Bite-Sized Training™

Problem Solving

MindTools™

Problem Solving: How to Search for Solutions Bite-Sized Training

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Introduction

Problems have a way of making themselves very well known; solutions on the other hand, prefer to remain a bit more mysterious. One of the main reasons for this is the reality that there's often more than one factor contributing to the problem, and often the real sources of those factors aren't clear. When there are multiple potential culprits, hiding in multiple places, identifying the best way to deal with the presenting problem is mind-boggling.

Choosing the first solution that comes to mind or the easiest one to implement is very attractive when faced with having to navigate the complexity of the interrelationships that exist. However, you risk missing the real underlying causes of what's going wrong on the surface. Without a systematic approach to understanding all aspects of the problem, you often end up with "Band Aid" solutions that only cover up the symptoms temporarily. When you don't drill down to the root of the issue before looking for solutions, the problem festers and quite often requires massive reconstructive surgery later on.

This **Bite-Sized Training™** session focuses on helping you learn the essentials of identifying the root causes of defined problems. In a Bite-Sized lesson that'll take around an hour, we'll show you how to:

- Define the problem in a way that will help you uncover its causes.
- Identify multiple factors contributing to a problem using Cause and Effect diagrams.
- Drill down to the root causes of those factors.

By the end of the lesson, you'll have learned the tools you need to uncover sources of a problem - the foundation to successful problem solving.

1. The Importance of the Big Picture

When you look at any problem, there's always more than one contributing factor.

Each factor you uncover suggests many potential solutions. The entire issue expands exponentially, and it's quite impossible to keep all the information straight in your head. When issues become complex and interrelated like this, diagrams or graphic representations of the problem are very useful. They help you to capture the big picture by forcing you to organize the factors contributing to the problem in a sequential or otherwise interrelated manner.

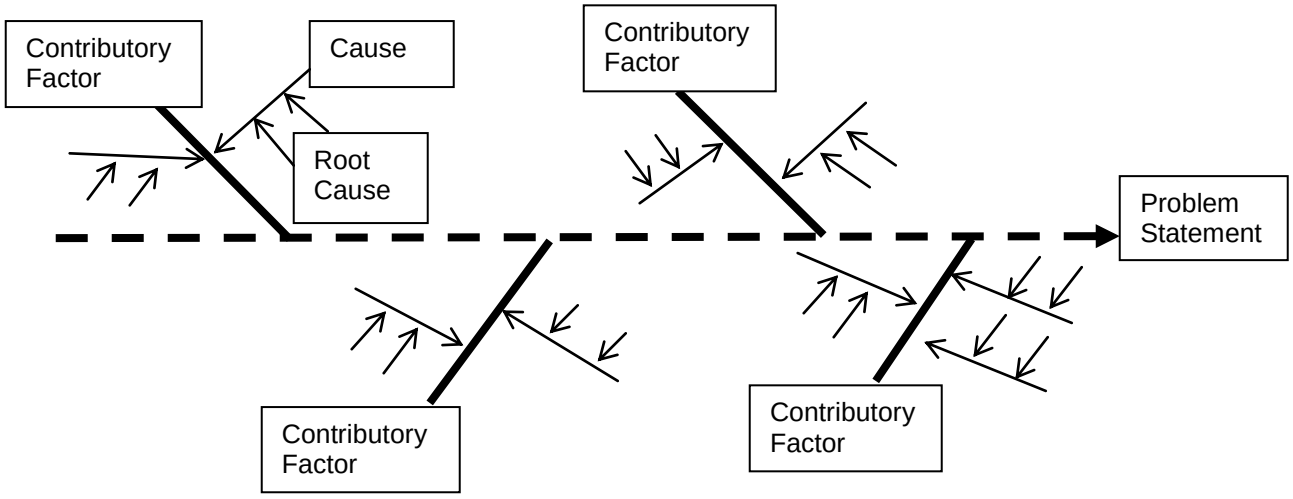
Preparing your analysis in this way requires considering all the possible causes of a problem, rather than focusing on the one or two most obvious ones. And we're looking at a method that does just that in this training session.

