That Industry 4.0 Digital Factory Thing

I'd like to tell you a story. *While this story is not the recounting of an actual single event, the questions and concerns about Industry 4.0 are derived from several conversations with our clients.*

One afternoon, I called one of my clients to touch base and see how he was doing. Right off the bat, he sounded very distracted, which was unusual for him. I immediately assumed COVID-19 related problems. Concerned, I asked, "Phil, you sound a bit preoccupied. I hope everything is okay." He paused for a moment before continuing.

"To tell you the truth, Joe, I'm really concerned about my company's future."

"What's the problem?" I replied.

"It's that Industry 4.0 Digital Factory thing," Phil replied. "We had some people out this week talking about what we need to be doing. And while it all sounds great, we simply don't have the millions required for this kind of investment. The problem is that from everything I hear and read it appears everyone is going in this direction. If we don't keep up, they make me believe we're not going to survive."

"Hang on there, Phil," I said. "First of all, how familiar are you with Industry 4.0?"

"I've read the articles in the trade journals," Phil replied. "I've seen quite a few *YouTube* videos. I know about the benefits of the robust computerization, data analytics, and network connectivity. I'd also say I was up to speed on the integration of robotics and the Internet of Things. But the more I learn, the more I get this sick feeling because we don't have the money for a major investment like this."

"Let's take a time-out here," I said. "I know someone who can shed some light on this subject. His name is Chuck Gates and he has a long background of leadership roles in the power transmission industry. In fact, he teaches courses on the subject of Industry 4.0 at the Illinois Institute of Technology here in Chicago. Why don't we get a Zoom meeting going with Chuck?"

To quickly interject, Chuck Gates, as a real person, is a factual component of the story. He knows a great deal about Industry 4.0. Please be sure to read more about Chuck at the end of this article. Now, let's continue.

Having become quite adept lately at using Zoom, like many others, within a few minutes we were connected with Chuck, each with our video turned on and our microphones unmuted.

After a brief introduction and a summary of our discussion thus far, the Q&A between Phil and Chuck began.

Phil: So Chuck, how do I get on the Industry 4.0 bandwagon when I don't have millions of dollars to invest?

Chuck: Well Phil, to begin let's take a few steps back. The first basic question is whether or not gear manufacturing is essential. The good news is that since the laws of physics are not changing, gears and related components will continue to

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be needed for the foreseeable future as an essential component of the economy. There is no technology to replace gears as a key source of motion for so many essential products. So the answer to this first question is yes.

Industry 4.0 or the Fourth Industrial Revolution could be viewed as an essential driving force to remain competitive in the gear industry. But the next question we need to ask is this: Do gear manufacturers *really need* to embrace Manufacturing 4.0 and Quality 4.0 to compete in the future?

Phil: Exactly. Do I need this to be competitive?

Chuck: I've had many clients ask me this same question. To provide a meaningful answer, I recommend an approach consisting of four fundamental phases for evaluating and potentially moving forward with Industry 4.0. These are:

Phase 1 - Readiness

Phase 2 - Action Plan

Phase 3 - Implementation

Phase 4 - Step It Up

In this meeting today, why don't we just focus on Phase 1? While this can be quite a bit involved, I'll just hit the highlights. Sound good to you?

Phil: Certainly. Please proceed.

Chuck: Okay. First of all, it's important to understand that the digital transformation of a manufacturing operation is basically the implementation of selected hardware, software, networks, and systems. The ultimate goal of this digital transformation is to more effectively and efficiently meet your customer expectations and continuously improve net income.

This leads us to the first phase which I previously mentioned, this phase is entitled READINESS. As with any change or improvement, particularly one that will cost time and money, it's really important to understand if you actually *need* to adopt digital transformation. To do this you need to take a close look at the current state of your business and then fully understand the value of Gear Manufacturing 4.0.

In essence, going through this first phase provides the proof as to whether you need digital transformation or not. You can't automatically assume that moving into a more advanced digital transformation is an absolute requirement. Buying into the notion that your business cannot survive without the investment of advanced technology can be a costly mistake if doing so does not yield significant beneficial results. This first phase will help you understand more clearly what is needed to accomplish your goals. Some businesses may already be extremely advanced in flexible and agile manufacturing. If these businesses have long-term projections which show no need for investment, then it might be a good idea to avoid any changes and stay the course.

