The concerns existed. The knowledge was there. Only, leadership didn't hear it - or didn't want to. That's not an exception. It's the pattern known as The Iceberg of Ignorance. Only a fraction of what goes wrong on the shop floor ever reaches management.

Why we often tackle complex problems the wrong way

Complex problems require a different approach

Major incidents rarely start with an explosion. They start with an unanswered email. A warning that was brushed aside. A concern that lingered in the lower layers of an organization. When two Boeing 737 MAX aircraft crashed shortly after take-off in 2018 and 2019, fingers were quickly pointed at a technical flaw: MCAS, a software system that automatically pushed the aircraft's nose down based on data from a single sensor. But anyone who reads the internal documents saw that the problem had been flagged long before. The concerns existed. The knowledge was there. Only, leadership didn't hear it or didn't want to. That's not an exception. It's a pattern.

By Jeroen Bloem and Gijs Verrest

In 1989, Japanese consultant Sidney Yoshida gave this pattern a name: **The Iceberg of Ignorance**. Only a small portion of what goes wrong in daily operations reaches the top. His at-the-time anecdotal observation has since been confirmed by research. In hospitals, factories, public institutions, and high-tech companies, crucial knowledge often remains trapped at the operational level. An MIT study showed that executives have five to ten times less visibility into operational risks than their own employees. And an international 2023 study found that 74 percent of middle managers actively "sanitize" bad news before passing it upward. Not with malicious intent, but to avoid appearing incompetent, or because they believe they can fix the issue themselves.

Why does this happen? Psychologist and Nobel laureate Daniel Kahneman, author of "Thinking, Fast and Slow", points to a deeply rooted human reflex: our desire to reduce complex problems to simple explanations. He calls this cognitive laziness. What we don't immediately see, we unconsciously ignore. We seek confirmation for what we already believe (confirmation bias), rely too heavily on our experience, and underestimate how much we don't know. What's visible feels like truth — what's missing naturally fades from view.

In organizations, this creates a dangerous combination: those who know the most are not heard, while those who make the decisions often act based on a simplified version of reality. And the greater the time pressure, the stronger that effect becomes. Problems are then reduced to isolated incidents, responsibilities narrowed to functional silos, and analysis replaced by action. But complex problems and challenges cannot be solved with simple explanations or quick fixes. On the contrary: they require patience, visualization, collaboration, and above all thinking space. Not because the problems are too difficult, but because they demand something we're not good at: dealing with uncertainty and doubt.

We see these mechanisms not only in aviation but anywhere technology, decision-making, and organizational culture intersect. In manufacturing environments, hospitals, public services, and, closer to home, at **GKN Fokker Aerospace**.

There too, it all started with an apparently minor technical problem: an anomalous measurement. No red alert—rather, a quality issue that seemed manageable. However,

GKN Fokker Aerospace: how it started

In a specialized production line, high-end components are manufactured for the tail section of business jets. These components consist of composite materials that are fused together with great precision using an advanced, robotized induction-welding process.

To ensure the quality of this welding process, a few test specimens are welded alongside regular production parts. After welding, these samples undergo thorough inspection. This includes, among other things, checking the temperature reached at the contact surface during welding, as well as the mechanical strength of the joint. These inspections are essential to guarantee the reliability and safety of the final aircraft components.

The problems began with the discovery of a small deviation in one of these test specimens: the measured strength fell just below the required value. Later, a deviation was also observed in the measured temperature of a test article. Because these deviations initially appeared sporadically, they were at first considered as isolated incidents. Only when both deviations began to occur more frequently was a full investigation launched to determine the underlying causes.

As a precaution, production was temporarily halted until the source of the problem could be identified and substantiated. This decision created significant time pressure, and reliable conclusions had to be drawn quickly. A multidisciplinary team of specialists gathered all available data and searched for correlations. It soon became clear that this was an exceptionally complex problem. The data showed contradictions, interpretations varied, and no clear root cause emerged. Although several corrective measures were implemented, none provided a definitive or lasting solution.

BOEING 737 MAX: a complex problem

1. Business case over design
Boeing wanted to quickly counter the success of the much more fuel-efficient competitor to the Boeing 737, the Airbus A320 neo. To save time and money, the company once again chose to upgrade the existing 737 rather than develop an entirely new aircraft. This became the 737 MAX. Larger, more fuel-efficient engines had to be mounted higher on the wing, which gave the aircraft a tendency to "overshoot" during steep climbs — climbing unexpectedly steeper than desired.

2. Software as a plaster: MCAS
Instead of structural redesign, Boeing introduced the Maneuvering Characteristics Augmentation System (MCAS). This software automatically pushed the nose down when a single Angle of Attack sensor detected a high pitch angle. There was no redundancy; if that one sensor failed, MCAS would repeatedly override the pilots.

