

That Industry 4.0 Digital Factory Thing – Part 2

Joe Arvin

Welcome to the second installment of an article which is presented as a guide for navigating the topic of the Industry 4.0 Digital Factory.

In the first part, featured in the August 2020 Issue of *Gear Technology Magazine*, I presented a fictional account of a Zoom meeting between me, a gear company president named Phil (a fictional character) and Chuck Gates - a very real person and one of our AGS consultants who is very knowledgeable on Industry 4.0.

In the first installment, Phil learned not to panic, for there is a methodical approach for evaluating what should or shouldn't be done. He also learned about the multi-phased approach for assessing and implementing the Industry 4.0 Digital Factory, and the specifics involved in Phase 1.

In this episode, we continue the conversation as Chuck outlines the steps involved in Phase 2.

Chuck: So Phil, it's good to talk to you again. Why don't you tell Joe and me about how you did with the READINESS Phase—or Phase 1?

Phil: It's good to talk with both of you again as well. Here's what we've done so far with Phase 1.

In Step One, we looked into the advanced manufacturing and smart factory enabling technologies that are available to us. Specifically, we focused on the technologies that can be used to make us more effective and efficient. Among these were the Industrial Internet of Things, artificial intelligence, augmented reality, robotics, additive manufacturing, and so on.

In Step Two, we detailed the current state of our business—which helped us to understand our demand forecast, our performance, and our process flow.

In Step Three, we determined where we wanted to be in the future—or in other words, we defined the future state of our business.

And finally, in Step Four, we compared our current state and our future state, and we looked carefully for any gaps between the two. Let me tell you, I think we've learned quite a bit about ourselves by going through this process.

Chuck: Great Phil. Now let's talk about the next phase in this process which is Phase 2 or the ACTION plan.

The goal of the action plan is fairly straightforward. By looking at the current state of your business, and then comparing that to the future state of your business, this comparison will allow you to identify gaps. Then you develop the action plan in order to use the advanced technologies you identified which can be used to fill these gaps as a way to achieve the future state of your business.

Phil: That makes perfect sense. I think we have identified a future state that has many gaps and opportunities for improvement over our current state.

Chuck: That's really important to know. You see, companies that do not develop a more competitive approach, and remain reactive to the changes in customer demand, they will likely have problems down the road.

Phil: Yes, that makes sense. But here's a problem that I'm having. As our Digital Factory Committee learned about these technologies, they're all fired up about us adding them to our operation. In fact, they're already talking about a CAPEX investment in the area of \$4.5M to address our gaps. We just don't have that kind of money right now.

Chuck: Instead of trying to address all of the enabling technologies that you've identified at once, pick two to get started with. In other words, use the *Pick-Two* approach. Here is how to do that.

First, determine the two areas of performance that you feel are your top priorities. In other words, which two business results that are being

achieved with your current processes require immediate improvement? Some potential examples could be quality, revenue, cost reduction, delivery time, throughput or cycle time, profit, customer service, demand forecast accuracy, asset utilization, return on sales, and growth.

This focus can lead to a more disciplined approach to creating the plan of action. Trying to integrate all of the enabling technologies at once can be extremely daunting and lead to being overwhelmed.

This is really important. The keys to success in manufacturing are to invest wisely and do so in a timely manner. The Industry 4.0 Digital Factory is not about chasing a fad; it is about making advanced technology business decisions that have an attractive return on investment and a short payback period. Do not implement a digital transformation out of fear. Only innovate with a solid business purpose in mind. Change for the sake of change can be dangerous if there is no proof of the need.

Joe: If I can interject at this point, perhaps I can offer some ideas from my perspective as a gear guy. It's always important to identify your gaps, but it's also important to realize that not all of these gaps will require an Industry 4.0 technology to be resolved.

Phil: That's interesting Joe. I think I see where you're going.

Joe: I've always said that the key to success is investing in the latest technology. But that often comes with a high price. While it's critical to invest as much as you can, there are many things that you can do to improve the gaps without the large price tag.

Let me ask you a question Phil. When you identified the gaps, what was one of your most significant problems?

Phil: That would have to be scrap and rework.

Joe: What did your quality assurance people attribute those problems to?

Phil: The main problem was rooted in our machines that continually require maintenance to maintain tight tolerances. There was also a lot of operator error.

Joe: That's a good example of what I'm talking about. To address the machine problem, you could consider retrofitting or rebuilding those machines. Or you might want to look for used machine tools that will increase your capabilities. There is a lot of late model equipment on the market in as-new condition, often available from companies that have gone out of business. This equipment can be purchased at a dramatic cost savings when compared to new. As for operator error, you might consider a focused training solution to address this problem.

Phil: We also have the need to increase

our productivity.

Joe: In this case, you might want to really consider the purchase of a machine that is capable of performing multiple operations in one chucking.

On the other hand, robotic load and unload with integral inspection and auto adjustment to the machine if necessary would be a great way to integrate Industry 4.0 technology to improve your productivity. Furthermore, 3D printing for prototyping and wear resistant tooling is now a viable option and something to seriously consider.

These are just a few ideas, but my point is that it's best to analyze these other approaches before rushing into an expensive digital factory technology solution.

Chuck: Joe's exactly right. When

you identify the gaps, you need the most cost-effective business case to make this decision on integrating the enabling technologies. Many deficiencies can be fixed without digital factory components. You need to be sure that the investment in Industry 4.0 technology is really your best solution.

