The CEO Perspective: Leadership Challenges for Manufacturers

written by admin | March 28, 2016

(Business, U.S. Manufacturing) Recently I came across the PriceWaterhouseCoopers Annual CEO Survey online and listened to several 3-6 minute videos about leadership challenges for manufacturers. The speakers talked about both new and old trends they are focused on as company leaders, with several that could apply to small and medium-sized manufacturers.

The top five leadership challenges included harnessing digital media, integrating diversity of the workforce, technology adoption in manufacturing, developing emerging markets and partnering.

Alex A. Molinzaroli, Chairman, President and CEO of Johnson Controls, Inc. spoke about deemphasizing North America and Europe, as growth lessens there, and expanding into emerging markets. A second theme was partnering to accelerate their growth, creating more co-dependency with suppliers and customers. Improving the diversity of their company is also top of mind and the CEO needs to relate to employees by being flexible and trusting people.

A second interview was with Rodney O'Neal, CEO and President of Delphi Automotive Systems LLC talking about how advanced car systems are today (did you know there are over 50 computers in cars today?) and what features we might expect in the near future through technology adoption. He discussed the idea that you can count on change, therefore the CEO has to connect the dots, listen to what the world is saying to create the vision, strategy and tactics for the company and decode the message.

Denise Morrison, President and CEO of Campbell Soup Company US talked about building purpose, a shift in demographics and the change in families that have affected their product lines, using eCommerce with retailers and their customers

and the growth of a middle class in emerging markets. As the millennial generation grows up, both as customers and employees, the company faces challenges in products and within their own culture they have to respond to.

Perhaps my favorite video was the interview with Alan Wilson, Chairman, President & CEO of McCormik & Company. He talked about this 125-year-old spice company learning best practices from other industries, dealing with cybersecurity, working with social networks for new product development and using lab robots to mix and identify origins and flavor notes. He also spoke to diversifying their workforce to leverage talent around the world and a natural curiosity that a CEO must have to be successful.

These are short, poignant videos that are interesting to listen to and not just because 3 of the 4 companies have been MEP clients. If you are interested in executing any of the concepts discussed in these videos around emerging markets, technology adoption, workforce development or supply chain partnering, contact your local MEP Center. They can help translate large company successes into success with your business.

Where Your Productivity Problem Is Hiding

written by admin | March 28, 2016

The farther we get from the production line, the less adept we are at managing productivity.

(IW – William Heitman: 3-10-16) A global auto parts manufacturer was introducing a new engine component and wanted to use more digital technology for its assembly

and packaging.

Its industrial engineers designed a full-scale prototype and proceeded to testing. Videos and other documentation ensured relentless scrutiny, fine-tuning and consistency.

The results were impressive: factory labor was cut by more than half.

Although the team's actions seemed instinctive, they followed a centuries-old "industrialization" process that balances three characteristics of effective work: *standardization, specialization of labor* and *management of worker autonomy*. As they would eventually learn—painfully—these characteristics apply to any work anywhere in the company.

For example, the new robotics required more rigorous levels of parts interchangeability. This required that existing standardization for parts be improved to levels measured in microns. Next, the work activities had to be redistributed among new machines and workers. The existing specialization of labor was redesigned. Job roles and tasks were restructured. Finally, the new robotic process required changes to the workers' traditional decision-making authority—their autonomy. A new schedule of worker decision authority was specified and managed as precisely as a parts list for inventory.

The goal of industrialization is to harmonize the operation of tangible capital—machinery—with intangible capital, especially human activity and know-how. Well-documented records of work methods allow businesses to convert the skills of individual workers, which are costs, into institutional knowledge, which is an asset.

This institutional knowledge is the company's "experience curve." It is a critical component of the intangible capital that accounts for a majority of the value of businesses today. It provides a formidable barrier to competitors. And, ideally, it advances in a never-ending march of increasing refinement.

Like any asset, however, the experience curve can be underused and its value wasted. Anything that reintroduces errors, ambiguity or variance undermines a

painstakingly developed experience curve.

Often this wasted value is the unintended consequence of an otherwise well-intentioned improvement. Call it "Virtuous Waste."

Unfortunately, a malfunctioning experience curve will not leak oil or flash a warning buzzer. This intangibility, plus the good intentions that inadvertently created the waste, means the symptoms will likely be overlooked and misinterpreted.

And that is precisely what happened a year later at the auto parts maker. Downtime had increased gradually and persistently. No one knew why. To investigate, engineers added a new digital entry station to each machine operator's station. The plan was for workers to enter the reasons for machine downtime directly into the plant control system.

In theory, this was an excellent idea. In practice, it only created a new problem: each digital station used a free-text entry field. No standardized directions, codes or drop-down menus were provided. This allowed each operator to describe a downtime root cause "using his own words." The result: an entry station at a single machine typically generated more than a thousand "falsely unique" descriptions.

