Penn State Learning Factory

written by Lauri Moon | August 1, 2016

Does your business need some engineering design, prototyping or fabrication work? IMC partners with Penn State Learning Factory to solicit projects each semester.

The Learning Factory's mission is to bring the real world into the classroom by providing engineering students with practical experience through industry-sponsored and client-based capstone design projects.

Learning Factory projects have also involved Business students helping to create business plans for start-up and small business partners. IST students have helped companies address IT-related issues (e.g., data management, access, security) as part of these projects.

Contact Dana Gordon for more information about getting involved with the Penn State Learning Factory.

Advancing Information Transformation in the Manufacturing Sector

written by Lauri Moon | August 1, 2016

Treat data and information as you would any critical business asset: measure, document and manage essential attributes such as value, risk and cost.

(IW — Kimberly Knickle: 7-6-16) Manufacturers depend on information and analytics to help them deal with the complexity caused by global operations, value chains and market. Most recognize that there is tremendous opportunity to use,

analyze and apply information all across the business. However, they need to do a better job capitalizing on the information that is and will become available to them and to embed intelligence in how they manage their operations and deliver products and services.

Manufacturers must evolve from a classic data management approach to one that leverages information and knowledge as critical business assets. Existing quality, data governance and data management practices are still essential. But these practices must evolve to meet the requirements both of the legacy environment and of the digital business under construction.

Information transformation is a huge and critical challenge for many. IDC estimates that by 2020, the digital universe will reach 44ZB, or 44 trillion gigabytes, of data—a tenfold increase over that in 2013, with 40% growth per year. To make matters worse, IDC estimates that 22% of the information in the digital universe was usable for analysis in 2013; however, less than 5% of that usable information was analyzed. These numbers need to change for manufacturers.

Although most manufacturers have aggregated and analyzed much of their transactional data, many see value in other data types and sources, such as machine- or sensor-generated data, GPS data, text, rich media (image, voice and video), and consumer sentiment from e-commerce sites and social networks.

The Rise of the Knowledge Worker

Manufacturers need their employees to do their jobs more efficiently and productively—as they manage operations, design products and develop new intellectual property (IP)—from anywhere in the world. Knowledge is the basis for augmenting and automating work throughout the company and from the experienced to the new generation worker to yield further productivity benefits.

Knowledge workers—those employees who primarily rely on data and information to do their work—currently represent about 40% of the manufacturing workforce. And in large or geographically dispersed manufacturers, information is often the glue that keeps the company working as one. Yet manufacturers often struggle to provide unified information access systems with a “single point of access” to heterogeneous

data sources or achieve what we call “truth in data.”

Data-Driven Manufacturing—In Processes and Products

Despite all of the localized information analysis that takes place today within various lines of business or applications, manufacturers are still not achieving the success they would like to in applying that information, whether because of data quality problems, data disconnects, the age or timeliness of the data, or even the availability of data.

Some of the use cases that are currently receiving the most interest leverage sensor data, create new products and services, and change how manufacturers interact with their customers and their customers’ customers. But most of these new use cases require the integration of enterprise data sources and external data sources (such as weather and traffic). This is especially true for two use cases that are of high interest to many manufacturers:

- *Predictive asset maintenance* uses sensor data on production equipment, integrated with enterprise asset management systems to drive maintenance and with inventory data to ensure an adequate supply of necessary service parts.
- *New service delivery via connected products* uses sensor data in products in use by customers to monitor real-time product performance data for maintenance, to confirm products are under warranty, or to deliver consumables. Integration bridges sensor data, warranty systems, CRM, ERP and supply chain applications.

Eventually, we will also find manufacturers selling their data as a product, and although we don’t fully know how this market will develop, it builds on the fact that “knowledge is power.” 3-D printing and robotics will also contribute to data-driven manufacturing as well, both requiring a significant amount of data to fine-tune their performance and generating large volumes as they operate.

Changing Technology—Business Process Platforms and Advanced Analytics

Other factors are driving the need for information transformation, such as the need to support business processes and interdepartmental collaboration that crosses

application boundaries. For example, the global product innovation platform, which serves as a way to increase access to and sharing of product-related documents and data for distributed engineering organizations and well beyond engineering. Data integration and analytics are absolutely essential to the successful implementation of the innovation platform and other process platforms.

The availability and demand for more advanced analytics are also accelerating, as manufacturers look to the promise of prescriptive analytics, machine learning and cognitive computing to provide guidance or even automation.

Information Transformation

Manufacturers must do more than just invest in tools and technologies; they need an information transformation. Such a strategy can help manufacturers advance and draw maximum benefit from the extraordinary power of information. In each stage of this transformation, leaders should focus on the following dimensions:

- **Data discovery**: including acquisition and preparation, exploration, visualization and datafication.
- **Value development**: through analytics, algorithms, program management and quality.
- **Value realization**: through monetization, productization, real-time orchestration and service innovation.
- **Knowledge and collaboration**: including work virtualization, knowledge and integration, governance, and risk.
- **Information architecture**: including data management and enterprise information model, integration and synchronization, information architecture services, and security.

At the highest level of maturity—the optimized stage—organizations will be able to drive continuous improvement in how data value is developed and realized throughout the value chain. They will rely on an information platform that ensures the security of the company's IP and clearly establishes information as an essential corporate asset. They also will value their data and even monetize it.

