Whitepaper

THE PRODUCT DEVELOPMENT PROCESS

Reasons to Improve Your Process

Overview

Is your product development process robust?

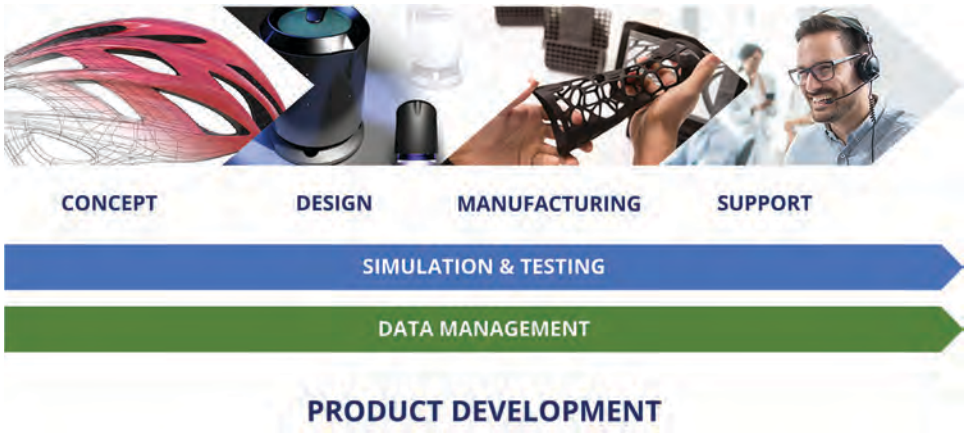
We dealt with one company who thought theirs was, until they ran into the following problem:

- Their design department created the design
- Their engineering department analyzed the design to ensure it would meet its performance requirements, was satisfied that the design would do so, and signed off on the design
- Their manufacturing department started producing the product, based on the signed-off design
- So far so good…until it was later discovered that engineering analyzed and signed off on an older version of the design
- Once the problem was found, engineering analyzed the latest design and found issues that necessitated a re-design before they could sign off
- The products produced from the now-wrong design had to be scrapped
- All of this created wasted time and money (more than $0.5M estimated)

Maybe their product development process was not so great after all. Would your product development process have avoided this problem?

Product Development Process Revisited

In a prior paper (Ref. 1) we defined—at high level—the product development process (depicted below). This is a simplified view of the product development process. Note that there are additional company processes and technology infrastructure that interact with and support the product development process.



Benefits of a Robust Product Development Process

Why have a robust product development process? The benefits are many, including:

- Developing and releasing your products faster
- Improving your products' quality and performance
- Ensuring that your customers' requirements are met
- Improving the visibility and predictability of your development costs and schedules
- Reducing the amount of wasted time in looking for needed data
- Increasing the productive time available to your engineers without adding staff
- Leveraging past work and data in order to be more efficient now
- Automating key repetitive tasks in order to save time and increase repeatability

Can your company create better products, more efficiently, by improving your product development process? The answer is "yes" for almost every company. Is it "yes" for yours, too?

Adverse Effects of a Non-Robust Product Development

Here are some additional examples we've seen of product development processes tht could be improved:

- A company's design department was measured and compensated on the number of design files they created per time. That might sound great...but the designs were not "analysis ready" and the engineering analysts had to spend lots of time to correct them so they could be properly analyzed. This slowed down the overall process. This is an example of a functional "silo"—in this case, design—maximizing its output at the expense of overall product development process throughput.
- At another company, CAE (engineering analysis) was typically rushed in that they got the final design very late in the process, so CAE had to take shortcuts, and as a result they would not sign off on the design as they felt they had insufficient time to the analyses correctly, and thus more physical testing had to be done to compensate. This led to extra time and cost in the product development process.
- Due to one company's rules, the designers were not allowed to run any analysis programs and CAE analysts were not allowed to edit any design geometry. When

there were design-analysis integration issues--as there often are--it was very inefficient to make the needed changes due to these restrictions, and thus a slowdown of the overall product development process occurred. In this case the division of labor created a hurdle to be dealt with.

- We were dealing with a product that experienced an abnormal external load and the manufacturer had to make an assessment as to whether or not the product was still viable. Time was of the essence as the customers needed a near-immediate answer. This assessment took nearly three hours, after which the product was deemed viable as is. When we visited the manufacturer a few weeks later on a business trip we brought up the incident and expressed some surprise that the assessment took so long, as it seemed to us to be a rather quick assessment. The support engineer verified that, indeed, it was a quick assessment, but it took more than two hours to find the original design and analysis data, and this was for a very new product model. They acknowledged that it likely would have taken significantly longer to find relevant data for an older model.
- We dealt with a company whose key structures engineer had just left the company and they had no idea how to deal with the data that had been in his head. He had kept a physical notebook with some of the information, but this was not nearly sufficient for someone else to replicate if necessary, since the data was not kept electronically or in a manner for others to readily and easily access, and he had also not fully documented key modeling and analysis assumptions.
- Several companies we dealt with had a "build it and bust it" product testing process. This process—prototype creation, prototype testing, start over if there's an issue—consumed significant cost and time, which could have been reduced if a "virtual test" (CAE) process was in place for at least some of the design iterations. A number of years ago we did a study of about 25 companies that had such a purely physical process, and when they incorporated at least some CAE they reduced their prototypes and tests by an average of 50%.

A web search shows numerous product structural failures over the years. It's likely that at least some of them could have been avoided with a better product development process. The year 1999 saw two such publicized failures:

1. The Mars Climate Orbiter burned up when it mistakenly entered the Mars atmosphere deeper than planned. The failure was due to a difference in physical units of measurement—metric and SI—when the assumption had been that the units were consistent. This was highly publicized and became a "poster child" for

checking units. Would a better product development process have caught this?

2. The Mazda Protégé failed the industry-standard rear-into-pole bumper test, with the results—crumpled rear, broken rear window—appearing on the nightly news, publicity Mazda surely did not intend. The impact of such a failure is a blemish to the company and possibly lost sales. Would a better product development process have caught this?

Some more recent product failures have been extremely costly:

- In 2010 Toyota recalled 8.1 million vehicles due to the possibility of gas pedals getting stuck in floor mats. The government said this might have contributed to the deaths of 89 people in the prior 10 years. The recall cost Toyota $2 billion that year, and a few years later another $1.2 billion in a related fine.
- In 2014 General Motors recalled more than 30 million cars due to faulty ignition switches, which were linked to 124 deaths and more injuries. The recall and death/injury claims cost GM $4.1 billion.
- In 2016 Samsung had to recall 2.5 million smartphones due to overheating batteries and fires, which cost the company $5.3 billion and a black eye.

Would better product development processes have prevented these? Do you have any similar product development "horror stories"?

Summary:

- There are many reasons to have a robust product development process (and many more reasons not to have a non-robust one). Does your product development process need to be improved?

Reference:

- The Product Development Process Defined, Saratech whitepaper, 2020.

About Saratech

Saratech is an engineering company focused on helping manufacturing companies of all sizes solve product development problems. Over half of our 90+ team members are degreed engineers and we use the technology we sell in our own production environment. Whether it's design, analysis, data management, or manufacturing improvement, we get customers to where they need to be. We are headquartered in Southern CA with sales and technical staff supporting customers across the United States.