In hindsight, the problem was obvious. The implementation of the digital entry stations ignored the three elements of industrialization: standardization, specialization of labor and management of worker autonomy. The solution was simple: integrate these elements into root cause identification.

The hard part was recognizing that the well-intentioned digital improvements had backfired. Virtuous Waste is difficult to spot and painful to acknowledge. It's a psychological problem, not a technical problem.

The improvement team worked quickly to industrialize. It discovered that many causes were merely identical problems worded differently. Fewer than a dozen causes accounted for three-quarters of the downtime. Standardized drop-down menus were added to the entry stations.

More than half of the newly standardized causes, however, involved operator error: misunderstanding the operating instructions, mistreating the equipment or

misdiagnosing the problem. Thus new rules to manage worker autonomy were needed. The plant changed workers' "decision rights" and introduced specialization of labor for diagnosis. An operator could enter simple causes. More complex causes required consultation between the operator and his supervisor. A third category required diagnostic tests prior to entry. All of this was documented on laminated cards mounted next to the entry stations.

Downtime was cut by three-quarters in eight months.

Want to find a treasure trove of Virtuous Waste improvements in your business, as this manufacturer did? Search beyond historically industrialized areas. Industrialization receives generous management attention when it involves the direct activities of production. Look at worker activities that are about production, that are one step removed from the line. Scrutinize them every bit as scrupulously.

(William Heitman is managing director at The Lab Consulting, which has been implementing non-technology business improvements since 1993. He holds an MBA from The Wharton School of the UofP.)

Where Does Smart Manufacturing Fit, on the Road to World-Class Manufacturing?

written by admin | March 28, 2016

Smart manufacturing is about the equipment telling us what will work better, not about us turning dials to tell the equipment what to do.

(IW – Andrew Waycott: 3-9-16) Smart Manufacturing is new to us. But World Class Manufacturing has been with us, at least in concept, since manufacturing began. It's only the definition that keeps changing.

In the late 1700s, General Jean Baptiste Vaquette de Gribeauval suggested that musket manufacturing might be faster and cheaper if muskets were made from … wait for it … interchangeable identical parts. What a concept!

Until then, each musket was made in full by a skilled machinist; each newly-created part had to be fashioned to fit the eccentricities of its previously-made counterpart. But by 1803, mass production with interchangeable parts had been achieved at Portsmouth, for the British Royal Navy. A new era of World Class Manufacturing (WCM) had begun.

Just as the French general's idea moved the standard of the day for WCM, so has Smart Manufacturing raised the bar today. What was not possible decades or even years ago is today increasingly necessary. Smart Manufacturing? It raises the bar, enables manufacturers to move further down the path to World Class Manufacturing.

The data tell the story

What is Smart Manufacturing? One could argue that it's technology-enabled manufacturing, but that begs the question of what 'technology' means. I think Smart Manufacturing takes a sharp turn away from what the equipment is doing, to what the equipment is telling us. It no longer focuses on us turning the dials in order to tell the equipment what to do. It's about the equipment telling us what will work better.

The data tell the story that's the endgame. But how do you get there? It depends where you are now.
Let's discuss two broad scenarios—for those with older machinery who've yet to set out on the path, and those who have already made a start.

Scenario 1: I've got a traditional factory and old machinery—now what?

One major boon for manufacturers with investments in aging but still operating machinery has been the plunging cost of sensors. Only two decades ago, it was a handful of bold early adopters who were willing to invest hundreds of thousands to

connect the sensors and controllers and analyze the results. Most, understandably, didn't.

Today, retrofitting sensors to older machinery is surprisingly doable. And because WCM is a journey rather than an event, it's possible to be successful adding one sensor at a time.
Start now.

Scenario 2: We collect digital data, we have a data historian – now what?

Maybe you've been collecting data electronically for years. The question is, what are you doing it for? And what do you do with it? Do you use it chiefly for record-keeping and compliance? Have you used it aggressively to, say, decrease downtime?

The greatest joy of digital data is the ability it gives you to objectively discover what warrants attention. To focus on what matters. Rather than noise.

This is increasingly true over the past 10 years. Sophisticated software has finally managed to catch up with the flood of data, find meaning, and, as times goes by, leverage that meaning. Find the critical bottlenecks where a new solution can make a real difference, and make that solution happen.

All scenarios: The path to Smart Manufacturing runs through MES

Smart Manufacturing starts with a Manufacturing Execution System (MES). That means:

- Collecting a broad array of data from your plant floor machinery,
- Analyzing the data to identify issues and money-saving opportunities—driving fundamental operational improvements,
- Shaping those insights into always-visible, actionable information for your line managers. These people need to know, at a glance, the single best thing they can be doing right now. All day long.

To raise the bar further: Smart Manufacturing also is about logistics and the supply chain. In theory, a Smart Manufacturer can receive an order for 100,000 parts and

automatically route that order to a number of plants in a range of locations, and have the order fulfilled in the most efficient way possible.