Information and embedded intelligence drive continuous innovation in processes,

products and services; enable revenue streams; and fuel enhanced customer engagement and experiences.

Our guidance for manufacturers over the next year includes:

- Assess your enterprise capability in each of the dimensions of an information transformation.
- Adopt a balanced scorecard approach to coordinating initiatives and interdependencies across the dimensions. Our research indicates that imbalance across the maturity levels impedes success.
- Lead by example and champion collaboration. Allow both top-down and bottom-up actions to positively interact. Educate all the stakeholders.
- Treat data and information as you would any critical business asset. This means measuring, documenting and managing essential attributes such as value, risk and cost.
- Focus on meaningful but limited initial initiatives before investing in larger ventures. Agree on maturity targets and create the roadmap of your information digital transformation.

The most advanced companies can accelerate the pace of sophisticated analysis, the mix of data and data types, and the ability to optimize and predict business decisions. Leaders in information transformation will treat data and information as they would any critical business asset—with investments in people, processes and technologies that acknowledge information's strategic importance and with a roadmap to maximize information's contribution to business success.

(Kimberly Knickle is research vice president with analyst firm IDC Manufacturing Insights.)

ISM Reports Manufacturing Finishes First Half of 2016 in Good Shape

written by Lauri Moon | August 1, 2016

(Modern Materials & Handling — Jeff German: 7-1-16) Manufacturing finished the first half of 2016 in strong shape, based on the June edition of the Manufacturing Report on Business from the Institute for Supply Management (ISM).

The PMI, the index used by the ISM to measure growth, was 53.2 (a reading of 50 or higher indicates growth), which topped May by 1.9% and is the fourth straight month of growth, too. What's more, the PMI is now at its highest level going back to February 2015, when it was at 53.3. From October through February, the PMI had seen sub-50 readings, with October marking the first month that the PMI was below 50 since November 2012. June's PMI is 2.9% above the 12-month average of 50.3. ISM noted the overall economy has seen growth for 85 consecutive months.

Each of the report's core four metrics, including the PMI, saw growth in June. New orders, which are often cited as the engine that drives manufacturing, saw a 1.3% increase to 57.0 and reached its highest level since coming in at 57.4 in December 2014. Production was up 2.1% at 54.7 and at its highest level since July 2015's 55.0. Employment rose 1.2% to 50.4.

ISM said that of the 18 manufacturing sectors contributing to the report, 13 reported growth in June, including: Printing & Related Support Activities; Textile Mills; Petroleum & Coal Products; Food, Beverage & Tobacco Products; Fabricated Metal Products; Apparel, Leather & Allied Products; Paper Products; Miscellaneous Manufacturing; Computer & Electronic Products; Chemical Products; Primary Metals; Machinery; and Nonmetallic Mineral Products. *The three industries reporting contraction in June are*: Electrical Equipment, Appliances & Components; Transportation Equipment; and Plastics & Rubber Products.

ISM member respondents cited in this month's report were encouraging. A food, beverage, and tobacco respondent said his company is gaining new customers through better sales management, and a machinery respondent said business is steady with some signs of increase.

A plastics and rubber products respondent said demand continues to be robust. A primary metals respondent observed that orders are slowing from China, and American consumers are still steady.

“I really like this whole report,” said Brad Holcomb, chair of the ISM Manufacturing Survey Business Committee, in an interview. “It’s been building and increasing in momentum for the last four-to-six months, and we are finishing the first half of the year on a high note.”

Backlog of orders in June saw a 5.5% jump to 52.5, which Holcomb said is a bodes well for future production growth, and supplier deliveries slowed at a faster rate, with a 1.3% difference to 55.4 (a reading above 50 for this metric indicates slowing).

Exports and imports were up 1.0% and 2.0% to 53.5 and 52.0, respectively.

“These metrics all show that things are solidifying and continuing a positive trend after some sluggishness,” he said. “But now things are going the other way. And if you look at some other related news, consumer confidence and spending is up, too, with all things starting and ending with consumers.”

The report’s section on buying policy also paints a positive picture for the current state of manufacturing, with capital expenditures in June average days for commitment lead time went from 127 days in May to 131 days in June. This reflects companies placing more orders for capital equipment.

And with the first half of the year being relatively solid, Holcomb said that this shows manufacturers’ CFO’s are opening up the purse strings to approve projects.

“Things are set up well to align with our forecast we made in May,” he said.

Brexit impact: In a separate report issued today on Britain’s decision to leave to the European Union last week (Brexit), ISM respondents’ feedback indicated that while most procurement executives don’t foresee major disruptions, many are cautiously watching the situation closely and believe Brexit will hamper growth to varying degrees.

Nearly 60% (58%) of manufacturing respondents cited a negligible net financial impact, with 7% saying it was negative, 31% saying it was slightly negative, 4% saying it is slightly positive, and 0% saying it is positive.

“My response to Brexit is ‘who knows?’” said Holcomb. “One scenario is that Europe becomes more competitive, as each nation hunkers down and fights for its share of the marketplace and competes more strongly. In the short-term, there is going to be concerns about the price of currency, currency fluctuations, and other things. The stock market is already completely recovered after the fall, and I am willing to stick with our forecast…and that estimated adjusted increase in our manufacturing revenues of 2.8% appears to remain on track.”

(Jeff Berman is Group News Editor for Logistics Management, Modern Materials Handling, and Supply Chain Management Review. Jeff joined the Supply Chain Group in 2005 and leads online and print news operations for these publications.)