2. Cause and Effect Diagrams

A very effective graphical tool for tracing a problem (the effect) back to its many potential root causes is a Cause and Effect diagram, developed by Dr Kaoru Ishikawa, an engineer and professor in Japan. The steps involved in creating a Cause and Effect Diagram help you to:

- Define the problem.
- Identify the main contributing factors.
- Identify the causes within each of these factors.
- Drill down to isolate the root causes.
- Analyze the problem in detail.
- Identify possible solutions.

These diagrams are often called Fishbone diagrams because they have a spiny look to them - the contributory factors are the key areas which contribute to the problem, and the causes of those factors and their root causes are further traced.



You can see from the example above that a Cause and Effect diagram is a method of capturing many different inputs, which visually prompts you to consider all possible causes of the problem, rather than just the ones that are most obvious.

The best way to become confident with this method of solution identification is to work through an example. Read the case study on the next page - then we'll complete a Cause and Effect Diagram to analyze to the problem that is presented.

Tip:
An "Effect" can be negative (a problem) or positive (an objective) depending on what you are looking for solutions to. In our example we will be looking for solutions to a problem but you can just as easily look for ways to accomplish a desired outcome.

Case Study

S&P Office Machines keep finding themselves in a cash flow crunch. They're looking at ways to avoid this problem in the future, they and think a Cause and Effect Diagram would be a useful tool. S&P Office Machines has been in business for 28 years. They've been very successful to date, and contribute much of their success to the fact that they had many of the same employees from start-up. Two of the senior salesmen retired in September but the replacements are now doing a great job.

Every year they go through a forecasting exercise where they determine the next year's budget on a month-to-month basis, based on what happened in the same month the previous year. This approach has been quite effective in the past, but this year they find themselves way below target for the month of December and this is causing cash flow difficulties. The low sales problem is compounded by the fact that they had to spend over $8,000 recruiting their two new salespeople. They spent more than they budgeted because it was much more difficult to find salesmen with office machine experience than they had anticipated. There was no one in the office to fill-in so they had to get the new guys up and running as quickly as possible.

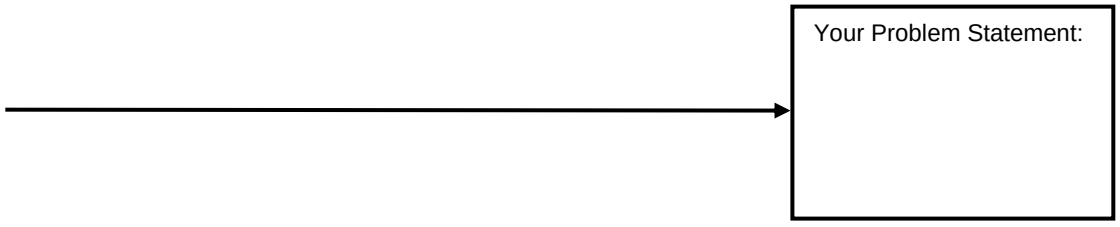
This over expenditure on recruiting put a dent in the advertising budget as well, which probably had a negative effect on December sales as well. Last November and December they did a massive promotion campaign and there was no money in the budget to do the same this year. In fact last year's December sales were higher than any other month of the year. The success of this campaign was particularly welcome because it helped to offset the natural decline in sales due to the Christmas season and the fact that year end was closing in. Companies tend not to invest in office machines until the start of the year when they have a brand new budget and the preoccupations of the holiday season make office machines a low priority.

They are looking at ways to make sure this type of significant budget shortfall does not happen again and have decided that a Cause and Effect Diagram technique to uncover root causes and reveal potential solutions will help them to do that.