Today's reality

Not every operation will need to revamp and upgrade to attain the above giddy levels of digital automation. However, even the 'little guy down the road' will need to be able to fit into the advanced systems of his larger neighbor, in order to receive and fill his neighbor's outsourced orders.

Day by day, the world of manufacturing is getting Smarter … raising the bar on the road to World Class Manufacturing.

(Andrew Waycott is Chief Operating Officer and Chief Technology Officer, Factora)

Twisting the History of Steel Wire Rope

written by admin | March 28, 2016

(3/4/16 – Australian Mining) When it comes to productivity and progress, ingenuity is the backbone of the mining industry. Many will agree that mining activities have been the precursor to almost every significant technological development in our history. The period to which we attribute the most exponential growth in technology, the Industrial Revolution, owes everything to a few key inventions. The steam engine, the Bessemer Method and dynamite are often listed as the most important inventions of the modern age, but there is one other without which these things would not have had such remarkable impact on our lives.

At least, that's what occurred to me after I was invited to take a tour of the 120-year

old Wirerope Works factory site in Williamsport, Pennsylvania. As a rigger I had always appreciated the importance of steel wire rope to mining and to civil engineering, but despite this seemingly simple invention being part of every single day of my life working in the mining industry, I knew very little about how it is made, and even less about its history.

They say you should never visit the sausage factory, and that may be true, but the wilfully ignorant are not to be trusted, and steel wire rope is certainly a special type of sausage. It was a visit that put me through the emotional spectrum, from disinterested to bemused, to bewildered, and finally awed at the sheer scale of the operation. It's a little bit like when you find out where babies come from: Horrifying and weird to begin with, but before long you find yourself utterly fascinated…

Flexible steel wire rope has been one of the mainstays of heavy industry for more than a hundred years. Whether you want to lash down scaff planks, carry out lifting and cranage, use draglines for surface mining, or even pull down a massive statue of Saddam Hussein, wire rope has thousands of applications.

The Wirerope Works factory in Williamsport, Pennsylvania has a long history of producing this essential component of progress in the 20th century, and although cheaper imports from China and India continue to flood the market, the caretakers of the Bethlehem Wire Rope brand are still proud to produce a product of the highest quality on local labour and quality materials.

Based in Lycoming County in Pennsylvania, Wirerope Works (WRW) began its life as the Morrison Patent Wire Rope Company in 1886. The original mill was built upstream on the banks of the Susquehanna River to service the softwood logging industry, however regular flooding led to the relocation and inevitable expansion of the factory in the town of Williamsport.

The design and manufacture of steel wire rope was no longer in its infancy at that stage. The first practical use of steel rope in 1834 was credited to a German mining official named Wilhelm August Julius Albert, who worked at the Clausthal silver mines in Saxony.

Up until that point, all mining haulage was done with hemp fibre rope or chains. In the humid, damp conditions of an underground mine, moisture would cause the ropes to perish from rot, the gradual deterioration reducing their load bearing capacity, so they required frequent replacement.

Chains at that time were no better in terms of safety, as the Bessemer process for making steel was not invented until 1855. Iron chains lacked elasticity, but were also metallurgically inconsistent and therefore, unreliable. A single weak link could make a chain prone to catastrophic failure without warning, and there was no way of knowing which might be the weakest.

That first incarnation of modern steel wire rope was extremely effective for heavy haulage, and much more reliable than rope or chain. Albert Rope, as it came to be known, was a simple construction of three 3.5mm gauge wrought-iron wires, hand-wound into strands, with three or four of those strands wound into a single rope. However, Albert rope lacked the flexibility of rope or chain, meaning it couldn't be drawn through a pulley sheave, and its use stopped in the 1850s.

But the idea for wire rope had already caught on in England, where thinner wires were woven around a fibre core, with six of those strands woven around a central fibre core, resulting in a more flexible product. This design, as well as a mechanical system for its construction (called a strander), was patented by Robert Newall, who brought the new technology to America, and the boom-time economy of the California Gold Rush.

However, it was in Pennsylvania where a German-born engineer and surveyor named John Roebling began to develop ropes which were entirely constructed of wire. Roebling used a 6/19 construction (6 strands; 19 wires per strand). A strand built of 19 wires of the same gauge resulted in a hexagonal profile, and desiring a round shape Roebling conceived of using three different gauges of wire to achieve that result. The effect of this was to reduce the space inside the rope, tightly packing

the wires together, which gave the rope greater stability under load.

With massive demand for coal haulage in Pennsylvania, as well as cable car applications for public transportation, and most importantly civil engineering projects to service, Roebling set up a wire rope factory in 1849 in Trenton, New Jersey. But he wasn't the first to invest in a factory like that: Other people had the same idea, and wire rope mills were starting to pop up around the United States. In only 14 years wire rope had gone from a hand-made experiment in a German silver mine, to a globally recognised tool of industry with high demand for scaled-up production.

