TOOLS FOR EFFECTIVE PROBLEM SOLVING

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Solving problems is at the core of continual improvement and these problem- solving tools will help you to take a structured and methodical approach. Problem solving may be the activity which takes up most of your time each day and is impossible to separate the task of problem solving from the task of continual improvement. They are one in the same, and you can't do one without the other.

Unfortunately, solving problems properly is an extremely difficult task in many cases. The problem may be complex, or you may have several different potential solutions to consider. Or, in some cases, you may have both a complex problem and a lot of possible solutions on your plate. When things get complicated as you are trying to make a crucial problem-solving decision, it is helpful to have tools available to use.

In this article, we are going to highlight five of the top problem-solving tools available. Once you understand how to use these tools, and why they can be effective, you will be able to look for opportunities to put them into action in real- world applications.

The following tools will be explained:

1. Brainstorming
2. Cause and Effect (Fishbone) Diagrams
3. 5 Why Analysis
4. Data Collection Techniques
5. Pareto Charts

BRAINSTORMING

It's always fun to ask individuals and teams the question, "What is the purpose of brainstorming?"

The most common response to that question is, "To list ideas." If indeed to list ideas is your objective, here's a guaranteed, iron-clad way to improve your personal productivity: Skip themeeting and mail in your ideas! Have somebody summarize all the ideas mailed in and sendthe master list back to you. You will have achieved your goal: a list of ideas. Whether brainstorming is employed in process improvement project, a problem investigation, or even in aroutine department meeting, its purpose is not merely to "list ideas."

The goal is to create ideas; to get the organization behavior concept of group synergy workingfor you. In other words, in a tiger team of four people, the efforts of 2 plus 2 produce the outputs offive! Where did the extra person come from? Well, during brainstorming, Molly says something. That triggers something inJacob's mind. When it's his turn, he hitchhikes on Molly's idea and tosses it out with a slightly different spin. Later, Emma does it yet again. We end up with ideas on the flip chart werecreated; ideas that no one individual team member would ever come up with on his or herown.

PROCEDURE FOR BRAINSTORMING

1. Post the question or topic on the flip chart or white board
2. Allow one or two minutes of "silent writing" to allow all participants to jotdown a few responses
3. Have members state their responses one-by-one, in turn
    a. No interruptions, no comments, no question
    b. Members can pass
4. Record ideas on the flip chart exactly as they are stated
5. When all team members pass on the same turn, it's over