Create Your Diagram

To start a Cause and Effect Diagram, write your problem (or objective) definition in a box on the right hand side of the paper and draw a horizontal line (a spine) going into it. This sets up the "Cause" line and the "Effect" box.

What is the problem in the S&P case study? It's poor cash flow. So write your problem statement in the problem box.



Tip:
Take some time to define the problem accurately and make sure that you're looking at the real problem and not just a symptom.

When you define your problem as a negative effect you risk getting off track and trying to justify or explain what happened. Restating the problem as a positive, where appropriate, can help you focus more on desired outcomes. In the S&P example, you could define the problem positively as "Positive cash flow needed" rather than negatively defining it as "Inadequate cash flow."

If you're working in a team, gather a cross-functional group so that you get the widest representation of ideas. Your objective is to uncover as many causes as possible. Therefore, the wider the experience perspective, the greater the number of alternatives.

Appoint one person to be in charge of filling in the diagram. Use a flipchart or whiteboard if available. The key feature is that everyone must be able to see the diagram as a whole and visualize the interrelationships. Use the same person as the facilitator when you start to brainstorm potential causes.

Identify the Main Contributory Factors

Now start looking at the main contributory factors to the problem. You will use these to investigate the causes of the problem in more detail.

Here's a set of contributory factor headings that you might find helpful:

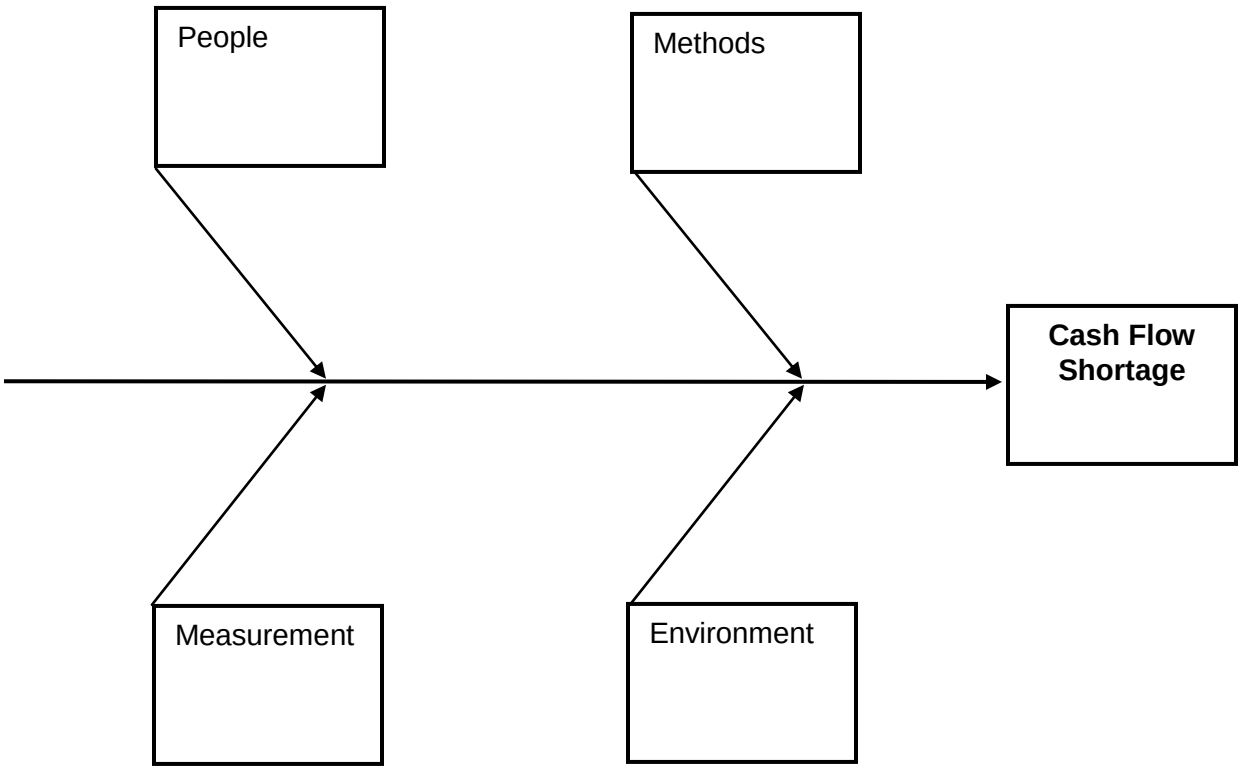
The 5 Ms and E

- **Man** - do the people have the necessary experience and knowledge?
- **Method** - are there adequate processes, defined procedures and clear instructions?
- **Machine** - does the machine have enough capacity; is it well maintained?
- **Material** - is the material of good quality; is the supply adequate?
- **Measurement** - are the measurements accurate; are the instruments correct?
- **Environment** - are there seasonal issues; economic issues?

Tip:
Remember, what you are looking for here are high-level categories. You will break each of these categories down into causes in the next step.

Determine which factors are most appropriate to your situation. You can choose categories from those above, or brainstorm factors that are specific to the problem that you are analyzing.

We will use four main contributory factors for our case study: People ("Man"), Methods, Measurement, and Environment. To do this we place the factors in boxes and draw diagonal lines from each of them to the spine to represent the cause-effect relationship. This is shown on the next page.



Identify Actual Causes

You are now ready to identify specific causes. Take 5 or 10 minutes to fill in as many causes as you can on the next page, based on the information given in the case study.

- Look at each main branch and attach as many causes to it as possible on the diagram on the next page.
- For each factor, ask yourself what causes are contributing to the effect.
- Indicate these causes by drawing lines into the main factor branch.

Here is a thought to get your started:

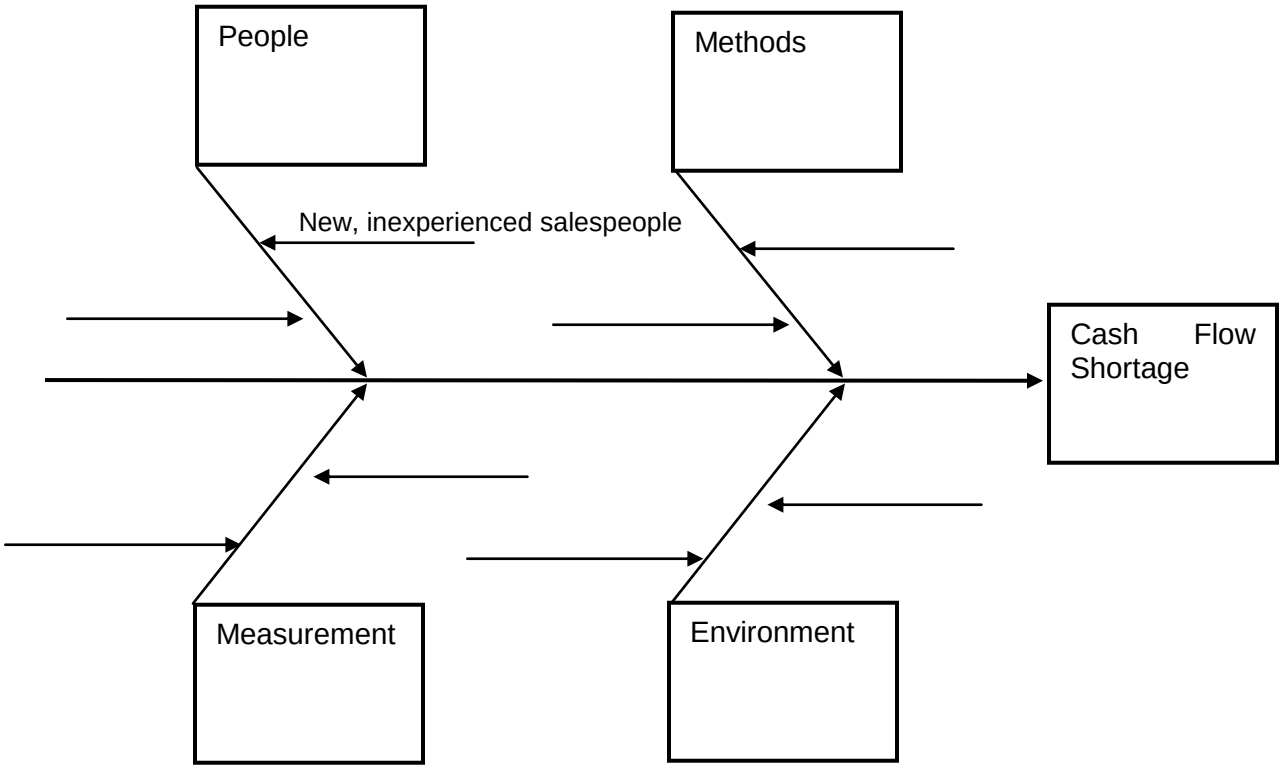
- How do People issues contribute to the problem of not having a positive cash flow? Answer: New and inexperienced salespeople.