On the other hand, if your business is very reactive, struggles with meeting customer demand, and the profitability

is lower than expected, you may want to consider a digital transformation strategy. In the end, don't do digital transformation just to be fashionable or out of the fear of being left behind. Do digital transformation because it provides an acceptable rate of return and maintains your ability to compete.

One point I'd like to make here, it's been proven that the key to remaining competitive is the ongoing reinvestment in your machining capabilities. That has not changed in the era of the modern digital factory. Ongoing investment in equipment should remain as a main focus. But keep in mind that many of these new digital factory technologies will likely be built into the new equipment or it can be retrofitted into your existing equipment.

Let's take a more detailed look at the main four steps suggested in this first phase of READINESS. I believe these steps provide a common-sense approach to establishing the foundation and value of digital transformation for each individual company. Each company is unique and the digital transformation requirements will most likely be different as well. One size does not fit all. It's not about Go Big or Go Home. It's about Go Smart.

Phil: I like what I'm hearing. So what are the steps involved in this first phase?

Chuck: As I said before, these are just the highlights. In Step One, your company leadership needs to be aware of the advanced manufacturing and smart factory enabling technologies that can be implemented to improve your ability to handle product variety and volume more effectively and efficiently.

It's important to have a good understanding of the available enabling technologies such as digital, automated, and additive manufacturing tools. There's plenty of information available online about these technologies so we don't need to get into that right now. I would just recommend that you and your team do the research to be sure you have a solid understanding of these technologies and how they can help you improve in areas that need to be improved.

Phil: That sounds reasonable. We can form a committee and collectively task them with this research and evaluation.

Chuck: The second step of Phase 1 involves detailing the current state of your business. This process will provide a comprehensive starting point for describing your business as it is today. The current state of your business is most likely something you already know on an intuitive level. However, formally taking this step is essential for clearly and completely defining your operation. This helps you to define and document your customer base, your demand forecast accuracy, your on-time delivery performance, your financial health, your key results achieved, and your process flow. This step may also provide some revealing insights about managing your business more proactively.

Phil: This is good stuff Chuck. What's next?

Chuck: This takes us to the third step of Phase 1. Here you will need to create the future state of your business. Use all of the same elements that were listed for the current state of your Business to create the future state. This will provide a clear picture of where you want to be in the future. In other words, the intent is to validate that you are on the right track for continued success.

These steps of the READINESS Phase can be deployed to assess your ability to document and analyze your future strategies. Most companies have already decided their future path. For others, these steps of the READINESS Phase can lead to a call to action or a newfound motivation to change for the better.

Phil: Here again, this makes a lot of sense. I'm guessing the next step of this phase is to compare the current and future states of the business?

Chuck: You're right Phil. In the fourth step of Phase 1, you'll compare the current state and the Future State to look for gaps. If there are no gaps, this can confirm that your current state is actually, in essence, your future state. This means you're clearly on the right track. However, if there are gaps, make a detailed list of them and these will be addressed in the next or second phase, which is entitled ACTION PLAN.

Phil: Excellent. This is the data-driven approach that all of us here can be very comfortable with in evaluating this potential investment in our future.

Chuck: Yes Phil. Phase 1 is critical to establishing the basis for moving forward with a strategy for digital transformation.

Why don't we do this? After you've completed Phase 1, let's talk again and we can go over the steps of Phase 2 in another Zoom meeting.

Phil: Great. I'll let you know if I have any questions.

Final Words

In the next part of this article series, we will hear what Phil uncovers in Phase 1 and then we will hear from Chuck Gates again on the steps involved in Phase 2.

I hope this story provides some valuable insights into your evaluation of the digital transformation of your operation. Please look for the continuation of the story in the next installment of Arvin's Angle in *Gear Technology*.

Finally, I would like to thank Chuck Gates for his valuable assistance in the development of this article.

Of course, if you have any questions or comments, please contact me at *ArvinGlobal@Gmail.com*.

ChuckGates received his Bachelor of Science degree in Management from the University of Illinois and his Master of Science degree in Industrial Technology from Purdue University. Chuck worked at Caterpillar for forty years in numerous roles encompassing Gear Machining, Gearbox Assembly, Quality, Engineering, Training, and Management. He has received numerous Professional Certifications and Awards including that of Certified Manufacturing Engineer CMfgE. In addition to teaching a wide variety of Professional Certification Review Courses, he has taught at the college level as an adjunct professor since the 1990s. Chuck is on the roster of consultant resources for Arvin Global Solutions.

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