3. No warning, no training
To save airlines expensive simulator hours, MCAS was left out of the flight manual. Pilots did not even know it existed, let alone how to disable it.

4. Privatized oversight
The U.S. FAA delegated large parts of certification process to Boeing itself. Internal risk warnings were filed away or ignored, and managers downplayed bad news for fear of delaying the project.

5. Cultural pressure
Internal emails from 2016–2018 revealed widespread fear of "missing deadlines". Experts who raised concerns were ignored or sidelined.

The result: a single defective sensor, a hidden algorithm, and a culture of haste — together they caused two crashes, 346 deaths, and the longest global grounding of a modern passenger aircraft in history.

when a second anomaly appeared, not only did the complexity increase, but the operational impact also raised the pressure to resolve it. Subsequently, the teams involved became entangled in conflicting data, differences in interpretation, and a tangle of partial analyses and ongoing actions. Gradually, it became clear: the problem was not only in the data, but also in how the data was being handled. Only by deliberately choosing structure, visualization, and focused collaboration could the issue ultimately be resolved.

The era of complex problems

The Boeing 737 MAX disaster did not result from a single blunder, but from a sequence of individually defensible decisions. A software patch instead of a new design, a single sensor without backup, pilots kept unaware to save on training costs. Each decision seemed efficient — together, they formed a chain of failure that collapsed at the first wrong signal.

The difficulty of today's problems lies not so much in their incomprehensibility, but in how quickly they become intricate: a convergence of unknown circumstances and hard-to-predict consequences. Three trends drastically increase complexity:

1. Interconnected Technology

Machines, software, data, and human behavior constantly interact. A small change, human error, or software bug can ripple unnoticed through an entire system.

2. Expanding Supply Chains

Organizations rarely deliver complete solutions on their own anymore. They operate as nodes in global networks. A single malfunction by a partner can cause a shutdown elsewhere months later. As a result, the solution to a problem often needs to be sought elsewhere in the chain.

3. Blind Spots

As organizations outsource more critical functions or parts of them — IT, logistics, engineering — to external partners, a structural imbalance emerges: formal responsibility remains internal, while operational insight resides externally.

The consequence is clear: to understand a problem, one must look beyond one's own team or department, and multidisciplinary collaboration becomes crucial. At Fokker, too, the real picture only emerged once the

broader context was considered. What had seemed like a simple quality issue turned out to be a systemic problem.

Gaining control through a systematic approach

When a problem arises, many organizations instantly switch to fire-fighting mode: everyone rushes to extinguish the flames, but few look at the wiring underneath.
This reflex sustains the so-called fire-fighting spiral, issues seem resolved but reappear later, often elsewhere. A systematic approach breaks this cycle. Not by adding more paperwork, but by applying a method that prioritizes understanding before action. The key is to ask the right questions, in the right sequence:

What is happening?

What's the situation, what is the impact, and who needs to be involved? By gaining clarity and untangling the problem, organizations can prevent symptom management and background noise from clouding the analysis.

What exactly is the problem?

This is about understanding: what exactly is happening, where and when does it occur? Under which circumstances does it appear, and when does it not? This sharpens understanding of the problem and avoids trial-and-error actions.

What don't we know?

Identify missing information, plan measurements, and make assumptions explicit. Good data is more valuable than large amounts of data: what don't we know, what is uncertain, or what is unclear?

What is the cause?

With a clear understanding of the problem, we can develop targeted hypotheses about potential causes and contributing factors. Use evaluation and testing to gather solid evidence.

How does it all fit together?

Complexity can be unraveled by visualizing the interconnections of the whole system in

Fokker: a structured approach

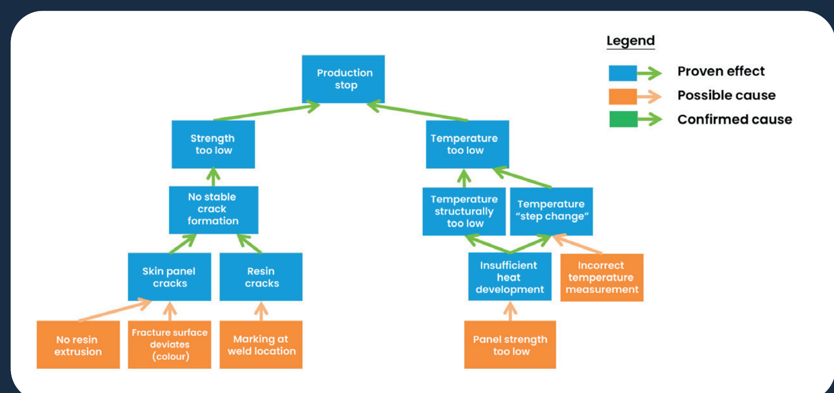
The complexity of the problem called for a more structured approach. The team began by compiling an overview of all points of concern, followed by a timeline mapping the deviations in weld strength and temperature. A distinction was made between gradual fluctuations and abrupt changes, the so-called "step changes". Notably, both types of deviations began occuring around the same period.