Connecting STEM with Real-Life Manufacturing Jobs

written by Lauri Moon | August 1, 2016

How small and medium-sized companies on Long Island are trying to bridge the disconnect between what’s learned in school and the diverse tech opportunities out there.

(IW – Laura Putre: 6-30-16) Joe Spinosa grew up around his parents’ aircraft equipment business on Long Island, doing everything from sweeping the floor to putting things together. Give him thirty seconds, and he can recollect the names of all the hamlets and villages that the company moved to as it grew: Bellmore, Syosset, Farmingdale, then Hauppauge, then Ronkonkoma.

The company, East West Industries, that began 45 years ago with Mom and Dad’s kitchen table conversation—“Why are we doing for other guys what we can do ourselves?”—is now a finely tuned 50-person operation. Lockheed Martin, Boeing, and Grumman are among the clients for its military aircraft ejection seats and oxygen support systems. Last year, East West was one of only 100 of 13,000 suppliers that received Boeing’s Performance Excellence Gold Award.

The place is a wonderland of machinery and problem-solving. Four or five different kinds of

engineers work on the small staff, and the range of equipment is vast, from tiny reducers with valves and poppets in them, machined to ten thousandths of an inch, to portable floor cranes that service aircraft and weigh thousands of pounds.

Spinosa, who inherited the business with his sister, Teresa, recently started conducting plant tours with sixth through twelfth graders from the local school district, hoping to give kids a little piece of his own manufacturing immersion experience. Recently, 25 students, from sixth to twelfth grade, hand-picked by their teachers, got to poke around in every corner of the place: the sheet metal shop, the military sewing shop, the oxygen test lab. They learned about (and in some cases, witnessed) the product cycle, from conversations with the customer to mock-ups on a 3-D printer to prototyping and then low-rate initial manufacturing.

“When it finally comes together from these little parts that come off the machine, that’s where you see their interest pique up,” says Spinosa. “’Wow, this is pretty cool.’ That’s the kind of stuff that was going around. ‘Take a picture of me in the seat. Can we see the oxygen lab?’”

Spinosa is a supporter of a new initiative through the Long Island Workforce Development Institute (WDI) to connect schools and manufacturers. In New York, he says, schools have a mandate to teach technology, “but there’s a disconnect in terms of what the careers are and what to teach the children other than ‘Here’s how you take a CAD design and put it into a 3-D printer and print it out.’ What’s the use of that? what’s the utility of that? How does it knit into the whole picture?”

Another challenge is that without a huge manufacturing corporation to bring it all together, the 3,000 small to midsize manufacturing companies on the island tend to keep a low profile.

“We have a wonderful pipeline of manufacturers out here,” says Spinosa. “And I don’t think anyone really realizes it. They think that when Grumman and Republic moved off the island, things kind of died, but it’s not that way.

Last month, Long Island WDI made its first attempt to bring everyone together with a Manufacturing Innovation Institute that included manufacturing employers, teachers, guidance counselors, workforce development people and parents. Participants could try out a virtual reality welding simulator and listen to a panel of manufacturing leaders talk about tech careers.

The idea was to “chip away at the industry perception that we all struggle with, and educate the educators about what’s happening in the industry,” says Rosalie Drago, WDI’s Long Island regional director.

Drago’s group took a look at job postings from 200 manufacturers on Long Island over a 12-month period. All told, there were 2,300 tech jobs posted, and 81% of those jobs paid a salary of $80,000 or more.

Spinosa says one of the goals of the effort is to help teachers come up with more challenging curriculum. For instance, with 3-D printing, a typical classroom project is to make a very simple cellphone holder. But a creative kid who likes tinkering, might quickly be asking what’s next, and at school, there is no next. A stronger partnership between manufacturing companies and the schools can help answer that question.

Spinosa and others are starting to work with teachers on more advanced projects. For 3-D printing, it might be designing and creating everyday things with between 5 and 7 parts—like a tape dispenser, for instance.

“It teaches them the assembly and how do you look at something and make it manufacturable. What’s the cost at the end? Now they’re thinking on multi-levels.”

BREXIT: Ten Things Manufacturing Companies Should Know

written by Lauri Moon | August 1, 2016

(Manufacturing Leadership Council – Paul Tate: 6-28-16) When the world woke up last Friday morning, news that the U.K. had voted to leave the European Union after more than 40 years sent shock waves through the world’s political elite, global currency and stock markets, and company boardrooms.

Over the last few days the U.K. currency has gone into free fall, at one point hitting

a 30-year low against the dollar; stock markets have trembled, not only in London but across Europe, the U.S., and Asia; British Prime Minister David Cameron, who had campaigned to remain in the EU, has resigned; major banking institutions like HSBC have announced potential plans to move thousands of staff out of the U.K. to European locations; Standard & Poor's and Fitch both downgraded their U.K. credit ratings; Moody's has dropped its outlook on U.K. debt to negative; and warnings of protracted economic doom have hit the world's headlines.

As a result, the future for the U.K. economy, and the rest of Europe, now looks highly uncertain. What's more, any sense of real 'certainty' is unlikely to return soon.

Under the EU's Article 50, the process for a member to withdraw will take two years from the moment it is triggered. This may not happen until a new U.K. Prime Minister is appointed in October. However, this process is most likely to cover the general EU governance and regulatory issues only. Some observers believe that sorting out new trade agreements with the 27 remaining EU countries, if that is the chosen way forward, or any new rules governing the ultimate flow of workers across borders, may take much longer.