If Roebling had any hubris about cashing in on this amazing new invention, you could be forgiven for thinking it was a little dampened when his arm and shoulder were horrifically mangled in an accident with one of his stranding machines. But it would seem that Roebling's interest in wire rope was not strictly for profit, however, as he had for some time harboured a bit of an obsession with sketching suspension bridges. He was a big fan of the expansionist philosophy of Manifest Destiny, and had been very keen on establishing a utopian settlement called Germania (now the town of Saxonburg), where people like him trying to escape the brutal oppression of post-Prussian War Europe could be free to make sauerkraut and smoked pork products, unmolested by the authorities.

As luck would have it, farming cabbages didn't really agree with Roebling. He had studied in Berlin under the best academics in engineering, architecture, bridge construction, and hydraulics that Germany had to offer. Roebling was a very gifted individual, recognised at a young age as he grew up in Mühlhausen in Saxony, only 100 kilometres from the silver mines of Clausthal.

But Roebling recovered from his injuries, his factory continued to produce wire rope, and he designed and built a number of suspension bridges using his own product right up until he began design work for the Brooklyn Bridge. Unfortunately, Roebling managed to get his foot crushed by a ferry while standing on a dock trying to work out where the bridge should go. He died of tetanus 24 days later, but his son Washington went on to complete the Brooklyn Bridge project, while his son Charles would invent an 80 tonne wire rope machine.

By 1886, the year the Brooklyn Bridge was opened, a venture like setting up a wire rope factory in Pennsylvania was not at all a bad way to invest $100,000 (probably about $US3 million today), and that is precisely what three businessmen from Williamsport did.

Morrison Patent was changed to the Williamsport Wire Rope Company in 1888, manufacturing steel and galvanised wire rope “from one-eighth of an inch to two and one-half inches in diameter, and any length up to two miles in one continuous piece”, according to an 1892 history of Lycoming County.

The move to the Williamsport site set the company up for a period of charged innovation and growth, fed by the demand for haulage in Lycoming County’s massive lumber and coal mining industries. Williamsport was known as the “Lumber Capital of the World” and laid claim to having more millionaire residents per capita than anywhere else in the world.

The lumber boom in Lycoming peaked in 1891, and the neighbouring Indiana County saw a coal-mining boom start in 1900, so the industrial economy was perfect for the growth of the Williamsport rope mill. A new wire mill was built in 1916, and the current rope mill was built in 1928, which was pretty poor timing considering the Great Depression would start the next year.

By the time the Great Depression ended in 1939, the company was ripe for purchase by Bethlehem Steel, which renamed it the Bethlehem Steel Wire Rope division.

By 2004, the Williamsport site had been bought and sold a number of times, changing company names like a serial divorcee, acquiring assets from other defunct companies such as Roebling Wire Rope (the company started by John Roebling in 1849) but always keeping the Bethlehem Wire Rope brand, which became synonymous with top quality steel cable, and is still proudly emblazoned on their rope spools to this day.

In 2002 Williamsport Wirerope Works bought out the bankrupt Paulsen Wire Rope, a rope mill located in nearby Sunbury, and continued to produce under the Paulsen name. But by 2003 the company was also in financial strife, and the management

were looking for another buyer who could bail out the company and keep the 600,000 square foot Bethlehem factory running.

The US wire rope manufacturing industry had changed dramatically over the course of 100 years. From an exciting new industry that would allow explosive growth in the productivity of coal mining through the development of dragline surface mining operations in the early 20th century, as well as enabling some of the biggest civil engineering projects ever seen since the Pyramids of Giza, the US stable of 27 wire rope companies had been consolidated down to just three names: Bridon, WireCo, and Bethlehem.

Bridon is another Pennsylvania company, based 100 kilometres away in Wilkes-Barre. Unlike Williamsport which remained a local manufacturer, Bridon expanded rapidly, acquiring other wire rope companies and branching out across the world, developing into a massive, multinational conglomerate, as did WireCo Worldgroup.

With two global entities for domestic competition, Bethlehem also faced increasing pressure from low-cost offshore wire rope producers in countries like China, Korea and India.

Present executive vice-president Lamar J Richards remembers circumstances were looking grim for the Bethlehem brand and for the local employees, with a bid for takeover by Pennsylvania, USA and world market rival WireCo Worldgroup in late 2003.

“Instructions from the ownership at the time were, because we were about to be bought by a competitor we really weren’t going to be making wire, so we had to get rid of all the raw material, the rod, our starting point for the wire,” he said.

“Being the industrial little guys that we are, we removed several thousand tonnes of rod, so at the end of 2003 we only had one pack, two tonnes left. We would normally have 2000 tonnes in stock.

“We were later informed by our assessor that the deal probably wasn’t going to go through, and then our sole rod supplier went out of business in November. We didn’t really have any credence with any other suppliers, and availability was extremely

tight, there was a rod shortage.

