

Driving Product Safety and Quality with PTC Integrity™ Lifecycle Manager

TRW is dedicated to automotive safety, and is building a new generation of Cognitive Safety Systems to fulfill its mission of raising safety to a higher level than ever before.

With a broad portfolio of active and passive safety systems, TRW delivers braking, steering, and occupant safety systems such as airbags, seat belts, and steering wheels to more than 40 vehicle manufacturers and 250 nameplates. One of the top financial performers in the industry, TRW had 2014 sales of \$17.5 billion and more than 65,000 employees in 185 locations.

“The advantage of TRW is that we are a complete systems supplier,” explains Karl Schleier, TRW Team Lead and Business Process Infrastructure. For example, the company’s lane-keeping assist technology combines capabilities from its camera, radar systems, and steering systems divisions. As vehicles have grown increasingly complex, the ability to source such advanced “systems of systems” from a single supplier has become a key differentiator.

That singular focus on quality and safety extends to the organization’s embedded software development organization.

Back in 2008, a single TRW project team—frustrated by the challenges of developing complex products without standardized requirements management, workflow, and source control—turned to PTC Integrity Lifecycle Manager as its project standard. From that initial 15-person project, the PTC Integrity Lifecycle Manager install base has grown to support thousands of projects across all four major TRW business units. PTC Integrity Lifecycle Manager is now the company’s standard Application Lifecycle Management (ALM) solution used by 2,500 engineers company-wide, with another 2,500 projected to onboard in the coming year.

The reasons for that multi-year growth mirror changes in the automotive industry itself: An increasing emphasis on process maturity and rigor, greater systems-level thinking, more distributed and global teams, and enhanced emphasis on regulatory oversight and process compliance.



TRW relies on PTC Integrity Lifecycle Manager to reduce the cost of compliance by providing lifecycle traceability from requirement through architecture, code and test results.”

Karl Schleier

From pilot to company standard

“Initially, PTC Integrity Lifecycle Manager was an initiative by the electronics division in our braking group,” recalls Chris Segard, Lead Business Analyst and PTC Integrity Lifecycle Manager expert. After an initial evaluation with PTC Integrity Lifecycle Manager went well, the group tried it with more projects, which were similarly very successful. Soon, a small group of engineers were able to run up to forty projects with minimal overhead. “The company looked at us and asked, ‘what is this department doing differently than the other departments?’ And the answer was that we were running PTC Integrity Lifecycle Manager,” recalls Schleier.

Around this time, the company was experiencing growing pains from its rapid global expansion across 185 global locations and nearly 40 technical centers. Each technical center had its own tool chain, process standards, and workflow, limiting its ability to share expertise, data, and management insight.

“Obviously if you have various repositories, it’s harder to work together,” says Schleier. “And if you’re working with different processes across locations, it’s increasingly difficult to deliver on time with acceptable quality. We were facing challenges across the complete delivery process.”

Engineering teams faced additional scrutiny in the form of internal, external, and OEM audits, with no easy way of enforcing or demonstrating compliance. They needed to enhance process enforcement and reporting in order to meet ISO 26262 (Road Vehicles Functional Safety Standards) and Automotive SPICE (Software Process Improvement and Capability Determination) requirements.

Seeking to gain efficiencies and enhance compliance with regulatory standards, the company sought to standardize on a common ALM solution. TRW undertook a formal benchmark, and soon discovered they didn’t need to look far for the actual tools.

“We did an inventory across all of our engineering centers, and we discovered that we actually owned just about everything on the market. We counted 117 tools,” says Segard. “PTC Integrity Lifecycle Manager was just

simpler, and it all worked together. We didn’t have to buy this product and that product and knit all the tools together.”

“The big thing for us was traceability,” Schleier adds. “If I have a suite of different tools, I need to plug all of those tools together, which costs me hours and money to show traceability. But if I have one tool, I get quality, that traceability, for free. The PTC Integrity Lifecycle Manager toolset is one architecture, and this makes life easier.”

After completing a formal analysis, the company selected PTC Integrity Lifecycle Manager as its standard ALM solution.

Rollout strategy: Balance flexibility with rigor

Once the decision was made, Schleier and his team faced the daunting task of corralling independent-minded business units onto a common development platform. Their strategy was simple: “Give business units input into a common development process and the flexibility to choose variations that meet their specific needs,” explains Segard. “The team doing testing doesn’t need to have the same rigor, as far as source code management, as a team doing development. We try and make things easier for these teams.”