How, and when, the U.K. formally exits the EU, and under what conditions, is still a mystery. Will the U.K. shed all ties with the 27-nation single market and simply trade as yet another national economy? Or will it cut some kind of deal to remain part of the European single market in a different form, without some of the accompanying controls from Brussels?

One critical element missing from the vote-winning Leave campaign so far, of course, is any clear plan about what to do next. The 'Leavers' appear to be as surprised as the rest of the world that the British public voted for BREXIT at all.

In the midst of all this economic uncertainty and political turmoil, the question now is: What are the possible implications for manufacturing?

Will the BREXIT vote be remembered as an Independence Day for British manufacturers as they seek new, unfettered global markets –– or will it mark a Doomsday for U.K. industry, driving the economy and its manufacturing base to

shrink into recession and industrial contraction?

And where does this leave the rest of Europe, and the numerous global manufacturing companies with existing plants and important customer bases in the U.K.?

In an effort to provide some clarity in the midst of the confusion, here are 10 things that manufacturers should know about when trying to assess the future of manufacturing in the U.K., and some of the potential implications of BREXIT on their businesses.

1/ The Current State of U.K. Manufacturing:

The U.K.is the world's fifth largest economy and its manufacturing base is currently the ninth largest in the world, according to a recent report from the U.S. Congressional Research Service.

Manufacturing contributes around $460 billion in gross added value to the U.K.'s GDP each year, says the Confederation of British Industry (CBI), and accounts for around 46% of the U.K.'s total $345 billion of worldwide exports.

Growth in the U.K. manufacturing sector, however, is flat right now, in no small part due to the uncertainty generated by the run up to the BREXIT vote last week. The UK's manufacturing PMI only just crossed the growth threshold of 50 points in May with a figure of 50.1, after dipping into contraction in April for the first time in over three years.

The Eurozone PMI, however, is faring better, with a flash PMI growth projection for June of 52.6, marking a six-month high.

2/ The Downside:

According to some forward economic projections, the impact of BREXIT could hurt the U.K. economy worse than either of last century's two world wars, or the 2008 global banking meltdown.

That may be overly dramatic, but there are already some worrying signs that the

U.K. economy now faces a number of significant issues.

A new report from the U.K.'s Institute of Directors reveals that two thirds of the 1,000 members it surveyed over the last few days said the BREXIT vote would have a negative impact on their businesses, a quarter planned to freeze employment, and 5% said they would be cutting jobs. More than a third also intend to reduce their investments plans, and a fifth said they would consider moving some operations out of the country.

Many of the U.K.'s manufacturing industry associations are also deeply concerned and have appealed for clear thinking over the difficult months ahead. "Great care must be taken during the negotiation process to protect manufacturing's interests and we will be working hard in the UK and in Brussels for that outcome. We believe that we can leverage UK manufacturing's reputation for innovation and flexibility to secure the best possible deal for our members outside the EU," James Selka, chief executive of the Coventry-based Manufacturing Technology Association, told the U.K.'s Engineer magazine.

3/ The Upside:

Not every economist is predicting doom and gloom, however. Oxford Economics has suggested a range of losses could be between as little as 0.1 per cent and 3.9 per cent, and that these may be short-lived as the U.K. will then be free to forge new trade deals with other, faster growing nations around the world.

"We should look ahead to opportunities to trade more freely with the rest of the world, as well as building on existing trading relationships with customers and suppliers in Europe," commented Lord Anthony Bamford, chairman of the $4 billion British construction equipment maker, JCB. "We have little to fear from leaving the EU."

In addition, some observers argue that because the falling pound will make British exports cheaper on world markets, and the U.K. a more cost-effective place to manufacture and set up business, any short-term downturn will be mitigated by longer-term gains.

Also, the UK has traditionally had a strong focus on high-value added manufacturing. Coming out of the EU might help UK manufacturers compete better on a global stage, as they will no longer be hindered by highly regulated EU industrial policies.

4/ European Trade:

Based on 2014 statistics, the UK manufacturing sector exported $155bn worth of goods to the EU that year, including over 600,000 vehicles. On the other hand, the EU exported nearly $260bn worth of goods into the UK over the same period.

The 'Leave' campaign's argument was that these figures show the EU needs the U.K. market more than the U.K. needs the EU. As a result, some believe that EU businesses like BMW or French Energy companies will be eager to ensure there are as few trade barriers as possible that could restrict future access to U.K. markets.

Others, however, expect the EU to punish the U.K. by making it as hard as possible to cut new trade deals with the remaining 27 countries in an effort to dissuade other European nations from taking their own exit options in the future. For example, there are already moves in France, The Netherlands, Hungary and Italy to push for similar EU referendums following the U.K. vote.

The problem is that if the U.K. fails to cut a beneficial EU trade deal, manufacturers may then face export tariffs to EU countries of up to 10% on cars, 4.6% on chemicals, 1.7-4.5% on machinery, and around 20% or more on food and beverages.

Potential tariffs, plus low sterling values, could also make imported technology purchases significantly higher in price, and hamper essential investments in future digital solutions across multiple industries, including manufacturing. One suggestion is that BREXIT may wipe out up to $4.6 billion of the value of tech spending in the U.K. this year alone.