To maintain focus, it was decided to first investigate the abrupt temperature variation in detail. Through targeted data analysis, they explored this specific issue. A comparison with a second welding robot, where no deviation occurred, provided valuable insights. Specialists from suppliers, the production department, and maintenance were involved to approach the problem from multiple perspectives.

The test specimens were visually inspected and systematically categorized, creating a comprehensive overview of all relevant characteristics. Possible causes were then tested against these findings. Soon, the team decided to conduct focused production tests to generate hard data and identify the true root cause.

The power of visualization

The systematic approach gave the team a clear overview of the problem and the potential causes. Their joint root cause analysis was visualized in the incident map below. This allowed cause-and-effect relationships to be examined based on facts, and previous assumptions to be critically reassessed.



One striking example concerned the assumption that the measured temperature was reliable. Further investigation revealed that the thermocouples used on one welding robot differed from those on the other. Operators who produced these thermocouples were insufficiently familiar with key quality requirements. When results from both robots were compared using the same measurement system, a significant temperature discrepancy became visible.
This opened space for uncertainty, divergent insights, alternative explanations, and reflection.

What had once seemed self-evident was re-examined and tested anew. By dividing the complex issue into smaller sub-problems, each could be studied separately, leading to a clear, evidence-based understanding.

an incident map: causes, effects, conditions, and breached barriers. In practice, this sequence acts like a funnel: wide exploration at the top, focused actions at the bottom.

Teams that apply this approach consistently experience major benefits:

1. **Complexity becomes manageable** - because the structure provides guidance and order.
2. **Focus** – it is clear what requires attention now and what can wait.
3. **Faster breakthroughs –** paradoxically, investing time upfront prevents many unnecessary actions later.

A systematic approach also lays the foundation for multidisciplinary collaboration: everyone speaks the "same language". At Fokker, the sessions made the problem visible to everyone, highlighting missing information and clarifying responsibilities.

Making Thinking Visible

Anyone who has ever scrolled through a 2,000-row Excel file knows: data only becomes insight when you can see it. Our brains are not designed for columns but for patterns. That's why data visualization is not decoration but it's a key to understanding. Daniel Kahneman calls it the biggest pitfall of fast thinking: What You See Is All There Is. We base our judgments on what's visible - ignoring what is outside the frame. Visualization reverses that logic: if we want people to draw the right conclusions, we must ensure they see the right things. What You See Is What You Get. To see is to understand.

Good visualization does three things:

1. **Reveals patterns:** A timeline, for instance, instantly shows when something began, how often it occurs, and whether it's increasing or decreasing.
2. **Unravel interconnections:** An incident

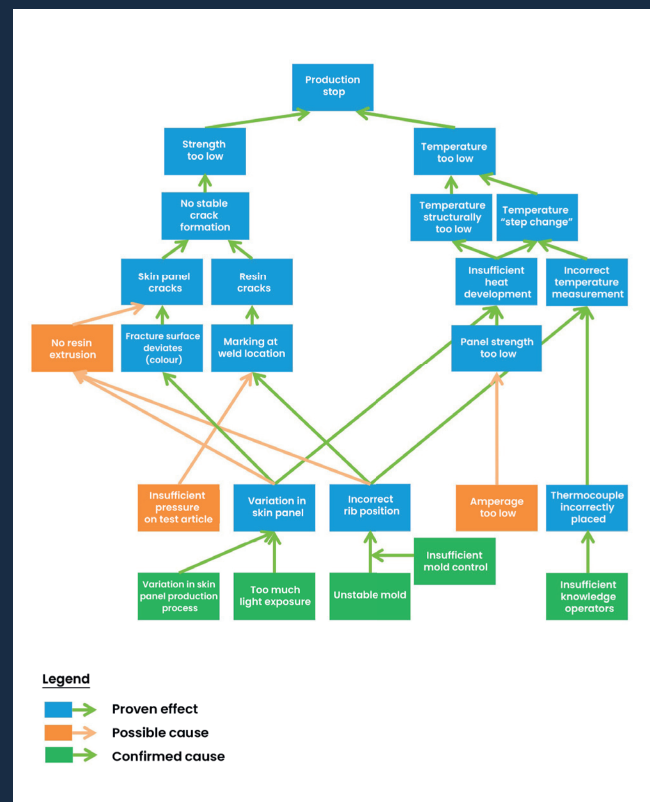
Fokker: Role of the facilitator

The complexity of the problem required not only a systematic approach but also an effective project organization. Under the guidance of an experienced facilitator and with regular coordination with a steering group, the right decisions could be made quickly. The facilitator's role was essential: asking critical questions, encouraging an open and investigative mindset, engaging the right people, and giving everyone space to contribute. The facilitator also supported the visualization process, allowing team members to focus on content. By presenting all data clearly, mapping deviations in detail, and elaborating the cause-and-effect chains, complex relationships became visible.