The team took advantage of the customizable workflow and interface in PTC Integrity Lifecycle Manager to create a process toolbox that would allow each business unit to choose the process that was best suited to its needs. “PTC Integrity Lifecycle Manager gives you that flexibility in way that is easier than other tools I’ve seen,” says Schleier.

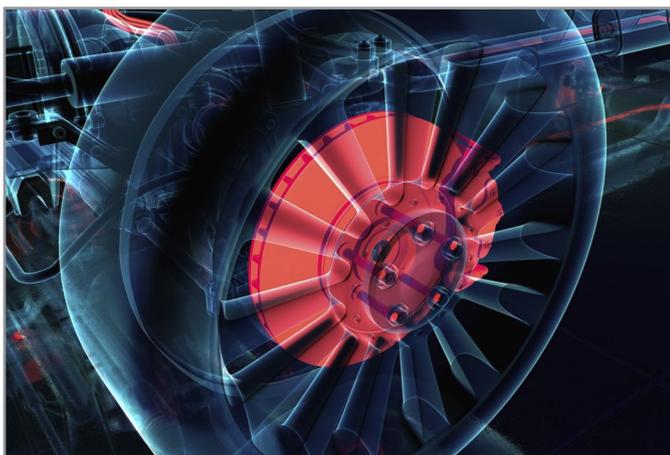
Today the infrastructure team maintains multiple process variants that are compliant with its development standards. “That way, no matter which configuration a business unit takes, we know it will be compliant,” explains Schleier.

At first, nearly every team requested specific modifications to their PTC Integrity Lifecycle Manager workflow. But over time, the number of process variants the infrastructure team had to support dwindled to a manageable handful.

“At the moment I would say there are three or four different process models that are the most efficient, depending on team size,” says Schleier. “And for large and complex groups, we have reduced that to just two variants.”

Greater confidence in delivery dates

Over six years, the team has matured its ALM practices with the help of PTC Integrity Lifecycle Manager and has seen three primary benefits. Chief among them is greater confidence in software and systems delivery dates. TRW relies on PTC Integrity Lifecycle Manager reporting to review project progress and guide teams



to deliver exactly what the customer requested at specific points in time. “PTC Integrity Lifecycle Manager helps you manage your project. Usually we have integration points every few weeks, and we agree with the customer on which features we will deliver,” says Schleier. “So it’s about guiding the people exactly towards this integration point.”

As the PTC Integrity Lifecycle Manager implementation expanded globally, TRW teams were able to gain insight through an end-to-end view that spans business units working in diverse global locations. “Has PTC Integrity Lifecycle Manager helped us use our resources more effectively around the world? Yes.” says Schleier, who notes that most projects now span multiple TRW sites.

More transparent development decisions

A second benefit is the availability of a historical record of key decisions made as projects evolve. “The whole architecture process is a process of making decisions. Do I realize a requirement through software, in a mechanical way, or in an electronic way?” says Schleier. “And everyone has good intentions, but people leave; they move from one segment to another. That’s why it’s important to have those decisions documented.”

Schleier notes that in addition to PTC Integrity Lifecycle Manager, TRW has been in production for ten years with PTC Windchill® for product line management. The combination of PTC Windchill and PTC Integrity Lifecycle Manager provides the company with a single source of truth on complex product information that spans the complete product and software engineering lifecycle.

Automating SPICE compliance

A third key benefit was automating compliance with Automotive SPICE and ISO 26262. “Our auditors want to see how I get from a requirement through my architecture and design into code, and how that code is tested and matched back to my requirement,” explains Schleier. “Having one tool, with that end-to-end view makes traceability a given, I don’t even need to think about it.”

“It just makes terrific sense that customers give you a requirement, and then you can trace exactly the decision you made for that requirement. You’re not guessing, you’re not even pulling up a document, you just click, click, and click, all the way through that chain. So you can prove to the customer that you’re doing what they’ve asked you to do.”

The Future of automotive safety

In the increasingly complex domain of automotive safety, PTC Integrity Lifecycle Manager plays a key role in helping TRW deliver software with high quality and process rigor. All of which helps TRW fulfill its mission of delivering cognitive safety systems that will keep pedestrians, drivers, and passengers safer.

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