

# STREAMS OF CHANGE

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## Practical Wisdom - Anticipating the Unexpected

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One might say that someone possessing Practical Wisdom has a lot of experience. However, an experience may be so narrowly focused that it may not count toward wisdom, such as many years doing the same job, producing iterative designs of a similar product, or strictly following rules without questioning underlying assumptions.

Rather, accomplishments that build Practical Wisdom might include cross-technology and multi-market experiences that contribute to a broad knowledge base, understanding why something worked or equally importantly, why it did not, and anticipating the unexpected.

Wait a moment! If it was unexpected, how could it have been anticipated? Answer - by the application of Practical Wisdom. It is an elevated level of perceptiveness applied to problem solving. Practical Wisdom contains two key elements: intuition and deliberation. Intuition is going with an informed gut, making quick decisions based on prior experiences. Deliberation is thinking through alternatives and more slowly and analytically coming to decisions. The challenge is to blend these differing paths to provide improved outcomes.

Let's get back to those unexpected results. Think about a recent example of an unexpected outcome, such as excessive software code bugs, missing traces on a new PCB design, poorly performing component, or equipment that works but not at a temperature extreme. These situations can be frustrating, but they happen all too often and result in delays in launching products, missed sales opportunities, and wasted investment funds.

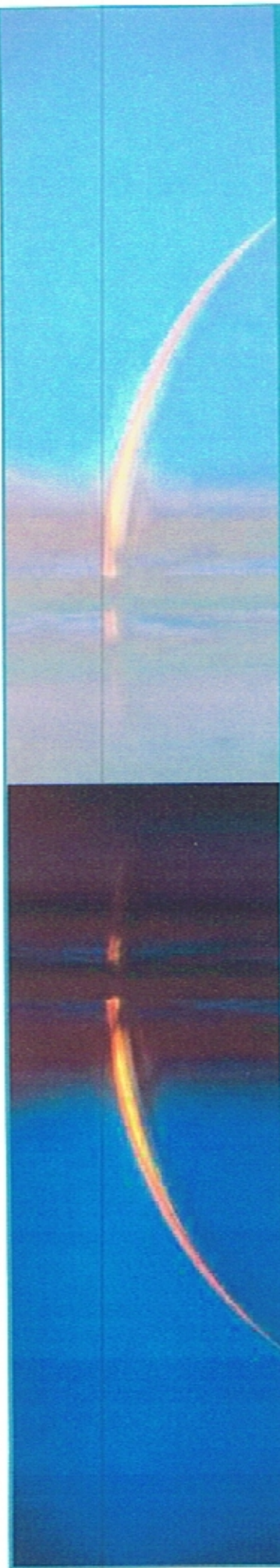
We all have heard the familiar excuses, such as: "we've always done it that way," "it takes three spins to get the PCB ready for production," or "no time to do a worst case analysis." These are superficial responses and unacceptable. Point being, these are examples of failings that could have been anticipated, and hence avoided.

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How should we address this frustrating situation? One approach is to have more productive and probing design reviews. These can be most effective if product requirements are well defined, potential issues are stated and simulated up front, and design philosophy is "right the first time."

Design Reviews are most effective with participants from outside the team and, where appropriate, outside the company. This brings new perspectives and experiences to the table and encourages probing and potentially embarrassing (but in a good way) questions. On the other hand, team self-provided design reviews might be likened to allowing a fox to guard the hen house.

Use Case Scenarios are an excellent tool to capture product requirements from customers' perspectives. Place yourself in each class of customers' shoes. Better yet, have customers walk through user experiences. Listen for wants and needs, and try to uncover the often-unstated expectations and unusual use, environmental or "oops" conditions. Where appropriate, create software models to simulate performance, and create hardware models to simulate assembly steps.

Finally, and perhaps the most difficult step, is to have the team embrace the concept of "right the first time." Over the decades, I've probably heard every excuse as to why this can't be achieved, especially from R&D teams that are trying desperately to launch a commercial product. "We can't know for sure what is going to happen so let's give it our best shot," and "let's try several experiments and see what the data tells us."

This last one is particularly problematic. Part of the scientific method that engineers should be following is to think through alternatives and predict outcomes. I'm reminded of one situation where my team was facing a serious wafer fabrication issue and the brainstorming session resulted in a request to perform 25 experiments and "see what the data tells us." Instead, I challenged the team to walk through each of the experiments and predict the most likely outcomes. After a few hours, we culled the list to four experiments, one of which provided an acceptable solution.

This is an example of combining intuition and deliberation. There was a wealth of knowledge in the team members, combined with some exceptional gut instincts. However, the discipline of deliberation prior to initiating the experiments focused the team to anticipate potential outcomes. Without this drill, a good deal of time and precious resources could have been wasted. Without this drill, some of the outcomes of the 25 experiments might well have been thought to be unexpected.

Practical Wisdom - blending intuition and deliberation - encouraging a team to anticipate the unexpected - can be a strong force to guide product realization successes on tight schedules.