“So in that environment, there was an effort by local people to see if they could put together a coalition to buy the company and keep the manufacturing here in Williamsport. The concern was that with a competitor buying we would ultimately be folded up and moved.”

And it was in this environment that local businessman Tom Saltsgiver, owner of a successful modular housing manufacturing plant, started to consider the prospect of buying an ailing historic business of significant value to the local economy, and decided to accept an invitation to take a tour of the Bethlehem plant.

But I didn’t know any of those things when I found myself standing, probably in the same spot as Mr Saltsgiver did when starting his tour, right there in the foyer of the single largest wire rope manufacturing facility in North America on a muggy Thursday morning. I had arrived at the factory with a junket of assorted journalists, exhausted from touring a gamut of other factories and fighting off a particularly vicious head cold, quite oblivious to the fact that our tour bus had, having dropped us off, already left with my camera bag still on board. Perhaps one could have forgiven me for being a little out of sorts at first. But not for long…

Walking into the front offices of Wirerope Works on Maynard Street, it’s clear there’s pride in the product here. Foot-long samples of rope in varying configurations and gauges lie on polished timber plinths in the foyer, cleaned of oil with sharp edges ground smooth for safe handling by visitors.

On the walls hang photographs of major construction projects which were supplied with Bethlehem brand wire rope: Madison Square Gardens, the restringing of the Brooklyn Bridge, the Niagara Falls tightrope.

Our hosts are all of a distinguished vintage, and they usher us into an opulent but small boardroom, resplendent in walnut lining (I’m later informed it’s faux timber) with a long table and large sumptuous leather chairs. I can tell they’re pretty excited to have us here. There’s a distinct chemistry between these guys, a lot of joking around and backhanded compliments: They’ve worked together for a long time.

Lamar J. Richards, the executive vice president of Wirerope Works, explains to us some of the history of the plant (see Australian Mining February 2016), but one of the most touching stories he tells us is about how the present owner, Tom Saltsgiver, came to buy the company and keep it alive for the sake of the local economy in Williamsport.

The owner of a successful modular housing manufacturing plant, Saltsgiver picked up the Bethlehem while it was in some very dire straits, and did so against the better advice of friends, family and colleagues, according to Richards.

“There was an effort by local people to see if they could put together a coalition to buy the company and keep the manufacturing here in Williamsport,” Richards said.

“The concern was that with a competitor buying there was a good chance we would ultimately be folded up and moved.

“In trying to put together that coalition [Saltsgiver] came in for a tour and went through the place, and then he indicated that he was interested in buying.

“He had the financial wherewithal to do that because the business he was in at the time was modular home building, and he had a plant about 20 miles from Williamsport.

“Back in 2003-4 housing growth was going great, and he had this financial business and he had the ability to get financing without any question.

“In the face of us being in a tough market, under the previous ownership we were undercapitalised. We didn’t have two pennies to rub together, and in the face of that our current owner stepped up, bought the place and put up working capital to keep the place running.”

Inability to secure raw materials meant many workers had to be laid off, and upon purchase the company called up 88 people to come back to their jobs.

About a year in from the purchase, Richards explains, Saltsgiver invited staff for a dinner with him and his wife.

“Our owner is extremely laid back, you would never think he was the owner of companies, or that he’s a multi-millionaire,” Richards said.

“So we go to this dinner, and my predecessor asked Tom to get up and say a few words, so he gets up and he says, ‘So I guess you folks would like to know why I bought this place?’ and we all sat there and said ‘Yes sir, we would’.”

So Saltsgiver tells the story: “Well, when I was looking at it to buy it, all my friends in the area who knew about the business said, ‘Don’t even think about it, don’t even think about it, it’s a bad deal’.”

“My financial advisors all looked at it and said that’s a disaster, don’t touch it.

“And my family, they said, ‘We don’t know anything about the steel business, don’t do it, we know modular homes we’ve made a good living doing that, don’t throw your money away here’.”

Richards said thus far it looked like three strikes, and surely that would have been the end of it for the prospective buyer, but he continues: “and this stuns me to this day, because he said ‘I prayed about it, I felt that God had answered my prayer and told me to proceed’.”

As it turned out, the newly renamed Wirerope Works became profitable after 18 months of capital support. Shortly after that, the housing bubble burst.

“It’s not often you’ll find an individual who’s willing to gamble millions of dollars based on his faith,” Richards said.

After this brief history lesson we are handed hardhats and earplugs and instructed that it will be very difficult to hear anything inside the factory. They weren’t wrong. Although the tour from that stage onward was sparse on information, I found myself going from a sense of bewilderment at the extreme conditions of the workplace to being strangely entranced with the manufacturing process.

One of the first things shown to us is the floor. The factory is tiled with timber bricks, grain pointing upward and creating a very unique effect where the timber had been polished by decades of wear. The timber floors are a result of

Williamsport's logging history, when wooden blocks were cheap and readily available in bulk. To this day when any flooring needs repairs or replacement, Wirerope Works still uses the original material. To walk on it is remarkably different from concrete, and where I can compare the two it is noticeably easier underfoot. Bear in mind the factory is 620,000 square feet, so a lot of what essentially was scrap lumber had been put to good use.

