

Five Whys

Five Whys

Practical Problem Solving

From Understanding A3 Thinking

Identifying the Root Cause

At the point of cause, it is usually fairly straightforward to identify the direct cause of the problem. What is the immediate thing that is happening (or not happening) that is creating the problem? This should be confirmed through additional observation or experimentation, as it would be highly unproductive to implement a countermeasure that does not address the problem.

However, the most obvious cause is rarely the root cause. So the problem-solver continues the investigation until a root cause is found, on that if taken care of, would eliminate all future occurrences of the problem. A common method for investigating root cause is the five whys approach. The problem-solver asks, "Why is this problem occurring?" Upon answering it, he or she will have identified a cause to the observed effect. The problem-solver then asks the question again, this time turning the cause into an effect, to identify a deeper cause. The problem-solver continues this inquiry until recurrence can be prevented by addressing that cause. When completed, the problem-solver has a clear and coherent cause-effect chain that demonstrates an in-depth understanding of the problem in context, noting how the root cause is linked to the observed phenomenon. The cause-effect chain should be shared with others to verify that it is probable and reasonable.

In other cases, however, the root cause cannot be deduced from the five-whys technique, and structured tests or experiments are used to eliminate possible causes. For example, one of the authors once investigated a quality problem in the final honing process of a connection rod. The large end crankshaft hole of the connection rod was not staying parallel to the small end hole for connection to the piston pin. He identified six possible explanations for the cause of the problem but could determine the real cause of the problem only by testing each possible root cause in careful sequence with measurements at each step of the way. Finally, he confirmed that a previous process was the culprit and the small end hole was not being reamed correctly. A realignment of the spindle head and proper fastening of the bearings in the machine in question solved the problem.

In problems related to organizational processes, we have found Spear and Bowen's articulation of rules for the Toyota Production System (TPS) to be quite useful.

Decoding the DNA of the Toyota Production System From their research, they distilled three rules that seem to govern how Toyota designs its work systems. They are as follows: * Activities shall be specified according to content, sequence, timing, and outcome. * Customer-supplier connections shall be clear, direct, and binary. * Pathways that deliver a product or good shall be simple and direct.

In one of the author's work on hospital systems, we have not found a single instance where an operational problem did not have, at its root, a violation of one or more of the preceding three rules. In other words, every problem we observed resulted from a poorly specified activity, an unclear connection, or complicated or undefined pathway. Thus, as a rule of thumb, we would suggest that the root-cause investigation of process-related problems continue at least until one of these rules has been identified.

The Problem-Solving A3 Report

Storyline of the Problem-Solving A3

Root-Cause Analysis

The report author should continue the investigation of the current condition until he or she uncovers the root cause of the problem symptoms identified in the current condition diagram. Failing to address the deeply rooted seed of the problem means it will likely recur. As mentioned in chapter 2, one common technique for root-cause analysis is the 5 Why's method. Using this deductive technique, the problem-solver simply asks a why question, approximately five times in a series, each time probing they next level of causality. Experience has shown that stopping at two or three whys usually means that the inquiry has not gone deep enough. Finding the root cause may also entail some experimentation. In other cases, an Ishikawa or fishbone diagram might be useful to determine some of the potential root causes.

Toyota's training documentation on A3 reports and problem solving goes to great lengths to emphasize the concept of the 5 Why's method of deduction when it comes to root-cause analysis. From hard work and experience, Toyota practitioners

have learned that rarely is the first insight correct and is almost never the ultimate cause of the problem. Thus problem-solvers must develop the discipline of going beyond the superficial level.

To illustrate this point, consider a production downtime problem where a machine stops due to an alarm indication on the control panel. Initial production responses were to reset the overload relay; however, the problem recurred. Eventually, a damaged motor shaft on a pump unit was detected, and the shaft was replaced. Most companies would stop their problem-solving activities here. Unfortunately, in many cases such as this one, that action did not address the root cause of the problem. Odds are high that the problem will reoccur at some point in the future. Only by forcing the discipline of 5 Why's thinking can the problem-solver begin to approach the root cause of the problem.