This approach led to a sharp focus and well-founded analysis. The final outcome was a set of verified root causes and their interrelationships, which could be clearly communicated in this incident map.

What did the investigation ultimately reveal?

It turned out that both the production process of the skin panel and the degree of light exposure negatively affected the mechanical strength of the test piece. Variations in the mold used for welding the test piece also played a significant role, influencing not only weld strength but also the temperature recorded during the process. Further analysis of these factors provided valuable insights into geometric control and necessary mold adjustments. Finally, it was found that the temperature measurements themselves were unreliable, due to improperly manufactured thermocouples.



In short, the deviations in weld strength and temperature could be traced back to a complex interplay of technical, human, and environmental factors. The necessary corrective measures have now been implemented. Since then, the deviations have not reoccurred, a clear confirmation that the chosen approach proved effective and sustainable.

map distinguishes different relationships of cause, effect, and failing barriers.
3. **Exposes gaps:** Missing or contradictory data becomes visible.

Visualization requires pausing. A good visualization doesn't point fingers but opens dialogue. It asks questions instead of forcing answers. That makes it safer for teams to share doubt or discuss "odd" measurements. Not to assign blame, but to understand together what's happening.

What stands out is shared. What deviates becomes discussable. And what once seemed complex starts to take shape. Visualization makes complex information manageable and thinking collective. Because only when we see the same things we can truly understand together. That is where real problem solving begins.

The value of a facilitator

In many organizations, the instinctive reaction is immediate: as soon as a problem appears, the team jumps on it. Like a dog spotting a squirrel ,there's no pause for thought, just action. Quick hypotheses, quick fixes, incomplete analyses. And all the while, the real question remains unanswered: what is actually going on?

That's exactly where a facilitator proves their value. Not as an expert, but as a guide. Not to make decisions, but to enable the right conversations. Because complex problems are rarely purely technical; they touch on behavior, decision-making, and collaboration.

What does a facilitator do? A good facilitator fulfills five key roles:

1. **Bring structure.** Define clear goals, establish logical sequencing, and set up a project framework with a steering committee and problem owner.
2. **Create safety.** So that people feel free to express doubt or challenge assumptions.
3. **Make thinking visible.** Through incident maps, timelines, observations, or even a sketch on the wall. Seeing is understan-ding.
4. **Listen and ask questions.** Especially: What does the evidence show? And: What don't we know?
5. **Anchor ownership.** No analysis without follow-up, no insight without action.

The human factor

Good analysis and decision-making rely not only on data but also on behavior. They require a focus on active listening, on creating space for different perspectives, on delaying judgment, and on dealing constructively with hierarchy and roles. It's not about solving everything yourself, but about exploring the problem together.

For complex problems, a facilitator isn't a luxury, they are a necessity. Research shows that in teams with psychological safety, three times more relevant information is shared. At Fokker, an external facilitator brought calm to the chaos. Every claim had to be supported by evidence. By working visually and reflecting systematically, the team developed a shared and clear understanding of the complex issue. Complex problems can't be solved by logic alone. They require structure, safety, and sharpness — and someone to guard all three. That's the role of the facilitator.

Why slowing down isn't a luxury – it's essential

We love quick answers. Clear causes, obvious culprits, immediate action. It provides certainty and, above all, it feels decisive. But that very feeling can blind us to what's really happening. Most failures in organizations don't stem from a lack of knowledge or effort — they happen because we move too fast. Because we feel uncomfortable with doubt, with incomplete information, with complexity that resists quick unraveling. So we default to the reflex: fix, solve, move on. What this article shows — from Boeing to Fokker — is something fundamental: that reflex no longer works. Not with intertwined technologies, not in sprawling supply chains, and certainly not in organizations where crucial signals never even reach the top.

That's why real progress starts with something that feels counterintuitive: slowing down. Understand first, then decide. Make thinking visible. Make doubt discussable. Not because it sounds nice, but because it works. Slowing down isn't resistance — it is the movement. Perhaps that's the most important lesson: the more complex the world becomes, the more we need leadership that doesn't rush, but pauses at the right moment to seek understanding. Q

About the authors

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Kepner-Tregoe's powerful methodology for prioritization, problem-solving and decision making enables organizations to resolve urgent complex issues swiftly and improve overall systems performance. Since 1958, KT has provided service and operational excellence leading to improved quality, increased efficiency and cost reduction. KT's best-practice methods are used in virtually all of today's Fortune 100 companies.
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