First we are shown the raw material: 4mm steel wire in loose looking coils about 6 foot across, lifted by forklifts and taken through to a hydrochloric acid bath which will strip off any contaminants. Having been battling a common cold for a few days, I didn't need to be told the fizzing pool before me was acid. Plumes of vapour were pouring off the bath, and before I could think of doing anything about it the congestion in my head loosened and poured down the back of my throat, and I suddenly I could breathe more clearly and easily than I had done for days! I realised it was the corrosive vapour that had cleared my head, and it might soon start to work on the tissues of my sinus. I tried to hold my breath while our host laughed and tried to explain, incoherently over the roar of the factory, the process of treating the raw material.

A small crane cabin with a lifting arm, fronted by glass and inhabited by a doleful looking man, ran back and forth along the length of the acid pool, picking up the large coils out of the bath and moving them down the line, gradually shuffling each one over the course of hours before they were considered clean enough to be taken for heat treatment in the furnace.

The operator did not wear any respirator or breathing apparatus, and I wondered if it were possible to build up a tolerance to acid fumes, or did it just slowly eat away at one's alveoli? He's still working here, I supposed.

We all back away from the deadly head-cold cure and are led to the furnace, where 12 of the washed coils are set up to feed wire through an oven blazing at 1000 degrees Celcius, only 360 degrees shy of melting point. I realise wearing my jacket, despite the cool Pennsylvania humidity, was not the smartest thing in the world to do and we walk past the contained inferno, pouring with sweat.

It's becoming amply clear to me that this is an extremely dangerous workplace, and

we continue to the other side of the furnace where the cherry glowing wires are fed down into a simmering oil bath for quenching.

We file past, only a couple of feet from the long vat of hellbroth with no rails or guards and I think to myself, 'this must be the single most dangerous thing I have ever stood near'. Having been a labourer and rigger for most of my adult life, I have certainly worked in some unsafe conditions, from high rise buildings with no fall arrest equipment to a uranium mine with no proper PPE, but even those experiences didn't seem to come close to standing next to this long vat of near-boiling oil. What would happen if one of us stumbled, reaching out for grip and finding only oil that could burn off a limb in seconds, or worse, what if one could fall in altogether! I reassured myself a victim of clumsiness would pass out almost instantly from the shock of the burn. Small comfort as we tried to stay as far away from the vat as possible, with a few feet of leeway for space.

Once cool enough, the wire passes through hydrochloric acid to wash off all traces of contaminant, and I hold my breath as we walk the length of the pool, our host taking deep breaths as if it were fresh spring air and not lung melting fumes, laughing as he watches the visitors squirm… Does he know something I don't? I sure hope so.

A coating of zinc phosphate, another rinse, and another final coating prepares the wire for extrusion, which has two key functions. The most obvious is for achieving the correct gauge of wire required for twisting into the various rope products, but extrusion also means the steel wire is stretched to align the structure of the steel to align in a single direction, which strengthens and increases the breaking strain of each wire.

However, the most important part of all of this is the stranding process, and here is where my reactions turn from shock to awe. As a rigger using steel wire rope on a daily basis for slinging, I had often wondered how the rope was produced, and here it was before my eyes: The factory floor – acres of it – was full of lines of planetary stranders, all with sets of wires in large bobbins, as many as 64 wires on a single machine, feeding into a single, oily strand of rope. The factory had machines of all sizes hard at work, furiously spinning to produce the some 1200 different combinations of wire rope that come out of the factory every three months.

The machines are clearly dangerous, spinning at a rate of knots. Later that evening I met a local teacher in a bar who tells me about a worker he knew of who was dragged into a strander and ripped to pieces. I didn't need to be told this was possible, it was obvious. But my sense for this hazardous workplace was quickly being replaced with a gripping fascination for the process.

We're led past rows and rows of finished product on massive timber spools printed with the Bethlehem logo and our guide Norm Szamocki, director of operations, screams at us that this is the product they affectionately refer to as "Tank Yank", their product which is used by the US military to kit out their M88 Hercules recovery vehicle, usually deployed for rescuing incapacitated tanks. This is the same machine and cable that helped the people of Iraq to drag down the Saddam Hussein statue in Firdos Square, Bagdad, an event in which the people who manufacture Bethlehem wire rope were proud to have a hand.

Finally, we come to the heart of the factory: We stand, astonished, gazing up at the 12 foot tall, 800 tonne closing machine, designed to produce the 7 inch rope for dragline boom pendants, and construction cable like that used to build the Brooklyn Bridge. The already huge strands are all dragged into a central point, slowly weaving the helical pattern of wires around a hefty centre rope into a single massive cable which will one day end up on a dragline somewhere in the world.