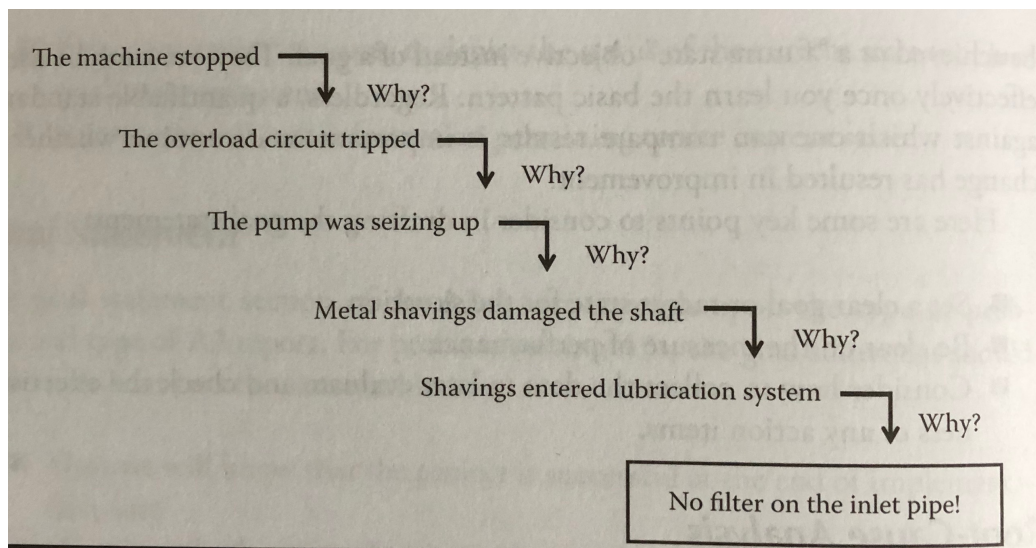


Figure 3.6 Example of the 5 Why's method

If we carry the inquiry forward, as illustrated by figure 3.6, several steps are required to get at the real root cause of the problem--that is, metal shavings entering the lubrication system. This deductive-thinking process eventually leads to a better insight that attaching a filter to the lubrication inlet pipe is a suitable countermeasure that should establish true recurrence prevention of the problem. Stopping short of this level would not permanently solve the problem and would only delay its eventual return.

Of course, it is possible to go even further, such as asking why shavings enter the lubrication tank or why shavings are generated in the process at all. However, in this case, the fifth why-level countermeasure of attaching a strainer to the inlet pipe is deemed sufficient to solve the problem. If this were not sufficient, a more thorough countermeasure would be needed. It is the thinking process and ability to determine true cause and effect is critical. The repetition of asking "why?" over and over helps guide the process.

In practice, real problems often have multiple cause or have causes that are well hidden and cannot be deduced up front using the 5 Why's method. Thus, experimentation may be required to establish cause-and-effect relationships. For this reason, the 5 Why's are not always written out on the A3 report--after all, what would be forcing a process and not requiring thinking. However, root-cause analysis and critical thinking are always probed and challenged during the writing and review process of any A3.

Regardless of the technique used to determine the root cause, the goal of the root-cause analysis section is to show either through logical deduction or experimentation that cause and effect have been established. Most problem-solving efforts fall incredibly short of this goal. Problem-solving teams we have observed often list items that are perceived to be problems without establishing any basic level of proof, or they list items that are easy or popular. This is not acceptable in A3 thinking. Either a cause-and-effect relationship should be established or a structured set of experiments performed to test for cause and effect. Otherwise, the problem-solver is just guessing at the issues and practicing a form of the "ready, fire, aim" school of problem-solving.

Figure 3.7 displays an example of a root-cause analysis summarized from the machine shop scrap problem. After further investigation, the report author found that one particular type of problem, undersized shaft arm, accounted for 72 percent of the scrap in the grinding operations. In this case, it turned out that potentially multiple causes contributed to the quality problem. It would be too space-consuming to list several 5 Why's tress, so instead, a fishbone diagram was used to list the main causes potentially contributing to the problem in some fashion. In this case, direct causality has not been determined so countermeasures will be attempted in response to the different perceived causes. Effectiveness will then also be confirmed.

Here are some items to consider in drafting the root-cause analysis section: * Be sure to show the root cause of the problem(s) identified in the current state. * Separate symptoms and opinions from cause and effect determination. * Consider what techniques are most useful for explaining root-cause insight: 5 Why's? Fishbone analysis? Other? * Identify what tests might need to be performed in order to establish some level of certainty pertaining to cause and effect. * Summarize the main findings of the root-cause analysis, visually, if possible.