5/ Foreign Investment in Manufacturing:

In 2013, FDI from Europe into UK manufacturing activities was estimated to be nearly $150 billion, including nearly $4.6 billion in R&D spending from non U.K.-based companies.

This level of inward foreign investment is now at risk. Foreign companies are expected to put on hold, or perhaps reduce, any plans for investing in U.K. manufacturing concerns until the future relationship with the rest of the EU is clarified. This is unlikely to happen for the next couple of years.

“This is very bad news for the EU, but even worst for Great Britain,” commented Industry 4.0 pioneer Dr. Detlef Zühlke, Executive Chairman of Germany’s SmartFactory Initiative and a member of the Manufacturing Leadership Council’s Board of Governors. “The direct impact will hit GB soon when foreign investors, banks, and companies have to rethink their investments.”

6/ Global Manufacturers in the U.K.:

For the time being, trade deals between the EU and the U.K., and the rules governing the free movement of European talent, will remain the same. Foreign companies with plants in the U.K. do not face an overnight crisis – yet.

But they are clearly worried about the future. Airbus, Ford, and BMW have all actively voiced their BREXIT concerns. BMW’s head of its Rolls Royce group, for example, wrote to staff warning; “Tariff barriers would mean higher costs and higher prices and we cannot assume that the UK would be granted free trade with Europe from outside the EU … Our employment base could be affected.”

Commented Chad Moutray, Chief Economist at the National Association of Manufacturers in the U.S. “It does create some challenges for businesses, particularly those that have a presence in the United Kingdom as a gateway into Europe. This is especially the case for the financial sector in the United Kingdom, but it is also the case for manufacturers. Those firms will likely watch the upcoming negotiations closely, ensuring that their ability to trade with the continent and others remains unabated.”

So a lot will depend on how the U.K. goes about agreeing trade deals with the EU as part of its exit strategy, and when. If the trade barriers are high, foreign companies like Nissan or BMW may well decide the balance between access to UK customers, versus access to the entire EU customer base, is not enough to warrant maintaining production on British shores and so could move existing plants, or focus investments

in new plants, onto the European mainland.

7/ Raw Materials:

In the short term at least, if the pound continues to lose ground against international currencies, price rises in imported raw materials for U.K. manufacturers seem inevitable.

In the medium term, if the U.K. decides to ditch, or is not allowed to maintain, the current free trade agreements with EU countries, prices of imported materials from the EU are also likely to be higher than they are today, due to potential import tariffs.

Manufacturers, both British and global, will need to be vigilant about tracking the impact of price fluctuations of raw materials on their costs of U.K. production, and continually assess the effectiveness of their current sourcing policies and partners, until the BREXIT negotiations deliver more clarity about the future.

8/ Manufacturing Skills:

One of the most fundamental aspects of EU membership is the free flow of talent across borders. This has become a major, and sometimes contentious, issue for many populations in Europe – both in terms of EU citizens moving from poorer economies like Poland and Romania into wealthy ones like the U.K. and France, and the influx of non-EU migrants into the region from other areas of the world.

Irrespective of your point of view, one of the key benefits has been access to a wider pool of talent for manufacturing companies, and the U.K. has benefitted as much as other nations.

While there are currently few suggestions that the existing EU-originating workforce in the U.K. should suddenly, or even eventually, be removed, the U.K. may well lose access to this wider talent pool if it decides not to adopt a reasonable border policy in the future. It may also reduce its attractiveness to talented foreign workers as new border controls are introduced.

With a limited number of skilled next-generation workers coming through the U.K.’s

educational system, and a skills gap already having a dampening impact on growth, one of the key issues now facing the U.K. manufacturing sector will be where the next wave of workers it needs to thrive in an increasingly digitally-driven future will come from.

It remains to be seen if a new, non EU-bound, U.K. government can successfully address this critical skills issue before it makes a significant economic difference to Britain's industrial sector.

9/ Product Innovation:

One of the things that the U.K. has a world reputation for is innovation – whether it's for new pharmaceuticals, new production techniques and materials, fashion goods, or leading-edge motor sport design.

Currently the British government maintains a comparatively hands off policy of innovation investment, focusing on programs such as Innovate U.K., with its Catapult and Advanced Manufacturing Center schemes. These, however, are not as coordinated or as powerfully funded as either the network of Manufacturing Innovation Institutes like the DMDII or America Makes in the U.S., or Germany's Fraunhofer Institutes that support German SMEs to continuously upgrade their products and processes by driving technology adoption.

In addition, the UK receives more funding from the European Research Council than any other country in Europe. Disengaging with the EU would mean this research support would be lost. Automotive, aerospace, pharmaceuticals, and chemicals are the verticals that could be most affected in an acrimonious divorce.

If the U.K. is going to maintain its innovative reputation, future British governments may need to review the country's manufacturing and technology innovation support strategy and adopt a far more direct, proactive, and better-funded approach.

10/ The Future of a Single Digital Market

From extended manufacturing supply chains, to common digital platforms for customer support and the delivery of new services, there's a significant global trend underway across many industries today to harmonize as many regulations, laws,

systems, policies, and standards as possible to drive out complexity in global networks and keep them secure.

In the past, the EU has launched a number of harmonization initiatives designed to help companies make it easier to do business across the continent, both in physical and digital terms. Inevitably, the U.K.'s departure from the EU now raises questions about whether this move to end-to-end harmonization can progress as swiftly as before if some countries are going to start to make up their own rules, or refuse to abide by others.