We have marked this on the diagram on the next page, and you can see our complete diagram in the next section.

Tip:
The most common method for identifying causes is brainstorming, because these diagrams are typically completed in teams.

Brainstorm ideas for each factor in turn. If you don't, you might get sidetracked, and not exhaust all the possibilities for each factor.

If there are causes that fit more than one factor, record them under every one that is applicable. These multiple factor causes are often root causes.



Drill Down Further

As you generate more and more causes you want to make sure that you reveal the root causes of your problem. One of the best ways of doing this is to use the 5 Whys approach. With this method you start with the high level cause and ask yourself "Why?" five times in a row. By the end of the fifth "Why?" you have usually drilled down to a root cause.

Take another 10 minutes to fill in as much detail as you can for each of the causes identified. Use the 5 Whys technique, as well as some brainstorming on your own. These causes may also have causes, so go to the lowest level of detail you can.

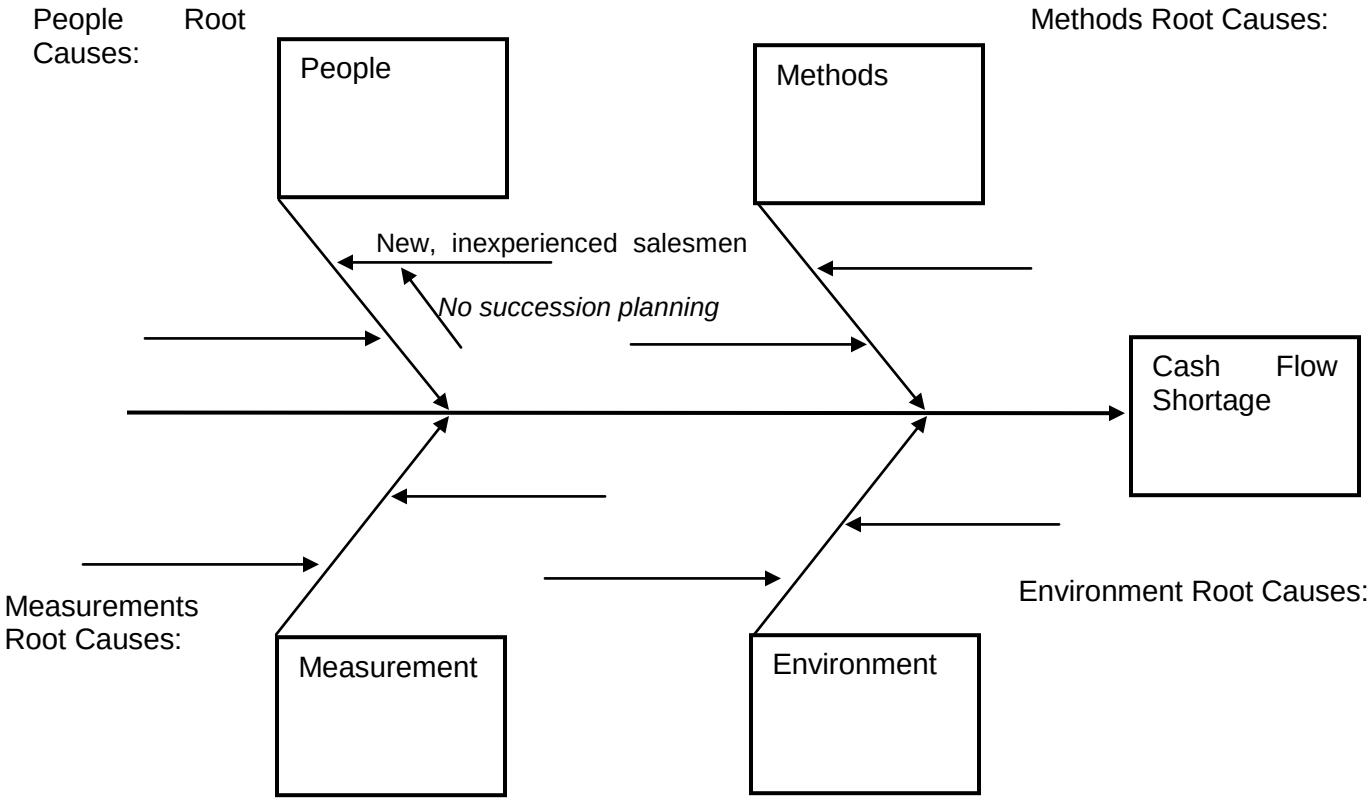
Again, we've started the People issues for you to follow.