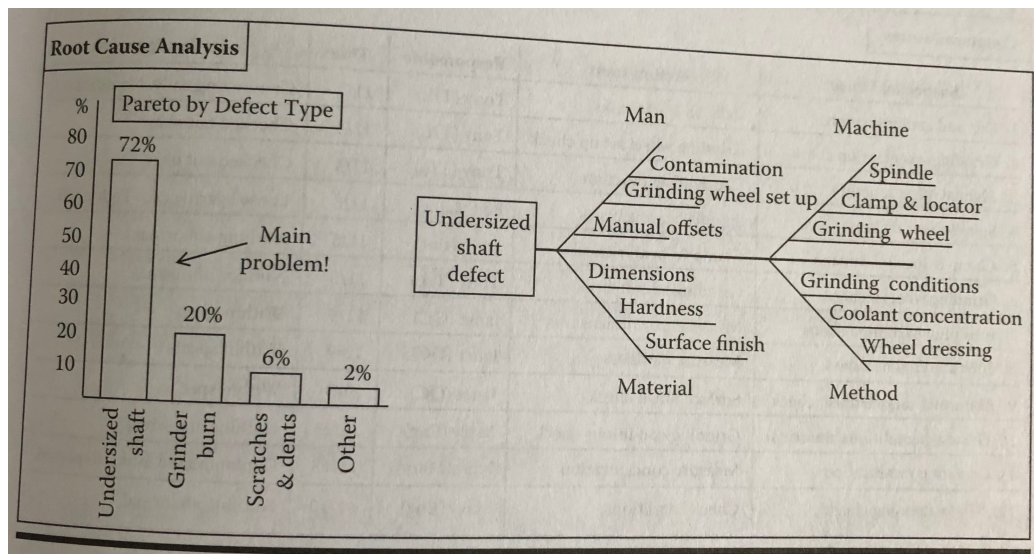


Figure 3.7 Example of root-cause analysis section for problem-solving A3 report

Reviewing Problem-solving A3s

Table 3.1 Review Questions for Problem-Solving A3 Reports

Root-cause analysis

- Is the analysis comprehensive at a broad level?
- Is the analysis detailed enough and did it probe deeply enough on the right issues?
- Is there evidence of proper five-whys thinking about the true cause?
- Has cause and effect been demonstrated or linked in some manner?
- Are all the relevant factors considered (human, machine, material, method, environment, measurement, and so on)?

The Wisdom of the Five Whys

From The Lean Startup

To accelerate, Lean Startups need a process that provides a natural feedback loop. When you're going too fast, you cause more problems. Adaptive processes force you to slow down and invest in preventing the kinds of problems that are currently wasting time. As those preventative efforts pay off, you naturally speed up again.

Let's return to the question of having a training program for new employees. Without a program, new employees will make mistakes while in their learning curve that will require assistance and intervention from other team members, slowing everyone down. How do you decide if the investment in training is worth the benefit of speed due to reduced interruptions? Figuring this out from a top-down perspective is challenging, because it requires estimating two completely unknown quantities: how much it will cost to build an unknown program against an unknown benefit you might reap. Even worse, the traditional way to make these kinds of decisions is decidedly large-batch thinking. A company either has an elaborate training program or it does not. Until they can justify the return on investment from building a full program, most companies generally do nothing.

The alternative is to use a system call the Five Whys to make incremental investments and evolve a startup's processes gradually. The core idea of Five Whys is to tie investments directly to the prevention of the most problematic symptoms. The system takes its name from the investigative method of asking the question "Why?" five times to understand what has happened (the root cause). If you've ever had to answer a precocious child who wants to know "Why is the sky blue?" and keeps asking "Why?" after each answer, you're familiar with it. This technique was developed as a systematic problem-solving tool by Taiichi Ohno, the father of the Toyota Production System. I have adapted it for use in the Lean Startup model with a few changes designed specifically for startups.

At the root of every seemingly technical problem is a human problem. Five Whys provides an opportunity to discover what that human problem might be. Taiichi Ohno gives the following example:

*When confronted with a problem, have you ever stopped and asked **why** five times? It is difficult to do even though it sounds easy. For example, suppose a machine stopped functioning:*

- 1. Why did the machine stop? (There was an overload and the fuse blew.)*
- 2. Why was there an overload? (The bearing was not sufficiently lubricated.)*
- 3. Why was it not lubricated sufficiently? (The lubrication pump was not pumping sufficiently.)*
- 4. Why was it not pumping sufficiently? (The shaft of the pump was worn and rattling.)*
- 5. Why was the shaft worn out? (There was no strainer attached and metal scrap go in.)*

Repeating "why?" five times, like this, can help uncover the root problem and correct it. If this procedure were not carried through, one might simply replace the fuse or the pump shaft. In that case, the problem would recur within a few months. The Toyota production system has been built on the practice and evolution of this scientific approach. By asking and answering "why" five times, we can get to the real cause of the problem, which is often hidden behind more obvious problems.