As one U.K. supply chain academic warned, if this happens, U.K. manufacturing suppliers may find themselves losing some of their traditional partners. "In a competitive environment where small changes can have significant impact on performance and relationships, switching between supply chains and countries may become an increasingly popular choice," said Dr. Christos Tsinopoulos, Senior Lecturer in Operations & Project Management at Durham University Business School.

As global industries become increasingly digitized, the need to maintain access to a single digital market in Europe may turn out to be one of the most important and complex areas of forward-thinking negotiation between the EU and the U.K. in the BREXIT divorce.

So What's Next?

Unfortunately, the true implications of BREXIT for U.K., European and global manufacturing companies look set to be clouded by continuing uncertainty until the EU and the U.K.'s new government thrash out an acceptable plan of action for both sides – and that could take at least two years.

While the shock waves continue to ripple across the continent, there are now even suggestions that a second referendum may be required detailing the specific exit plans before being signed into U.K. law. Some observers also assert that many British voters are fast moving from the BREXIT camp, to the 'REGREXIT' camp, as they begin to realize just how significant the vote could be for the future of the U.K. economy and industry.

Who knows what the next few months will bring? The future for manufacturing in the U.K. seems as tough to predict as the surprise outcome of last week's vote itself.

Watch this space …

Additional contributions from Frost & Sullivan's Muthukumar Viswanathan in London, and Karthik Sundaram in Frankfurt.

(Paul Tate is Research Director and Executive Editor with Frost & Sullivan's Manufacturing Leadership Council. He also directs the Manufacturing Leadership Council's Board of Governors, the Council's annual Critical Issues Agenda, and the Manufacturing Leadership Research Panel.)

How to Revitalize U.S. Manufacturing

written by Lauri Moon | August 1, 2016
U.S. manufacturing employment has edged up in recent years. New policies could accelerate job gains and investment in manufacturing. Illustration: Harry Campbell for The Wall Street Journal

Click here for full article.

Small Things that will Increase

Innovation in Your Company the Most

written by Lauri Moon | August 1, 2016

(Innovation Excellence — Yoram Solomon: 6-13-16) Last month I delivered my "un-kill innovation" executive workshop to an executive team of a Fortune 500 technology company in Florida. It was a great experience all around, but at the end I was asked for the key takeaways, and I narrowed them down to the following.

There are three key things that will increase innovation in your company the most.

They are small things. They have no investment or budget associated with them. They don't require you to roll out new processes or infrastructure. They don't need company-wide training. All they need is a change of attitude — ***yours***.

Accept that you are not driving (or even fostering) innovation. You are *allowing* innovation.

Your employees already know how important innovation is. They know it's good. You don't have to tell them that. All they need is the ***autonomy*** to do it. Innovation is like the sport of curling than golf. It is not the driving of the stone that gets it there–it's the swiping and altering the state of the ice in front of it that allows the stone to reach its destination. And you can only make small adjustments. You can't drive large ones.

Ask yourself: how do I react when one of my employees tells me that he (or she) tried something I didn't authorize and failed?

If you react severely, and let them know that there will be consequences for trying unauthorized things–they will never do it again. But here is the thing–you know who never fails? Only those who never try. Accept that there will be trial and error on the way to success.

Let your employees try, and help them get on their feet again after they fail. This

will give them the autonomy and creative freedom to try again. When your toddler starts walking, soon thereafter they start running. Very quickly they fall. What is the first thing they do after they fall? No, the first thing is not crying. The first thing is ***looking at you*** to see your reaction. Your reaction will tell them whether they should cry, or get up and keep going. If you yell "oh, no!" or react in horror–they will cry. But if you yell "come on! keep going!" they will get up and keep going.

When an employee comes to you with an idea, avoid "I'll be the judge of that" or "I'll know it when I see it." Replace these reactions with "Let me tell you what will make me say yes."

One of the most powerful factors affecting creativity (and thus innovation) is sharing the "big picture." If you share the big picture with your employees and let them know what will make you approve a product idea (and the budget and other resources they are looking for)–you are forcing ***them*** to consider all aspects of their idea, and not just throw it over the fence to you for approval. You also ***reduce*** your workload (what a concept…), empower your employees, increase the probability that ideas are well vetted (your employees are in the front line of technology and customers, and are better positioned to assess the viability of their idea. I'm sorry to say, but you are highly disqualified to vet an idea from your position…)

Do those three things and you are guaranteed to increase the level of innovation in your company by orders of magnitude. As one of the participants in my workshop last week said: it will be transformative to the organization. Try it!

(Dr. Yoram Solomon is an inventor, a creativity researcher, coach, consultant, and trainer to large companies and their employees … is active in regional innovation and technology commercialization … and is a speaker and author on predicting the technology future and identifying opportunities for market disruption.)

How U.S. Manufacturers Can Compete

written by Lauri Moon | August 1, 2016

(Forbes – Bill Fotsch and John Case: 6-15-16) Nearly every politician these days bewails the loss of American manufacturing jobs. Nearly every politician promises—somehow—to bring them back. We're skeptical of these promises. Many thousands of factory jobs have been lost, and will continue to be lost, to automation, just as millions of farm jobs were lost to new technologies a century ago. And some manufacturing industries, such as garment making, will always find it impossible to produce goods in high-wage environments like our own.