The whole process is mesmerising, and it occurs to me that this place is like a Disneyland or Mecca for riggers. It's a real privilege to see how this is product made, the effort that goes into ensuring the finest quality product is produced for a discerning market that eschews the cheaper overseas manufacturers.

With a history spanning 120 years, the Wirerope Works factory has seen plenty of hard times, but it's also had a lot of luck. With good leadership at the helm from the likes of Saltsgiver and Richards, and ongoing demand for steel wire rope, the old Williamsport factory could continue to produce its quality bespoke products for

another 120 years.

Technology is Changing Manufacturing – and the Workforce

written by admin | March 28, 2016

Technology is transforming manufacturing into something completely different from what it was 10 years ago — and is quickly changing the expectations for individual manufacturers and their workers.

(American Machinist – Nora Leary: 3-10-16) Manufacturing accounts for an impressive $2.17 trillion of the U.S. economy, and despite the common misconception manufacturing is expanding in the U.S. — up by over 27% since 2009. It's a segment of the overall economy that has seen its significant ups and downs over the years though, from offshoring to job cuts: manufacturing is influenced by major economic developments and broad international trends. The latest factor affecting manufacturing is technological change, and its various effects on individual manufacturing operations and on workforce demographics.

Many changes in the manufacturing industry have been driven by consumer demand. Consumers want things faster, more individualized, and newer than last year or even last quarter. Therefore, manufacturers have had to keep up with not only the demand for products but with finding skilled workers to make these products.

New and advanced manufacturing technologies have helped to better meet consumer demand. With the implementation of computerized maintenance management systems (CMMS), manufacturers have become significantly more efficient. CMMS tracks system maintenance, inspection, and breakdowns, reducing or eliminating the effects of disruptions.

Instead of manually tracking problems or changes on a piece of paper, a CMMS handles all of these tasks remotely, increasing productivity drastically. The benefits include fewer repairs, lower maintenance costs, streamlined workforce, and historical data and trend reports. All of these help to keep up with consumer demand.

The influence of the Internet of Things (IoT) and Big Data CMMS technology also connects devices remotely, allowing them to "talk to each other." The still-developing IoT establishes individual factories as sources of (and destinations for) information via the Internet, increasing the potential for automation and remote monitoring. Instead of a manual check, IoT allows control systems to be networked to each other, and essentially monitor each other's process.

With this connection, factories can easily collect and aggregate big data, or a mass of information concerning their systems. This information can be measured and analyzed to increase productivity and efficiency in a factory. IoT should help manufacturers to work better (getting products to the consumers faster), and it's also an aspect of the product consumers now demand.

Consumers now demand that products are intelligent, responsive, and connected, or in other words, "smart". Terms like "smart lighting", "connected cars", and "wearable technology" are all examples of how products are becoming more valuable to the buyer and user. Consumers use this type of technology to track a variety of aspects in their daily lives – from what they eat to how much they exercise, people are becoming more reliant on smart technology.

Products becoming "smart" means that manufacturers must be able to produce these technologies on a large scale – but also to keep up with technological evolution of such products as they are improved and personalized. Essentially, this changes not only the business model for manufacturers but also the skillsets for workers.

Smart products are not stand-alone objects; they are a service, too. Manufacturers become service providers, which links them closer to the consumer. Manufacturers must understand and meet consumer demand with these products, connecting with them on a more personal level.

These products are no longer simply the outcome of mass production; they require specialized talent to create and produce them on a large scale.

What's happening to the workforce?

As exciting as they are, these technological advances have profound effects on the manufacturing workforce. 80% of manufacturers say they have a moderate or serious shortage of qualified applicants for skilled or highly skilled positions. In the next decade it's expected that as many as 2 million manufacturing jobs will be unfulfilled due to this "skills gap."

For example, 3D printing is becoming cheaper, and it is taking less time and material to produce a complex design. These products will not require an assembly line, instead they will require a small number of product designers, programmers, and manufacturing engineers to produce shapes that may (or, may not) otherwise be producible in a factory system. It's easy to see how manufacturing is shifting its need for "blue collar" workforces to highly trained "white collar" professions as the technology advances and grows.

Considered on its own value and potential, the U.S manufacturing sector would be the ninth biggest economy in the world. But, looking at it another way, a study shows that the average U.S manufacturer is losing roughly 11% of its annual earnings due to the lack of talent. Now imagine this effect on the broader U.S economy — it makes a significant difference.

Manufacturers have been attempting to blunt the effect of what will happen if the skills gap isn't closed, and it's beginning to be noticed. A variety of ways to close the skills gap have been proposed: encouraging STEM studies in schools, changing the stigma surrounding manufacturing jobs, training internal workers to prepare them for more complex jobs, etc.

How that gap will be closed is still unknown. The most likely solution would be a combination of efforts and a shift of public opinion will prove successful.