Toyota Production System: Beyond Large-Scale Production

Note that even in Ohno's relatively simple example the root cause moves away from a technical fault (a blown fuse) and toward a human error (someone forgot to attach a strainer.) This is completely typical of most problems that startups face no matter what industry they are in. Going back to our service business example, most problems that at first appear to be individual mistakes can be traced back to problems in training or the original playbook for how the service is to be delivered.

Let me demonstrate how using the Five Whys allowed us to build the employee training system that was mentioned earlier. Imagine that at IMVU we suddenly start receiving complaints from customers about a new version of the product that we have just released.

1. A new release disabled a feature for customers. Why? Because a particular server failed.

2. Why did the server fail? Because an obscure subsystem was used in the wrong way.
3. Why was it used in the wrong way? The engineer who used it didn't know how to use it properly.
4. Why didn't he know? Because he was never trained.
5. Why wasn't he trained? Because his manager doesn't believe in training new engineers because he and his team are "too busy."

What began as a purely technical fault is revealed quickly to be a very human managerial issue.

Make a Proportional Investment

Here's how to use Five Whys analysis to build an adaptive organization: consistently make a proportional investment at each of the five levels of the hierarchy. In other words, the investment should be smaller when the symptom is minor and larger when the symptom is more painful. We don't make large investments in prevention unless we're coping with large problems.

In the example above, the answer is to fix the server, change the subsystem to make it less error-prone, educate the engineer, and, yes, have a conversation with the engineer's manager.

This latter piece, the conversation with the manager, is always hard, especially in a startup. When I was a startup manager, if you told me I needed to invest in training my people, I would have told you it was a waste of time. There were always too many other things to do. I'd probably have said something sarcastic like, "Sure, I'd be happy to do that--if you can spare my time for the eight weeks it'll take to set up." That's manager-speak for "No way in hell."

That's why the proportional investment approach is so important. If the outage is a minor glitch, it's essential that we make only a minor investment in fixing it. Let's do the first hour of the eight-week plan. That may not sound like much, but it's a start. If the problem recurs, asking the Five Whys will require that we continue to make progress on it. If the problem does not occur again, an hour isn't a big loss.

I used the example of engineering training because that was something I was reluctant to invest in at IMVU. At the outset of our venture, I thought we needed to focus all our energies on building and marketing our product. Yet once we entered a period of rapid hiring, repeated Five Whys sessions revealed that problems caused by lack of training were slowing down product development. At no point did we drop everything to focus solely on training. Instead, we made incremental improvements to the process constantly, each time reaping incremental benefits. Over time, those changes compounded, freeing up time and energy that previously had been lost to firefighting and crisis management.

Automatic Speed Regulator

The Five Whys approach acts as a natural speed regulator. The more problems you have, the more you invest in solutions to those problems. As the investments in infrastructure or process pay off, the severity and number of crises are reduced and the team speeds up again. With startups in particular, there is a danger that teams will work too fast, trading quality for time in a way that causes sloppy mistakes. Five Whys prevents that, allowing teams to find their optimal pace.

The Five Whys ties the rate of progress to learning, not just execution. Startup teams should go through the Five Whys whenever they encounter any kind of failure, including technical faults, failures to achieve business results, or unexpected changes in customer behavior.

Five Whys is a powerful organizational technique. Some of the engineers I have trained to use it believe that you can derive all the other Lean Startup techniques from the Five Whys. Coupled with working in small batches, it provides the foundation a company needs to respond quickly to problems as they appear, without overinvesting or overengineering.

The Curse of the Five Blames

When teams first adopt Five Whys as a problem-solving tool, they encounter some common pitfalls. We need systems like Five Whys to overcome our psychological limitations because we tend to overreact to what's happening in the moment. We also tend to get frustrated if things happen that we did not anticipate.