All that said, US manufacturing may still be poised for a comeback. Some companies have found that overseas suppliers can't deliver top-quality goods. Others have discovered that transportation costs and long shipping times undermine whatever cost advantage they get from producing abroad.

Some large manufacturers, like GE, have learned to compete with anyone in the world. But what about the smaller suppliers that every big plant relies on? They'll have to step up their game if they expect to compete in a global marketplace. To see how, it might help to pay a visit to Trinity Products.

Trinity is a steel pipe manufacturer and custom fabricator, located not far from St. Louis. It employs about 160 people and does close to $100 million in annual revenue. The company makes big, infrastructure-size pipes and structures. You can see its handiwork in everything from bridges and power plants to giant signs and scoreboards. This is a tough business, dependent as it is on the level of infrastructure spending around the nation—something that Trinity's leaders have no control over.

But Trinity is thriving, because CEO Robert Griggs and his team know something about manufacturing that many executives and company owners seem to have forgotten: no one knows how to do a job better than the person who is doing it. They have turned Trinity into a kind of learning organization, with people on the shop floor making the company more and more competitive every day. (For a fuller description of how Trinity goes about this, see our article in this month's Manufacturing Leadership Journal.)

Trinity's journey started with open-book management. Griggs and CFO Jim Nazzoli helped employees learn about—and track—the company's revenue, costs, and profits. Today, the company circulates a scoreboard every morning showing billings and backlogs by product or process, along with key monthly statistics such as total orders and total mill tons.

Then they began working with a firm called the Cycle of Success Institute, known as COSi. (We have no connection to this organization.) COSi coaches helped Trinity create a system in which employees flag obstacles and bottlenecks and figure out how to solve them. "You identify a problem, put it on a list, monetize it, and prioritize it," explains Nazzoli, who has added the title of chief continuous improvement officer to his CFO job description. High-priority projects are assigned to a team, and every two weeks the team reports back to the COSi steering committee on its progress.

"We've accomplished 125 projects at the mill over five years," says Griggs. "We have all the data. We took coil splices from 25 minutes to 15. Changeovers from one size to the next size went from eight hours to five and then to three or three-and-a-half. We continuously organize and prioritize the projects. These lists never go away."

US manufacturers have long experimented with continuous improvement systems, of course.

But this one is a little different. Because the books are open, employees can see the effects of their efforts on costs and productivity. They can also see when they're on track for a profit-sharing bonus. That answers the question "Why should we worry about all this?" that some employees might ask. In the last five years, annual bonuses have ranged from $1,000 to $6,000 per employee.

Getting employees involved, helping them learn to think like businesspeople, sharing the wealth that they help create—this is what it will take to make American capitalism competitive again. And in the process, it just might save or generate a few more manufacturing jobs.

(We work with and write about companies that are improving business results and the lives of their employees through open-book management. *Bill*, founder and president of Open-Book Coaching, has more than 20 years' experience as a business coach and has helped nearly 400 companies bring the economics of the business alive for their people. *John*, editor of the online publication RetoolingCapitalism.com, is author of the classic books Open-Book Management and The Open-Book Experience. His articles appeared in Inc. and Harvard Business Review.)

Gilson Snowboards Summer Snow Day

written by Lauri Moon | August 1, 2016

Best Practices for Creating an Innovative, Advanced Manufacturing Culture

written by Lauri Moon | August 1, 2016

Promoting innovative, advanced manufacturing cultures within a community involves strategic planning and effective partnership with public institutions.

(Area Development – Dan Levine: 6-16-16) Advanced manufacturing – broadly defined as the integration and utilization of new technologies to improve products and processes – is a sector that Oxford Economics estimates now accounts for 44 percent of all U.S. manufacturing employment and supports 19 percent of U.S. GDP through its operations, supply chain, and payroll.

Companies all too often must choose between introducing advanced manufacturing equipment and processes into existing plants or shutting down operations and beginning production somewhere else. Consequently, many communities are anxious to support manufacturers that are modernizing plants rather than risk seeing those plants close.

At the same time, forward-thinking manufacturers understand that partnerships with public entities can accelerate and ease the cost of introducing complex new equipment and production processes into their plants. By examining two best-in-class examples, this article highlights ways in which supportive public-private partnerships can be established to help facilitate the promotion of advanced manufacturing. Each partnership helps companies improve productivity through either advanced manufacturing skills training or by offering advanced technological research development. This productivity improvement is the key to company survival, wage growth, and regional competitiveness.

Companies all too often must choose between introducing advanced manufacturing equipment and processes into existing plants or shutting down operations and beginning production somewhere else. During a recent engagement, Oxford Economics calculated that productivity in the U.S. advanced manufacturing sector is an estimated $226,071 per worker — more than twice the productivity of a worker in non-advanced manufacturing ($106,143).

Higher worker productivity is typically associated with higher wages and educational attainment (or higher skills training), and our data supports that assertion. In a non-advanced manufacturing plant there are approximately three workers with no more than a high school education for every worker holding a bachelor’s degree (or higher). In contrast, that ratio is nearly one to one (high school educated worker to bachelor degreed worker) in advanced manufacturing plants. However, even in an advanced manufacturing plant, one third of all workers typically hold only a high school degree (and an equal number have less than a four

year degree).

