool used to isolate factors that may influence or cause a given outcome.

Purpose: To represent the knowledge of the cause and effect mechanisms of a process by organizing all potential causes that contribute to the desired and undesired effect.

Guidelines for Cause and Effect diagraming:

1. Be as specific as possible about causes.
2. Ask who, what, when, why, and how.
3. To stimulate thinking, it may be helpful to organize into major categories such as People, Procedures, Materials, Equipment, and Environment.
4. Post diagrams to stimulate thinking and get input from other staff.

Checklist



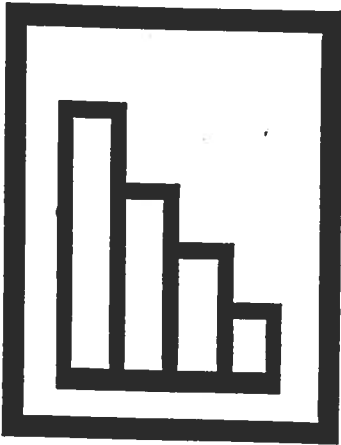
Definition: A data collection form consisting of multiple categories. Each category has an operational definition and can be checked off as it occurs.

Purpose: To facilitate the collection and analysis of data.

Guidelines for checklist preparation:

1. Use cause and effect diagramming and brainstorming to identify categories to be included on collection form.
2. Construct an operational definition of each category.
3. Decide who will record data and how often.
4. Construct form with categories as rows and time intervals as columns.

Pareto Charts



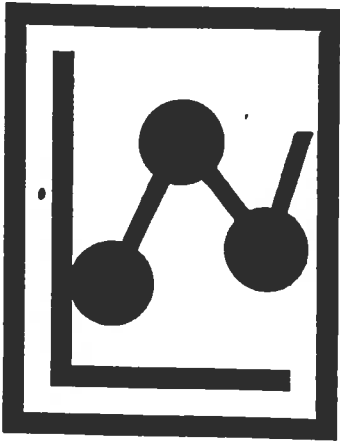
Definition: A bar graph to arrange information in such a way that priorities for process improvement can be established.

Purpose: To clearly sort the vital few from the trivial others in order to determine where the biggest improvement opportunity exists.

Guidelines for constructing a Pareto Chart:

1. Determine the classification of items to be included. (Data must be itemized or classified to construct a Pareto. How to do this is often obvious if data comes from a Checklist.)
2. Decide on the period of time to be included on your graph.
3. Total the frequency of occurrence for each item. The total for each item will be shown by the length of the bar.
4. Record frequency on the vertical axis and classifications on the horizontal axis.
5. Plot a line graph of the cumulative total for each item.
6. Title the graph and note the source of data on which the graph is based.

Run Chart



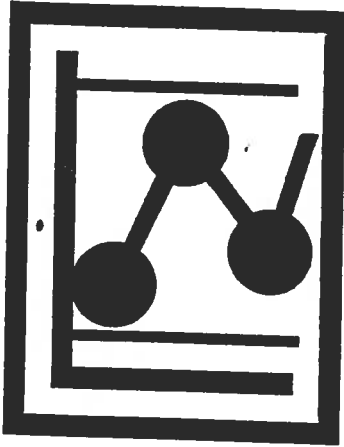
Definition: A display of process outputs in the order that they occur.

Purpose: To identify meaningful trends or shifts in the level of a process.

Guidelines for constructing a Run Chart:

1. Label the vertical axis with the unit of measurement for the process outputs.
2. Label the horizontal axis with the unit of time or sequence that the measurements occurred.
3. Mark a point on the graph to indicate the measurement or quantity observed or sampled at each point in time.
4. Connect the points with a line.
5. Compute the process level.
6. Draw a line representing the process level.

Control Chart



Definition: A run chart with statistically computed upper and lower limits of expected process variation.

Purpose: To report on the stability of a process.
To monitor for maintenance and adjustment.
To determine whether process changes have had an effect.
To study variation to discover its sources.

Guidelines for Control Charts:

1. Control charts are easy to interpret and straight-forward to construct. However, there are many types of control charts, and the appropriate one must be selected. The selection depends on the output measured and the method of measurement.
2. More detailed information about control charts is included in a special tools training course offered each month,

The following references also may be helpful if you want to learn more about control charts:

Understanding Statistical Process Control
by Donald J. Wheeler and David S. Chambers,
published in 1986 by Statistical Process
Controls Inc., Knoxville, Tennessee.

Modern Methods of Quality Control and
Improvements by Harrison M. Wadsworth,
Kenneth S. Stephens and A. Blanton Godfrey,
published in 1986 by John Wiley and Sons,
New York.