When the Five Whys approach goes awry, I call it the Five Blames. Instead of asking why repeatedly in an attempt to understand what went wrong, frustrated teammates start pointing fingers at each other, trying to decide who is at fault. Instead of using the Five Whys to find and fix problems, managers and employees can fall into the trap of using the Five Blames as a means for venting their frustrations and calling out colleagues for systemic failures. Although it's human nature to assume that when we see a mistake, it's due to defects in someone else's department, knowledge, or character, the goal of the Five Whys is to help us see the objective truth that chronic problems are caused by bad process, not bad people, and remedy them accordingly.

I recommend several tactics for escaping the Five Blames. The first is to make sure that everyone affected by the problem is in the room during the analysis of the root cause. The meeting should include anyone who discovered or diagnosed the problem, including customer service representatives who fielded the calls, if possible. It should include anyone who tried to fix the symptom as well as anyone who worked on the subsystems or features involved. If the problem was escalated to senior management, the decision makers who were involved in the escalation should be present as well.

This may make for a crowded room, but it's essential. In my experience, whoever is left out of the discussion ends up being the target for blame. This is just as damaging whether the scapegoat is a junior employee or the CEO. When it's a junior employee, it's all too easy to believe that that person is replaceable. If the CEO is not present, it's all too easy to assume that is or her behavior is unchangeable. Neither presumption is usually correct.

When blame inevitably arises, the most senior people in the room should repeat this mantra: if a mistake happens, shame on us for making it so easy to make that mistake. In a Five Whys analysis, we want to have a systems-level view as much as possible.

Here's a situation in which this mantra came in handy. Because of the training process we had developed at IMVU through the Five Whys, we routinely asked new engineers to make a change to the production environment on their first day. For engineers trained in traditional development methods, this was often frightening. They would ask, "What will happen to me if I accidentally disrupt or stop the

production process?" In their previous jobs, that was a mistake that could get them fired. At IMVU we told new hires, "If our production process is so fragile that you can break it on your very first day of work, shame on us for making it so easy to do so." If they did manage to break it, we immediately would have them lead the effort to fix the problem as well as the effort to prevent the next person from repeating their mistake.

For new hires who came from companies with a very different culture, this was often a stressful initiation, but everyone came through it with a visceral understanding of our values. Bit by bit, system by system, those small investments added up to a robust product development process that allowed all our employees to work more creatively, with greatly reduced fear.

Getting Started

Here are a few tips on how to get started with the Five Whys that are based on my experience introducing this technique at many other companies.

For the Five Whys to work properly, there are rules that must be followed. For example, the Five Whys requires an environment of mutual trust and empowerment. In situations in which this is lacking, the complexity of Five Whys can be overwhelming. In such situations, I've often used a simplified version that still allows teams to focus on analyzing root causes while developing the muscles they'll need later to tackle the full-blown method.

I ask teams to adopt these simple rules: 1. Be tolerant of all mistakes the first time. 2. Never allow the same mistake to be made twice.

The first rule encourages people to get used to being compassionate about mistakes, especially the mistakes of others. Remember, most mistakes are caused by flawed systems, not bad people. The second rule gets the team started making proportional investments in prevention.

This simplified system works well. In fact, we used it at IMVU in the days before I discovered the Five Whys and the Toyota Production System. However, such a simplified system does not work effectively over the long term, as I found out first-hand. In fact, that was one of the things that drove me to first learn about lean production.

The strength and weakness of the simplified system is that it invites questions such as What counts as the same problem? What kinds of mistakes should we focus on? and Should we fix this individual problem or try to prevent a whole category or related problems? For a team that is just getting started, these questions are thought-provoking and can lay the groundwork for more elaborate methods to come. Ultimately, though, they do need answering. They need a complete adaptive process such as the Five Whys.

Facing Unpleasant Truths

You will need to be prepared for the facet that Five Whys is going to turn up unpleasant facts about your organization, especially at the beginning. It is going to call for investments in prevention that come at the expense of time and money that could be invested in new products or features. Under pressure, teams may feel that they don't have time to waste on analyzing root causes even though it would give them more time in the long term. The process sometimes will devolve into the Five Blames. At all these junctures, it is essential that someone with sufficient authority be present to insist that the process be followed, that its recommendations be implemented, and to act as a referee if disagreements flare up. Building an adaptive organization, in other words, requires executive leadership to sponsor and support the process.