5 Whys for People

- Why was there not enough cash coming in? Because the sales team was bringing in fewer sales.
- Why were they bringing in fewer sales? Because the sales people were new and not sufficiently experienced.
- Why had the new sales people not learning enough? Because the only people who knew the best ways to sell the products had retired.
- Why had the new sales people not learned from the retiring ones? Because the recruitment took longer than expected and so they started too late to overlap with the previous sales people.
- Why had there been no overlap? Because there was no succession planning.

The lack of succession planning was one of the root causes of why people issues contributed to the lack of positive cash flow. This is shown on the diagram on the next page.

Tip:
As well as 5 Whys and Brainstorming, another effective way of identifying the causes of a problem is the Drill Down Method (http://www.mindtools.com/community/pages/article/newTMC_02.php).



Analyzing the Diagram

The last step when using the Cause and Effect Diagram as a starting point for finding solutions to problems is to analyze the root causes you have identified and decide which ones warrant further investigation.

Things to look for that tend to indicate where you should focus your attention include:

- One branch that is more detailed or congested than others. When this happens it is likely that you will need to look at that source very closely.
- If one of the main categories has far fewer causes than others, this often indicates that you have not fully investigated this branch.
- If there are lots of categories that have only one or two sub branches, then perhaps these need to be combined.
- Causes that are repeated under many different categories are often ones that are root causes and typically should be dealt with first.

Tip 1:
If one branch becomes too complex, simply break it off and continue on another page.