When teams follow this procedure, they end up with ideas on the flip chart that were created –ideas that no one team member would ever come up with on their own, no matter how much time you gave them. In the above example, Emma's idea was comprised of a piece of Jacob's idea that wascomprised of a piece of Molly's. This synergistic creativity is both the goal and the product of brainstorming.
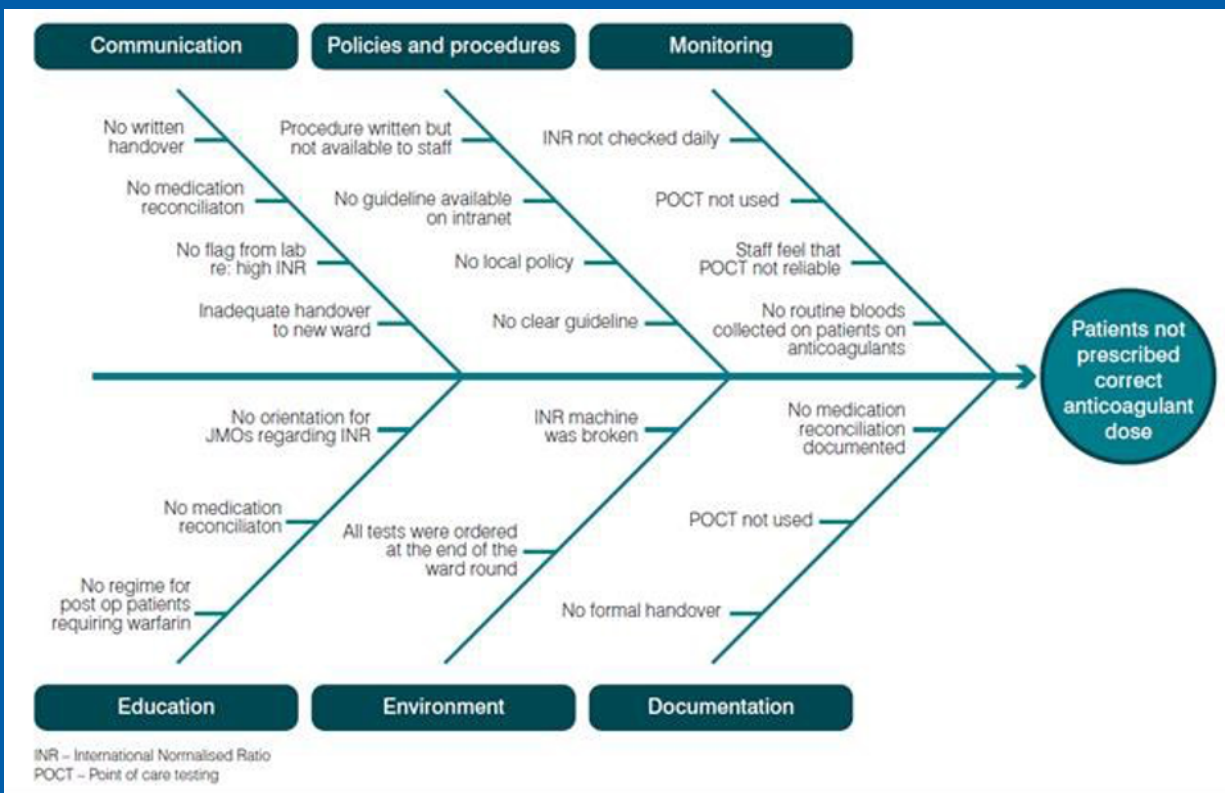
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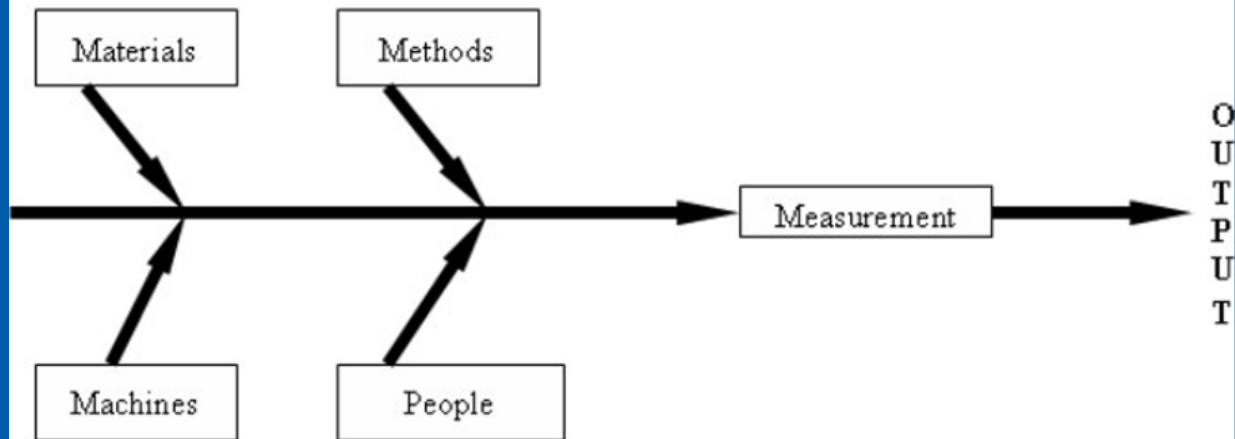
CAUSE AND EFFECT (FISHBONE) DIAGRAMS

The correct use of the brainstorming technique above may generate several flip chart pages of creative ideas. As a next step, building a cause-and-effect or Fishbone diagram provides anorderly form for organizing the ideas and illustrates the relationship between a problem (effect) and its possible causes. When analyzing technical or manufacturing or product-related problems, brainstorming ideas will often fall cleanly into Walter A. Shewhart's basiccategories of a process.

When dealing with problems or process issues that are not technical or manufacturingrelated, however, the above categories may not apply. Instead, in the aftermath of abrainstorming session teams are encouraged to derive from their own ideas the appropriatecategories. For example, figure shows the cause- and-effect diagram that was generated by a team at the Clinical Excellence team trying toanalyze possible causes of incorrect patient medication prescriptions.