Often, individual contributors at startups come to my workshops, eager to get started with the Five Whys. I caution against attempting to do that if they do not have the buy-in of the manager or team leader. Proceed cautiously if you find yourself in this situation. It may not be possible to get the entire team together for a true Five Whys inquiry, but you can always follow the simple two-rule version in your own work. Whenever something goes wrong, ask yourself: How could I prevent myself from being in this situation ever again?

Start Small, Be Specific

Once you are ready to begin, I recommend starting with a narrowly targeted class of symptoms. For example, the first time I used the Five Whys successfully, I used it to diagnose problems with one of our internal testing tools that did not affect customers directly. It may be tempting to start with something large and important because that is where most of the time is being wasted as a result of a flawed process, but it is also where the pressure will be greatest. When the stakes are

high, the Five Whys can devolve into the Five Blames quickly. It's better to give the team a chance to learn how to do the process first and then expand into higher-stakes areas later.

The more specific the symptoms are, the easier it will be for everyone to recognize when it's time to schedule a Five Whys meeting. Say you want to use the Five Whys to address billing complaints from customers. In that case, pick a date after which all billing complaints will trigger a Five Whys meeting automatically. Note that this requires that there be a small enough volume of complaints that having this meeting every time one comes in is practical. If there are already too many complaints, pick a subset on which you want to focus. Make sure that the rule that determines which kinds of complaints trigger a Five Whys meeting is simple and ironclad. For example, you might decide that every complaint involving a credit card transaction will be investigated. That's an easy rule to follow. Don't pick a rule that is ambiguous.

At first, the temptation may be to make radical and deep changes to every billing system and process. Don't. Instead, keep the meetings short and pick relatively simple changes at each of the five levels of the inquiry. Over time, as the team gets more comfortable with the process, you can expand it to include more and more types of billing complaints and then to other kinds of problems.

Appoint a Five Whys Master

To facilitate learning, I have found it helpful to appoint a Five Whys master for each area in which the method is being used. This individual is tasked with being the moderator for each Five Whys meeting, making decisions about which prevention steps to take, and assigning the follow-up work from that meeting. The master must be senior enough to have the authority to ensure that those assignments get done but should not be so senior that he or she will not be able to present at the meetings because of conflicting responsibilities. The Five Whys master is the point person in terms of accountability; he or she is the primary change agent. People in this position can assess how well the meetings are going and whether the prevention investments that are being made are paying off.

The Five Whys in Action

IGN Entertainment, a division of News Corporation, is an online video games media company with the biggest audience of video game players in the world. More than 45 million gamers frequent its portfolio of media properties. IGN was founded in the late 1990s, and News Corporation acquired it in 2005. IGN has grown to employ several hundred people, including almost a hundred engineers.

Recently, I had the opportunity to speak to the product development team at IGN. They had been successful in recent years, but like all the established companies we've seen throughout this book, they were looking to accelerate new product development and find ways to be more innovative. They brought together their engineering, product, and design teams to talk through ways they could apply the Lean Startup model.

This change initiative had the support of IGN's senior management, including the CEO, the head of product development, the vice president of engineering, the publisher, and the head of product. Their previous efforts at Five Whys had not gone smoothly. They had attempted to tackle a laundry list of problem areas nominated by the product team. The issues varied from discrepancies in web analytics to partner data feeds that were not working. Their first Five Whys meeting took an hour, and although they came up with some interesting takeaways, as far as the Five Whys goes, it was a disaster. None of the people who were connected to and knew the most about the issues were at the meeting, and because this was the first time they were doing the Five Whys together, they didn't stick to the format and went off on many tangents. It wasn't a complete waste of time, but it didn't have any of the benefits of the adaptive style of management discussed in this chapter.

Don't Send Your Baggage through the Five Whys Process

IGN had the experience of trying to solve all of its "baggage" issues that had been causing wasted time for many years. Because this is an overwhelming set of problems, finding fixes quickly proves overwhelming.

In their zeal to get started with the Five Whys, IGN neglected three important things:

1. To introduce Five Whys in an organization, it is necessary to hold Five Whys sessions as new problems comes up. Since baggage issues are endemic, they naturally come up as part of the Five Whys analysis and you can take that

opportunity to fix them incrementally. If they don't come up organically, maybe they're not as big as they seem.

2. Everyone who is connected to a problem needs to be at the Five Whys session. Many organizations face the temptation to save time by sparing busy people from the root cause analysis. This is a false economy, as IGN discovered the hard way.
3. At the beginning of each Five Whys session, take a few minutes to explain what the process is for and how it works for the benefit of those who are new to it. If possible, use an example of a successful Five Whys session from the past. If you're brand new, you can use my earlier example about the manager who doesn't believe in training. IGN learned that, whenever possible, it helps to use something that has personal meaning for the team.