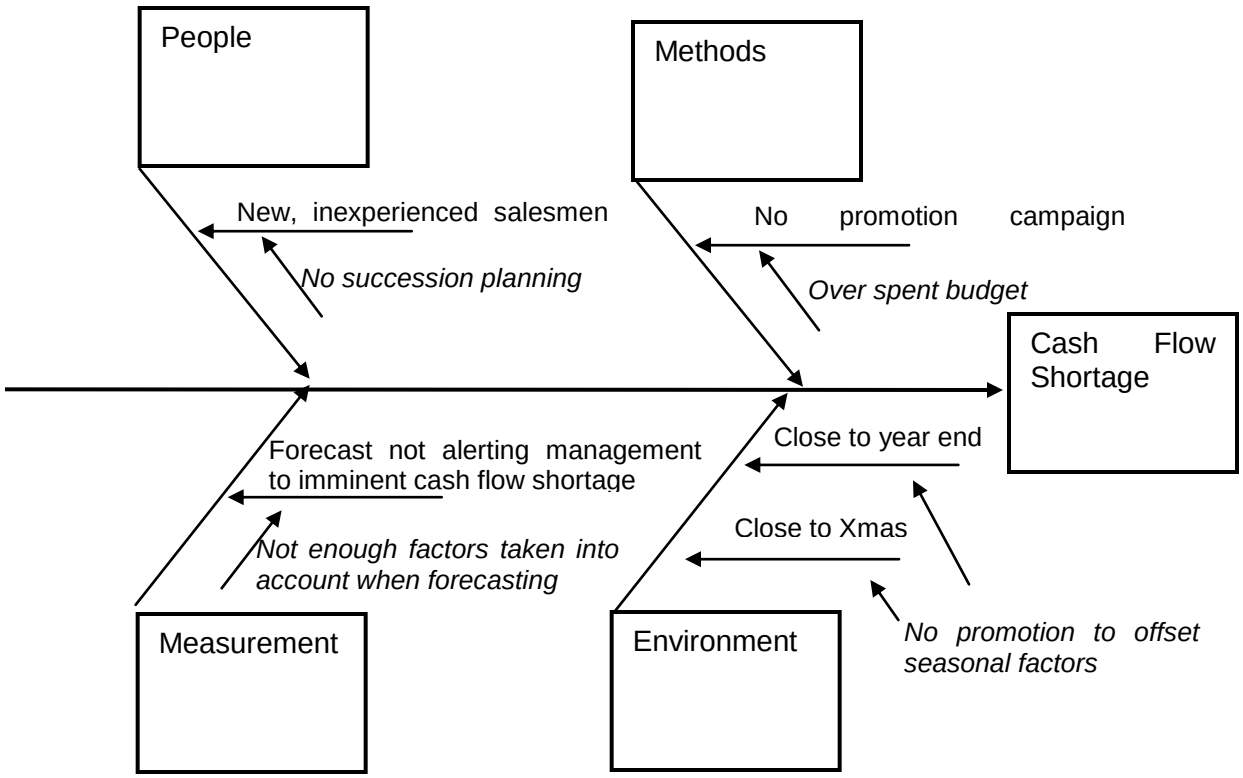
Tip 2:
If you are having trouble deciding which cause, or causes, should be given the highest priority, consider using one of the decision-making techniques discussed in the Bite-Sized Training on Decision Making Paralysis (http://www.mindtools.com/community/Bite-SizedTraining/DecisionParalysis.php).

Other decision-making resources, including Pareto Analysis (http://www.mindtools.com/community/pages/article/newTED_01.php) can be found on our Decision Making Techniques page (http://www.mindtools.com/community/pages/main/newMN_TED.php).

Identifying Solutions

Once you've completed your full analysis, you'll be able to identify the possible solutions that you need to put in place.

3. Completed Cause and Effect Diagram



4. Key Learning Points

Finding solutions to problems is a complex process and you can quickly become confused by all the details and interrelated factors. Having a systematic way to analyze the causes of a problem gives you a solid starting point from which you can start to generate potential solutions. The Cause Effect Diagram is a very useful tool for this purpose and the process you go through to complete the diagram can be very insightful.

Working through a Cause and Effect analysis forces you to:

- Define the problem clearly.
- Identify and investigate main contributory factors that are exerting pressure on your organization.
- Further detail the causes that are at play for each factor.
- Drill down to the root causes of a problem.
- Analyze the causes you have identified and determine where your next actions should be.

At the end of the process you'll have a very good understanding of the problem, and a handful of ideas that can be investigated further and turned into actionable solutions.