Communication | Policies and procedures | Monitoring

No written handover
No medication reconciliaton
No flag from lab re: high INR
Inadequate handover to new ward

Procedure written but not available to staff
No guideline available on intranet
No local policy
No clear guideline

INR not checked daily
POCT not used
Staff feel that POCT not reliable
No routine bloods collected on patients on anticoagulants

Patients not prescribed correct anticoagulant dose

No orientation for JMOs regarding INR
No medication reconciliaton
No regime for post op patients requiring warfarin

INR machine was broken
All tests were ordered at the end of the ward round
No formal handover

No medication reconciliation documented
POCT not used

Education | Environment | Documentation

INR – International Normalised Ratio
POCT – Point of care testing

BUILDING THE FISHBONE DIAGRAM

1. Write the problem or issue under discussion in a box on the right-hand side of the page. This is the "effect."
2. Draw an arrow from the left side of the page to the box on the right side.
3. Review brainstorming ideas. Identify common themes or categories of ideas.
4. Write the main categories of possible causes, directing a branch arrow from eachcategory to the main arrow.
5. Onto each branch arrow, write the relevant ideas that were generated during the brainstorming session.
    a. These will look like "twigs" on the main branches
    b. Onto each of these twigs, write in even more detailed items from the brainstorming, making even smaller twigs.
6. Check to ensure that all possible causes are included on the diagram. If appropriate, use brainstorming to generate additional ideas.

5 WHY ANALYSIS

5 Why root cause analysis is a basic technique that does not require regression analysis, hypothesis testing or other advanced statistical methods. In many cases, it can even be appliedwithout data collection, and it's easy to perform without statistical analysis.

5 Why is most often used when human factors are involved, in day-to-day on-job problemsolving, and in safety and health investigations. At the risk of over- simplifying this simple tool, 5Why involves repeatedly asking the question, "Why?" (A five-year-old is usually very good atthis technique!)

When a problem has been reported or discovered, teams proceed with the following procedure:

1. Write down the specific problem. Writing it down helps formalize the problem anddescribe it completely. It also helps the team to focus on the same problem.
2. Ask why the problem happens and write the answer down below the writtenproblem.
3. If the answer you just provided doesn't identify the root cause of the problemwritten down in step 1 above, ask Why again and write that answer down.
4. Loop back to step 3 until the team agrees that the problem's root cause is identified. This may take fewer or more than five Why's.

Numerous other examples of 5 Why applications can be found in the literature and on theInternet. One, posted on www.velaction.com/lean-information, reported a problem of coolantleaking from a machine that was affecting both safety and production.

➢ Why is coolant is leaking from the machine?
o   Because a seal was damaged.
➢ Why was the seal damaged?
o   Because metal shavings got into the coolant.
➢ Why were metal shavings in the coolant?
o   Because a screen on a coolant recycling pump was broken
➢Why was a screen on a coolant recycling pump broken?
o   Because the screen is in a place where it was likely to be damaged by dropped parts

The team concluded that the last item above was the root cause of the coolant leak. Correctiveaction was to redesign the machine or add a guard to cover the screen and prevent futuredamage. If the seal was merely replaced, it would have soon needed repair again when the problem recurred, and the damage repeated itself.