After our meeting, the IGN leadership decided to give Five Whys another try. Following the advice laid out in this chapter, they appointed a Five Whys master named Tony Ford, a director of engineering. Tony was an entrepreneur who had come to IGN through acquisition. He got his start with Internet technology, building websites about video games in the late 1990s. Eventually that led to an opportunity at a startup, TeamXbox, where he served as the lead software developer. TeamXbox was acquired by IGN Entertainment in 2003, and since that time Tony has been a technologist, leader of innovation, and proponent of agile and lean practices there.

Unfortunately, Tony started without picking a narrow problem area on which to focus. This led to early setbacks and frustration. Tony relates, "As the new master I wasn't very good at traversing through the Five Whys effectively, and the problems we were trying to solve were not great candidates in the first place. As you can imagine, these early sessions were awkward and in the end not very useful. I was getting quite discouraged and frustrated." This is a common problem when one tries to tackle too much at once, but it is also a consequence of the fact that these skills take time to master. Luckily, Tony persevered: "Having a Five Whys master is critical in my opinion. Five Whys is easy in theory but difficult in practice, so you need someone who knows it well to shape the sessions for those who don't."

The turnaround came when Tony led a Five Whys session involving a project that had been missing its deadlines. The session was fascinating and insightful and produced meaningful proportional investments. Tony explains: "The success had to do with a more experienced master and more experienced attendees. We all know what the Five Whys was, and I did a really good job keeping us on track and away

from tangents. This was a pivotal moment. Right then I knew the Five Whys was a new tool that was going to have a real impact on our overall success as a team and as a business."

On the surface, Five Whys seems to be about technical problems and preventing mistakes, but as teams drive out these superficial wastes, they develop a new understanding of how to work together. Tony put it this way: "I daresay that I discovered that Five Whys transcends root cause analysis by revealing information that brings your team closer through a common understanding and perspective. A lot of times a problem can pull people apart; Five Whys does the opposite."

I asked Tony to provide an example of a recent successful Five Whys analysis from IGN. His account of it is listed in the sidebar.

Why couldn't you add or edit posts on the blogs?

Answer: Any post request (write) to the article content api was returning a 500 error.

Proportional investment: Jim--We'll work on the API, but let's make our CMS more forgiving for the user. Allow users to add and edit drafts without errors for a better user experience.

Why was the content API returning 500 errors?

Answer: The bson_ext gem was incompatible with other gems it depends upon.

Proportional investment: King--Remove the gem (already done to resolve the outage).

Why was the gem incompatible?

Answer: We added a new version of the gem in addition to the existing version and the app started using it unexpectedly.

Proportional investment: Bennett--Convert our rails app to use bundler for gem management.

Why did we add a new version of a gem in production without testing?

Answer: *We didn't think we needed a test in these cases.*

Proportional investment: *Bennett and Jim--Write a unit or functional test in the API and CMS that will catch this in the future.*

Why do we add additional gems that we don't intend to use right away?

Answer: *In preparation for a code push we wanted to get all new gems ready in the production environment. Even though our code deployments are fully automated, gems are not.*

Proportional investment: *Bennett--Automate gem management and installation into Continuous Integration and Continuous Deployment process.*

Bonus--Why are we doing things in production on Friday nights?

Answer: *Because no one says we can't and it was a convenient time for the developer to prepare for a deployment we'd be doing on Monday.*

Proportional investment: *Tony--Make an announcement to the team. There will be no production changes on Friday, Saturday, or Sunday unless an exception has been made and approved by David (VP Engineering). We will reevaluate this policy when we have a fully automated continuous deployment process in place.*

As a result of this Five Whys session and the proportional investments we made, our deployments are easier, quicker, and never again will our process allow a developer to place gems into production systems with unintended consequences. Indeed, we have not had another issue like this. We strengthened our "cluster immune system" as you would say.

Without the Five Whys, we would have never discovered all of the information we did here. My guess is that we would have told that one developer to not do stupid things on Friday nights and moved on. This is what I emphasized earlier, where a good Five Whys session has two outputs, learning and doing. The proportional investments that came out of this session are obviously valuable, but the learnings are much more subtle, but amazing for growing as developers and as a team.