Trends in engineering strategy and management

By Lee Teschler | April 4, 2018

In this interview and podcast, Mr. Goldense discusses the trends he is seeing in the areas of engineering management, manufacturing strategy, and technological advances. A transcript of the interview highlights follows.

Does the phrase business strategy have a bad name today?

Among some engineers, the word strategy has come to have a bad connotation. Over the years, what used to be a structured discipline has deteriorated to become an over-used term. If one goes back to WWII when there was a need to formalize longer-term plans what we saw over the next 20 or 30 years were defined strategic planning methodologies that give you horizons of five or ten years. There was an associated technology roadmap that also gave you a ten-year horizon. This lasted until the late 1970s when we began to see the first glimpse of global competition when the Japanese and Germans began to enter traditional western automotive markets, consumer electronics markets, and the like.

Some engineers claim that their company management has a strategy but nobody outside the executive suite knows what it is. Is this a widespread view?

The word "strategy" is used to cover a lot of things that are both tactics and strategy. As product cycles have shortened and technology cycles have increased, the ability to get that longer-term horizon has shortened and in many industries, there is a desire for something that can be called strategy and strategic thinking. But many companies are just reacting something they see already happening as opposed to planning their future. The IoT and IIoT (internet of things and industrial internet of things) have really accelerated that.

Additive manufacturing seems to have an impact on strategy…..

Definitely. Rapid prototyping has been coming of age little by little for about 30 years. The technology is starting to branch out beyond traditional mechanical/electrical/materials markets into biological and life sciences markets. That's a sign that it is here to stay. The impact so far has not been at the strategic level. It has been at the design and featuring level where you can iterate a design more quickly to get to an optimum design. Within a few years, the long-touted word rapid manufacturing is likely to become a reality for certain industries such as the toy industry and aerospace where production quality parts are being built using rapid prototyping.

It can take a long time for technologies to mature. What it the level of maturity for rapid manufacturing and rapid prototyping?

It is starting to come of age. It has been about 32 years since the first stereolithography equipment was demonstrated in the mid 1980s and if one assumes that bodies of knowledge typically take 20 to 50 years to develop we are about three-fifths of the way in, we are starting to see it spread

to other industries, and in the next ten years of so we will see rapid manufacturing replace a lot of the traditional manufacturing environment.

Will this change the way companies do business and affect what their engineers do?

For repetitive and discrete manufacturing, meaning that your lines run 24-7 and discreet meaning you do large batches but it is not a continuous manufacturing environment, rapid prototyping will be more expensive for those segments but where you've got lower volumes and higher numbers of batches, in discrete and job shop manufacturing, rapid prototyping will replace a lot of the traditional production equipment. And, as the IIoT and the automation of the factory start to get into gear with fewer and fewer people involved in actually building product, that creates an opportunity to replace the person assembling with robots today, rapid prototyping equipment in the future. So I do think it is going to be quite profound. It will affect the decisions folks are making about how they are going to produce their product.

Though factory automation has gotten a lot of headlines, you talk about something called engineering automation. What is the difference?

When I first got started, drafting boards were still around. We saw first 2D CAD systems where you replaced the blueprint with an electronic 2D diagram, then very quickly, we had 3D. Shortly after that came computer-aided engineering, finite element analysis, tolerance stacks and a variety of tasks that could be done in an automated manner. If we fast-forward that to today, we are on the cusp of design rules being able to replace certain decisions people make by querying a parts library and selecting the best part from the existing parts because we already know how it performs and functions. I think designers in the future will become more visionary where the parameters and requirements for what they are trying to achieve will be communicated by using semantic processing and linguistic technologies. Automated systems will be able to take inputs from a designer whether they be verbal or text and basically pull out of libraries and create designs in an automated way. And that is even before we get to full artificial intelligence.

Will this get rid of islands of automation?

In any evolving technology that spreads to several different areas of a company, people have to make it work for their niche before they can start worrying about the department next to them or on another floor. Islands of automation will remain. But just like in the 1980s with the introduction of the first factory automation equipment, where you had manufacturing centers that were not connected, once the centers matured, you could work on connecting them. We saw this with CNC machines which were preceded by no computers and NC machines. All of a sudden they were all hooked together once NC became a mature discipline.

You've also said this will affect how businesses and organizations are structured. Can you say how that might affect engineering organizations?

If we look 15 years in the future and assume rapid prototyping has come of age, and that the IoT has penetrated factory floors, that there is connectivity and the ability to communicate everywhere

– machine to machine and with people and vice versa – we will see a change in the way we go about manufacturing. There are two articles in the Harvard Business Review that cover this well, both by Michael Porter. The first was in the fall of 2015 and he refreshed it in the fall of 2016. He talks about two big organizations sitting underneath management. One is going to be the assembly of all design, marketing, and manufacturing in a single organization. The second is going to be all customer-facing functions in a giant customer services organization.

You can already see his manufacturing idea take hold. The word Devops is the current term for operational folks heading in that direction. In seven or eight years Devops will be in full swing. Certainly, there are going to be changes.

Porter's other prediction is that a new organization will pop up called the big data organization. The manipulation of data is going to be so important to both drive production and strategy that he sees a direct report to the company president in charge of a data organization. And that is entirely separate from IT systems. It is about data as a strategy and data as the primary generator of company value.

For listeners who don't know, who is Michael Porter?

Any individual who has maintained his presence in the top of management literature and stood the test of time, that's an accomplishment. I am not sure someone who is from a family of engineers should worry about what label is on the person who identifies the future. If you are in engineering or product development, it is worth taking a few minutes to look at the HBR articles or at least study the emerging Devops initiatives that are occurring in many industries. One example is at one of the largest medical device companies in the world. It recently formed a Devops organization and is in the process or rearranging all of its organizations under top-level management to conform to the Devops structure.

All in all, we are in a very interesting decade as the ways of the last 70 or 80 years are being changed and are no longer appropriate given how far technology has advanced. We don't yet see what is going to form in the future because we are in a transition period. It is unsettling to many people in the same way that social media has been unsettling to a lot of folks because it has changed writing and communications and introduced the use of emojis to express things. So it is a challenging period for folks who started their careers in more traditional organization structures versus the unknown of what the organization structure will morph to in the future. I think it is a fascinating time to be in industry. It suits people at the start of their career because it is all they have been exposed to. Folks in mid-career are having quite challenging times with the unseating of things that have become familiar to them for 15 or 20 years of their career.

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