A Best-in-Class Example of *Company Training*

Let's look at *B. Braun Medical's* highly innovative program to train its existing workforce in the use and operation of the advanced manufacturing equipment that the company has been introducing to its Allentown, Pa., plant. B. Braun is one of the world's leading manufacturers of medical devices. Like many other manufacturers, managers at the Allentown plant noticed a skills gap in their existing workforce as increasingly sophisticated equipment was introduced into plant operations.

The company reviewed the key competencies that workers require in order to understand the theory of how the equipment works and the principles that govern line operations in an advanced manufacturing plant. These competencies include mechanical, electrical, hydraulic, and pneumatic functions. A *Progression Based System* ("PBS") was introduced to make sure that all employees receive basic training in each of these functional areas. The underlying strategy behind PBS is to train all workers in these core competencies, and then help the employee learn to apply this theoretical background to the operation, maintenance, and repair of equipment in the plant.

Training is divided into five levels: entry, basic, intermediate, comprehensive, advanced (with a master's level under development). The expectation is that each employee will advance to the comprehensive level. An estimated 90 percent of all current operations in the plant are covered at the comprehensive level. In other words, an employee completing the comprehensive level of training will possess the theoretical knowledge needed to understand (at the practical level) 90 percent of the plant's production operations.

Each level takes approximately one year to complete and training is done through a mix of company time and employee's time (depending on the current level of the employee). All training was initially provided by a local vocational school but has since been expanded to include the local community colleges as well. PBS has allowed B. Braun to retrain and upskill its employees, and the better skilled workforce has, in turn, helped the company reduce its operating and maintenance costs. The program is now being introduced to other B. Braun facilities in the United States.

The success of B. Braun's PBS program reflects, in part, upon its excellent relationship with the Lehigh Valley Workforce Investment Board (WIB). The WIB helped the company navigate different agencies; helped identify grants that offset some of the training costs associated with PBS; and put the company in close touch with the community's K-12 educational leaders. Educating guidance counselors, students, and parents at the high school level about opportunities in advanced manufacturing is an important part of the company's recruitment strategy.

Key to the program's success was its design around carefully researched training needs. Too often, training providers and companies rely on anecdotal evidence or ready-made solutions without first undertaking the careful data-driven analytics necessary to ensure strategic alignment among employees, managers, training providers, and other interested partners. This data-driven foundation, in turn, accelerates the process of engagement, articulation, program development, and effective implementation strategies. The B. Braun program is a best-in-class example of a company training its core workforce in the skills needed to succeed in an advanced manufacturing environment.

A Best-in-Class Example of *University Support*

The *National Institute for Aviation Research* (NIAR) at Wichita (Kansas) State University is a best-in-class example of a university supporting advanced manufacturing in its community by providing research and development services in key technological disciplines. From its inception in 1985, NIAR was organized to research and develop technologies identified by its industry advisory board (which is comprised of the vice presidents for engineering from many of the leading aviation and other advanced manufacturing companies in Wichita).

NIAR is organized around labs that operate as independent business units. Labs open and close under the direction of NIAR's advisory board, with each lab pursuing a specific technology identified by the board. This orientation around the research objectives of local industry (an industry-centric organizational approach) is quite different from the faculty-centric organizational approach found in many other offices of research and technology transfer (in which commercialization of faculty innovation is the primary objective).

Because each lab is self-funded, its research must be highly relevant to the advanced manufacturers whom it is organized to serve. Current labs, for example, are

organized around additive manufacturing, computational mechanics, composites and advanced materials, and more than a dozen other cutting-edge technologies. Large capital expenditures (for state-of-the-art equipment) are typically priced into research and certification testing projects done for private clients, although approximately 15 percent of NIAR's budget comes from the Kansas Aviation Research and Technology Growth Initiative. The university itself funds only a small amount of administrative overhead expense.

Higher worker productivity is typically associated with higher wages and educational attainment. One recent but not atypical success story involves *Airbus Americas*, a company with a large engineering presence in Wichita. NIAR's initial relationship with the company was to provide Airbus engineers with training in composites and advanced materials. The relationship has since been expanded to include full-scale structural testing in Wichita (the first time this is being done by the company at locations outside of Europe).

NIAR provides a best-in-class organizational model for university-business partnerships in advanced manufacturing. It has applicability to any community with a large research university and a cluster of companies with common research needs. It may also have applicability to communities seeking to leverage the technological expertise found on large military bases.

For example, one can easily imagine how (former) military personnel can be organized around technological competencies that are specific to the research and certification needs of military contractors (and civilian companies utilizing comparable technologies). The establishment of such a research institute in military communities might be an important first step in attracting the advanced manufacturing operations connected to the research and testing being conducted.

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The experiences of B. Braun and Wichita State University demonstrate that best-in-class practices to promote innovative advanced manufacturing cultures within a community do not happen in a vacuum. They involve strategic planning and effective partnership with public institutions. Educational institutions — ranging from K-12 right through advanced university research programs — have a vital role to play. This article profiled effective partnerships in

advanced manufacturing skills training and technological research and development. However, similar alignment is needed in energy, tax, and other regulatory arenas.

But one critical lesson learned from the B. Braun and NIAR experiences is that *best-in-class practices can only emerge when leading companies view local public partnerships as strategic and take the lead in making sure that their communities create environments that are supportive of advanced manufacturing.*

(Dan Levine is Practice Leader, Location Strategies and Economic Development, Oxford Economics, Inc.)