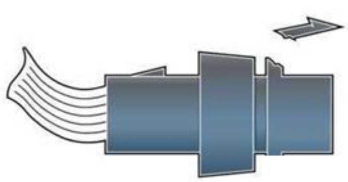
Refining the Art of Asking Why

---John Abrahamian

Many companies which have successful Lean Manufacturing programs, use a 5 Why interrogative approach for technical problem solving. By starting with the end result or symptoms of a problem and asking "***why***" a series of times, often the initiating cause can be identified. This can be a very powerful method since only by understanding the true cause of a problem can the simplest and most effective solutions be put into place. However, there are two major challenges with the 5 Why approach; the first is how to answer the question of why when the answer is not really known. Knowing and perceiving are not the same thing. The second is how the question is phrased. A subtle change in the wording will lead the team in a completely different direction.
At Shainin, we are also interested in asking why, in order to get to the true root cause of problems. Our focus is on perfecting what questions get asked and using the evidence that is available or generated to provide the answers. Some of our clients have described our approach as "refining the art of asking why".

A problem with a broken locking arm on an electrical connector illustrates the typical usage of a 5 Why approach (four whys in this example) and then contrasts it with the Shainin approach. The problem manifested itself as an inoperative automotive electrical component occurring in the field. Asking WHY (1) revealed that the component was not getting any current. Asking WHY (2) revealed that the mating electrical connectors were no longer fully engaged. Asking WHY (3) again revealed that the locking arm which secures the connectors together had broken off. Asking WHY (4) the locking arm broke, the team answered with "it was not strong enough".

So what corrective actions were available? Most engineers with any experience could develop a list of potential improvements to make the locking arm on the connector stronger; change the material to one which is stronger, increase the wall thickness, increase the fillet radius, etc. This is a very typical approach.



Using this thought process, how do we know if we have identified the "best solution"; that is, the cheapest and easiest to implement, with the lowest risk of creating a new problem? The changes mentioned to strengthen the locking arm are all design changes. Changes to a design which has already been validated involves cost and risk. Is a design change really necessary? Most connectors produced are not failing. Is it possible that a minor process change or perhaps tighter control over a particular parameter could also fix the problem?

There are many unknowns surrounding this problem, thus there is a risk that the team has walked past a simpler solution beyond the ones proposed. While the first 3 answers to WHY are confirmed through measurements and observation, the fourth one of why the locking arm broke leaves much to be desired. The team felt that they had to come up with an answer and so they arrived at an obvious conclusion. In fact, the problem is not so much with the answer (the locking arm was not strong enough) but with the question. When conducting a 5 Why investigation, how we phrase the question will very much determine the type of answer we get and ultimately what course of action we take. Shainin methods would provide a more structured approach to these questions. Before asking why the locking arm broke, we could have asked:

- Was the locking arm subjected to an abusive amount of energy which would have broken any connector?
- Why did the locking arm break in the exact location that it did?
- Why did only 1 out every 100 break?
- Were the failures produced on the same dates?
- Did connectors made in certain mold cavities have a higher failure rate than others?
- Did connectors tested in certain fixtures have a higher failure rate than others?

Once the answer to some of these questions were obtained, then the correct “Why” could be asked.
The team working with their Shainin coach developed a test in order to measure the energy required to replicate the failure mode. After testing samples that were selected from different batches, over different build dates, from different mold cavities and different test fixtures, they learned that there was a significant difference in the strength between some parts coming from the multiple test fixtures. Each completed wire harness is tested by pressing the electrical connector into a test fixture to ensure electrical connectivity. The team used a Component Search strategy and quickly converged on the key component of the fixture and then the dimensional difference between the best and worst test fixtures. Small cracks were being generated in some locking arm during the electrical check as the connector was inserted into the test fixture, and then propagating in the field under vibratory load. The corrective action was a minor change to a critical feature of the test fixture which was interfering with the locking arm, putting unnecessary stress on it as it was engaged during final acceptance testing. No engineering change was necessary.

The key part of this project was asking the right questions. The answers to these new questions revealed previously unknown differences and opportunities. Using Shainin methods, these questions were developed methodically, so that for any technical problem, the appropriate way to ask “Why” will help to uncover the true causes with simple solutions. In fact, we think of Shainin Red X Problem Solving as 5 Why for hidden causes.

5 Why is an effective approach for solving problems where the cause can be discovered through simple observation. But if the result of your investigation does not provide an answer which explains the variation in performance (why are only some of our products failing?), then your solution will not be as targeted as it could be, and instead may involve a design or process change that may be unnecessary. For these more complex problems where the true cause is hidden, learning to apply the Shainin methods to supplement your 5 Why process will be a worthwhile investment.