DATA COLLECTION

Process improvement projects, as well as Systematic root cause analysis, 8D and otherstructured approaches to problem solving, require a great reliance on facts and data.
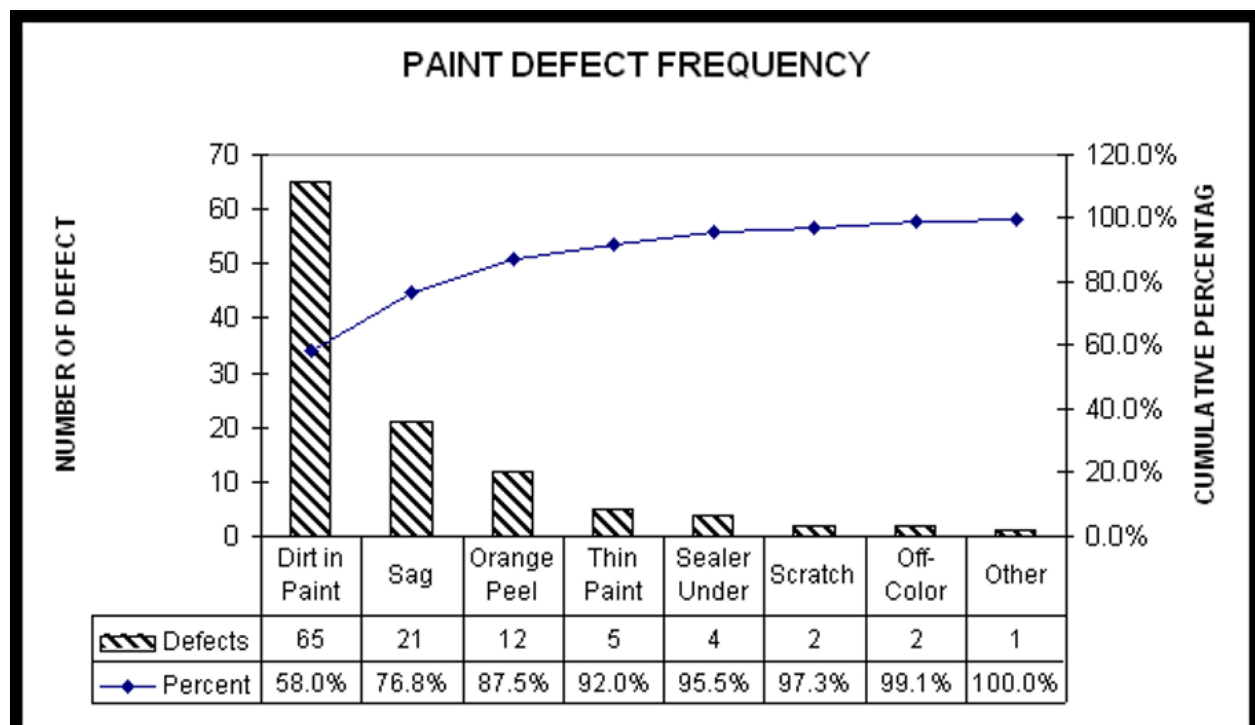
Guidelines for Collecting Data

1. Clarify the purpose for collecting the data. Only when the purpose is clear can thekinds of data to be collected be determined.

2. Collect data efficiently. In the great majority of problem-solving and process improvement efforts, all the data a team needs are already available in the form ofprior in-house data. It's sitting in a file somewhere; it's sitting on a printout somewhere.Go get it – efficiently! In other cases, however, the type of data needed may be difficult tocollect, measure, or record. Common problems include lack of instruments or manpower, difficulties in quantification, and the lack of clear operational definitions. What is essential is will, ingenuity and skill.

3. Always act according to the data. If the data you're collecting result in no action, stopcollecting the data! Remember to make data the basis of action. Make a habit ofdiscussing the problem based on the data and respecting the facts shown by the data.

PARETO DIAGRAMS

Pareto diagrams are a form of bar graph used to rank measured items in descending orderof priority. The Pareto Principle, sometimes called the "80/20 Rule," is used to sort the "vitalfew" from the "trivial many" issues. The Pareto principle is particularly important to problem-solving and process improvement project teams, because they will always have limited time,limited people and limited resources at their disposal. It is essential that those limitedresources be applied to areas that will provide the greatest return on the effort invested.Summarizing data in Pareto diagram format helps teams to zero in on the most likely and/ormost important causes of problems.

Arranging data in Pareto format may highlight something that might otherwise have goneunnoticed. For example, in the graph below, the team that prepared the diagram wassurprised to learn that, by far, the biggest cause of the failures was "dirt in the paint". Paretodiagrams will often bring to light issues that may not even have been under suspicion.

PAINT DEFECT FREQUENCY

	Dirt in Paint	Sag	Orange Peel	Thin Paint	Sealer Under	Scratch	Off-Color	Other
Defects	65	21	12	5	4	2	2	1
Percent	58.0%	76.8%	87.5%	92.0%	95.5%	97.3%	99.1%	100.0%

PROCEDURE FOR CONSTRUCTING THE PARETO DIAGRAM

1. Agree on the classification of items to be recorded (kinds of defects, number ofincidents, failure modes, size, cost, etc.).

    a. If your records aren't classified or itemized using a common scale, you can't construct a Pareto diagram!

    b. Revise your data sheets so data can be organized and recorded correctly.

2. Decide on the period to be illustrated on your diagram (weekly, monthly, quarterly, etc.).

    a. For some situations, your time period may be days or even hours.

    b. The important thing is to make sure you keep the time period for all related graphsthe same so you can compare them later.

3. Total the frequency of occurrences for each classification or item for the defined timeperiod. The total for each item will be the length of the bar on the diagram.

4. Draw horizontal and vertical axes and mark the axes in the proper units.

5. Draw in and label the bars.

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