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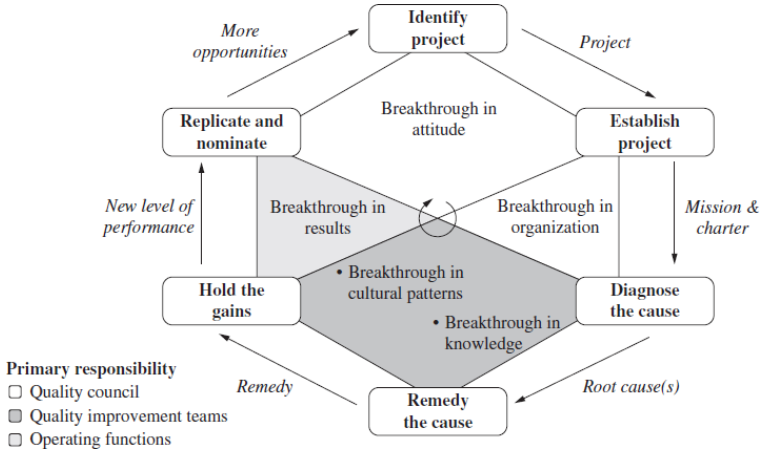
16.3. Juran's RCCA

Juran's four-step process for RCCA is an outgrowth of the work of Dr. J. M. Juran in which he described the universal process for quality improvement, shown in Fig. 16.2. This universal, as Dr. Juran stated in earlier chapters is the third universal of "control—the process for preventing adverse change." To ensure that all processes are in a state of control requires three basic elements:

1. The means to know the actual performance of the process
2. The ability to compare the actual performance to the targets or quality goals
3. The means to act on the difference to maintain control

Figure 16.2 The six major steps of problem solving.



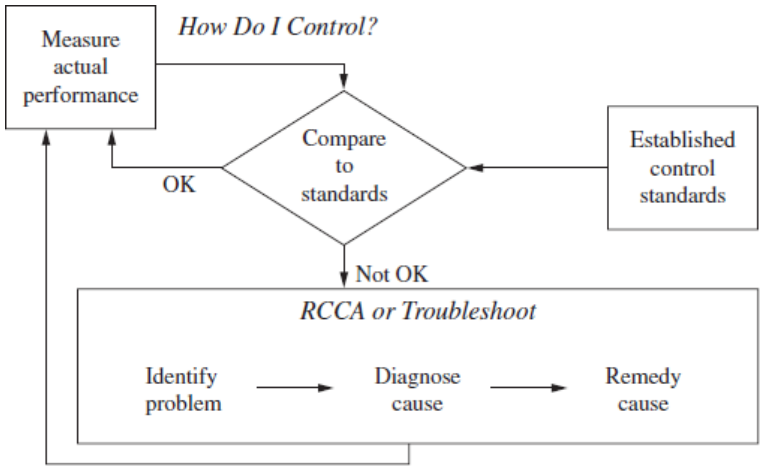
The third step requires a means and a method to determine what correct action should be taken. There have been many versions to act on the difference for centuries. Walter Shewhart coined the term PDCA (Plan, Do, Check, Act) as a means to set up the control functions. Practitioners of PDCA still need to know how to perform the action. While there are many tools to aid in root cause analysis, a simple method is needed to solve daily, sporadic, small-scope problems.

The Juran RCCA method described here is a simplification of the universal process for improvement described by Dr. Juran, and consists of four steps:

1. *Define*. Identify a change in performance.
2. *Analyze.* Diagnose the cause.
3. *Improve*. Remedy the cause.
4. *Control.* Hold the gains.

"Quality control can be defined as the maintenance or restoration of the operating status quo as measured by [meeting] the acceptable level of defects and provision of customer needs" (Monroe, 2009). The mechanism of controlling quality is depicted in Fig. 16.3. The troubleshooting portion of the control feedback loop is where RCCA is needed. When a measurement of a control subject is outside the established standard of acceptability, some means for identifying the cause is needed. Once the root cause or causes are identified, a remedy must be put in place that will eliminate them. After the cause is eliminated, the control feedback loop continues to monitor the process so the cause and problem do not recur.

Figure 16.3 The control feedback loop.



The four-step RCCA approach described above has several sub steps that must be undertaken to effectively diagnose and remedy the cause:

1. Define the problem
    - Identify frequency of the problem: sporadic or chronic (if the latter, apply breakthrough methods)
    - Establish responsibility to solve it, if it is not already established in a control plan
    - Prepare a problem statement
2. Analyze and diagnose the cause
    - Analyze symptoms
    - Formulate theories
    - Test theories
    - Identify root cause(s)
3. Improve and remedy the cause
    - Design and implement the remedy
4. Control to hold the gains
    - Adjust controls

Each of the steps and sub steps of Juran's RCCA approach is discussed in more detail in the following sections.