Phil: Yes, that's a good perspective. So as we plan to implement improvements that really do need Industry 4.0 specific components, what do we do next?

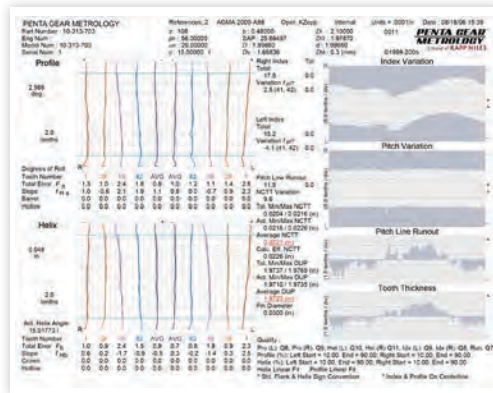
Chuck: First, I would recommend you take a look at this book. The title is *4.0: The Use of Emergent Technologies in Manufacturing*, which is published by Palibrio Publishing. This book lists some key enabling technologies which include the Industrial Internet of Things (IIoT), Manufacturing

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Execution Systems (MES), Artificial Intelligence (AI), Digital Twins, Augmented Reality (AR), Robotics, and Additive Manufacturing. Some additional key enabling technologies that can be used to move to a smart, digital factory are Big Data/Advanced Analytics, Automatic Guided Vehicles (AGV), Virtual Reality (VR), Machine Learning, Cloud Computing, Radio Frequency Identification (RFID), and Real Time Location Systems (RTLS). This resource can help you to focus on what technologies are best suited to address your gaps that can't be resolved adequately with other methods.

With this information, you're ready to proceed with Phase 2. Here are some helpful tips on how to get started in developing the plan of action.

Phil: I have a question. What if we are unable to select the two enabling technologies to include in the plan of action?

Chuck: If that is the case, I would recommend looking at Big Data/Advanced Analytics and Manufacturing Execution Systems (MES).

As you develop the action plan, you'll need to determine the specific

projects to implement along with the details including timelines and investment dollars needed. These projects also need to include an estimated cost-versus-benefit analysis.

Think of it this way. The plan of action will serve as the roadmap to identify the specific, new projects that will be deployed to implement the next following phase which is Phase 3.

Here is another important point. Your plan of action will need to include two major measurable objectives, and two outlined projects for each of the two major measurable objectives. It should have two investment amounts for each project—a minimum and a maximum. There needs to be two deadlines for each step in each project—a rapid finish and a slow finish. And finally, your plan will need two contingencies for each project, and two calculated return-on-investments for each project.

Also keep in mind that effective and efficient projects will include a project charter, project scope, activities, estimated activity durations or timelines, estimated activity costs, quality metrics, and resources needed. It is essential that a project manager is

assigned. To manage the projects and control the execution of the activities, there should be a monthly status review of the value proposition. The value proposition chart shows the estimated activity completion versus the actual activity completion, the estimated costs-to-date versus the actual costs expended, and the estimated benefits to date versus the actual benefits received. During these monthly project reviews, upper management needs to provide leadership in order to control the projects and to stay within the budget and deadlines.

Phil: What kind of timeline should we be looking at for completing Phase 2?

Chuck: Well, that depends on how aggressive the company is in pursuing excellence in the future. The willingness to develop a plan of action with detailed projects identified is actually a critical motivating factor. On the other hand, if company leaders are not sure about activating this systematic approach, and prefer to remain on their current course without pursuing a future of the digital transformation to a smart factory, it's tough to move forward. This may be referred to as relying on luck, fate, chance,

Previous Arvin's Angle Articles

In case you missed any of them, here's a list of previous articles by Joe Arvin, with issue and page number:

Business Development for the New Year

Jan/Feb 2017 – Page 50

It doesn't matter how efficient your plant is! What matters is the accuracy of your quote?

Mar/April 2017 – Page 54

Can Lean Manufacturing Kill Your Job Shop? A Tale of Two Companies

May 2017 – Page 42

You Cannot Rely on Labor Efficiency Reporting!

July 2017 – Page 48

The Valued Troublesome Employee To Terminate or Not To Terminate

September/October 2017 – Page 22

Strategies for Building Your Business

November/December 2017 – Page 54

Solutions for Your Process Engineer Shortage

January/February 2018 – Page 48

Training – A Top Priority for Investment

January/February 2020 – Page 46

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and magic to compete in the future. It is difficult to pursue excellence on a part-time, half-hearted basis.

So, good luck with Phase 2 as you develop your action plan. Certainly let us know if you have any questions. And when this phase is completed, we can talk about putting that plan into place with Phase 3.


Phil: Thanks. This has really been helpful. I'll let you guys know how we're doing.

Final Words

In the next part of this article series, we will hear what Phil uncovers in Phase 2 and then we will hear from Chuck Gates again on the steps involved in Phase 3. 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 Magazine*.

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. 

Chuck Gates 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.

Joe Arvin is a veteran of the gear manufacturing industry. After 40 years at Arrow Gear Company, Joe Arvin is now President of Arvin Global Solutions (AGS). AGS offers a full range of consulting services to the manufacturing industry. His website is www.ArvinGlobalSolutions.com and he can be reached by email at ArvinGlobal@gmail.com.



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