16.3.1. The Medical Analogy

The Juran RCCA approach is analogous to the approach a physician takes in treating an ill patient. First, the doctor will want to understand what is wrong: What's the problem? Without a clear understanding of the problem, it will be impossible to solve.

Next, the doctor will want to know more about the outward evidence that the problem exists: the symptoms. He might take the patient's temperature, ask what kind of discomfort the patient is experiencing, look into the patient's throat and ears, and so on.

Based on the observed symptoms, the doctor will formulate tentative diagnoses—theories about what could be causing the patient's illness. At this point the doctor is still unsure what the true cause of the illness is, so he will order tests to determine which of his tentative diagnoses is true. Perhaps blood will be drawn from the patient for analysis; perhaps the patient will be given an MRI exam or other diagnostic tests.

Once the data about the possible causes of the illness have been gathered, the doctor is ready to settle on a final diagnosis based on the facts. Now, hopefully, the true root cause of the patient's illness is known and the doctor can apply an appropriate remedy. Perhaps the patient will be given medication, prescribed physical therapy, recommended to make certain lifestyle changes—whatever the appropriate remedy is to alleviate the proven cause of the illness.

Finally, the doctor might say, "Come back and see me in two weeks." This is the activity of holding the gains intended to ensure that the patient is continuing with the prescribed regimen and the remedy is effective: the patient is getting better.

16.3.2. Elements of Effective RCCA

These are the necessary elements for effective root cause corrective action:

- *A problem*. A problem is outward evidence that something is wrong and warrants a solution, for example, a visible performance deficiency in the output of an important design, manufacturing, service, or business processes. Time and resources are needed to analyze and solve problems.
- *Data and information*. We cannot solve the problem until we have the hard facts that prove what the root cause is. Without data, we are merely guessing at the causes of the problem, and our efforts to solve it will be hampered by our lack of knowledge. More importantly, we will create doubt and greater risk will be introduced into our system.
- *Tools*. When a problem arises, there are many questions that need answers. Those answers will come from data found within our processes. At times, we are often faced with a great deal of data, but little information or facts. We can use tools to help us organize and understand the data. They are invaluable aids to effective root cause analysis.
- *Structure*. A logical and structured approach is needed to guide the RCCA process. This structure becomes the "guide or boss," not the people trying to solve the problem. At a minimum, this structure needs to use and involve multiple functions to discover root causes. This structure will allow us to "torture the data until it confesses." Data contains information. We need a means to extract it.

An almost unlimited number of tools are available to the problem-solving team, but those most often used for basic RCCA are:

- *Affinity method and brainstorming*. Brainstorming is a quality tool intended to stimulate creativity. It is useful because it helps the team consider a full range of theories about possible causes. The affinity process helps organize those theories.
- *Cause and effect diagrams*. An effective way to organize and display the various theories of potential causes of a problem.
- *Data collection*. These methods are used to gather information about a quality problem. A typical data collection form is arranged for easy use and includes clear instructions.

- *Failure mode and effects analysis (FMEA).* This is a structured methodology for identifying potential failure modes in a process or design and assessing the risk associated with the failures. It helps identify the most likely possible causes and helps design a more robust remedy.
- *Graphs and charts.* These are pictorial representations of quantitative data. They can summarize large amounts of information in a small area and communicate complex situations concisely and clearly.
- *Histograms.* These are graphic summaries of variation in a set of data. The pictorial nature of the histogram enables us to see patterns that are difficult to see in a simple table of numbers.
- *Box plots.* Like histograms, box plots provide a graphic summary of the pattern of variation in a set of data. The box plot is especially useful when working with small sets of data or when comparing many different distributions.
- *Juran's Pareto analysis.* This is a ranked comparison of factors related to a quality problem. It helps identify and focus on the vital few factors.
- *Process control plans.* These plans summarize the plan of action for a process out of control. Their purpose is to document the actions necessary to bring the process back into control and assist the process owners in holding the gains achieved by the problem solving.
- *Scatter diagram.* This is a graphic presentation of the relationship between two variables. In root cause corrective action, scatter diagrams are usually used to explore cause-effect relationships in the diagnostic journey.
- *Stratification.* It is the separation of data into categories. Its most frequent use is during the diagnostic journey to identify which categories contribute the most to the problem being solved.