What is known is how technology is converting manufacturing into something completely different than what it was 20, even 10, years ago. New manufacturing

workers are not only highly skilled, but highly paid, earning about 24% more annually than the average worker in the United States. Technology is helping to make these jobs more lucrative than before, and individual manufacturers must assess how to close the skills gap. It's important on a nationwide, industry-wide scale not only to track the progress of technology but to also find ways to keep up with the job demand.

(Nora Leary is the co-founder and head of marketing and business development for Launchway Media. Visit www.LaunchwayMedia.com)

MAPI Study Examines Productivity in U.S. Manufacturing

written by admin | March 28, 2016

Slowing growth in the computer and electronic products sub-sectors is being met with growth and investment in other areas.

(Industrial Equipment News: 3-10-16) A new study by the MAPI (Manufacturer's Alliance for Productivity & Innovation) Foundation analyzed productivity growth in a range of manufacturing sub-sectors over the past 25 years. The report provides statistical evidence relating to the importance of capital investment and educated labor on productivity performance.

In particular, the study looks for ways that manufacturers who have already invested in capital equipment can increase productivity and innovation. Produced by Cliff Waldman, director of economic studies at the MAPI Foundation, and sponsored by Rockwell Automation, the study presents evidence that innovation and capital investment play a significant role in driving multifactor productivity growth (i.e., output per unit of a combined set of inputs including labor, materials, and capital) in a wide range of manufacturing subsectors.

The MAPI study identifies capital investment as the mechanism by which productivity-enhancing innovation spreads through companies, supply chains, and the broad economy. “In the manufacturing sector, strong productivity performance is needed to meet the globally driven challenges of cost pressures and competitiveness,” Waldman observes. “For both manufacturing and the economy as a whole, the recent slowdown in productivity causes concern, because it contributes to both slow output and wage growth.”

The manufacturing sector has seen its pace of productivity growth slow over the last 15 years. As Waldman notes, part of this is due to slowing productivity growth in the computer and electronic products industry, which has played an out-sized role in driving manufacturing productivity growth in recent decades.

According to the study, industry sub-sectors that have experienced relative improvements in productivity performance since 1993 include machinery, transportation equipment and printing. But their growth has not been enough on an absolute basis to replace the decline in computer sub-sector productivity. Industries with a noticeable drop since 1993 in their relative pace of productivity growth include primary metals and petroleum and coal products.

The paper reveals strong cross-subsector correlations for both labor productivity growth and multi-factor productivity growth. The apparent interconnectedness of productivity performance across industries, says Waldman, is likely the result of supply chain linkages, innovation spillovers, cluster impacts and trade channels. Such evidence suggests that, where investments in any one industry lead to faster productivity growth, such expenditures can have impacts that extend to other sub-sectors as well.

Waldman concludes that a beneficial policy response must consist of a coordinated program that stimulates manufacturing equipment investment as well as innovation investment and increases the supply of educated labor in the broad economy.

The MAPI Foundation’s next study on productivity builds on this work and will reveal the findings of a national survey on technology and automation investment that was conducted to determine the drivers and pace of change in various manufacturing industries.

Executive Summary

Productivity growth in the computer and electronic products subsector, once the principal driver of productivity performance in the manufacturing sector, has experienced significant waning in recent years. Consequently, the U.S. manufacturing productivity outlook has become murky.

This is a challenging trend for our society, because increased productivity growth helps lift living standards. The good news is that empirical evidence put forth in this paper shows that innovation and capital investment play a key role in accelerating multifactor productivity growth (i.e., output per unit of a combined set of inputs including labor, materials, and capital) in a wide range of manufacturing industries.

I also find that the proportion of educated workers (B.A. degree and higher) in the manufacturing labor force is an important driver of labor productivity performance across a wide range of subsectors. The analysis suggests that focusing on boosting just one of these productivity catalysts would be less effective than focusing on multiple drivers.

A beneficial policy response must consist of a coordinated program that stimulates manufacturing equipment investment as well as innovation investment and increases the supply of educated labor in the broad economy. An optimal return on policy efforts requires public and private decision-makers to structure resource allocations in a manner that accounts for the likely linkages of productivity determination across manufacturing subsectors.

A complete copy of the study can be found here.

In the Rebalancing Global Supply

Chain, There's No 'Shore' Thing

written by admin | March 28, 2016
(Knowledge @ Wharton: 3-3-16)

Offshoring, reshoring, nearshoring — manufacturing and supply chains around the world are undergoing some seismic locational shifts, many of which the conventional wisdom did not see coming, and for reasons that may surprise you.

***Morris Cohen**, professor of operations, information and decisions at Wharton, and his colleague, Georgetown professor **Shiliang (John) Cui**, have been tracking those shifts for the past few years. They recently spoke with Knowledge@Wharton about their latest findings — and especially the counter-intuitive results.*

An edited transcript of the conversation appears below.

A Benchmarking Study

Morris Cohen: This is a benchmarking study dealing with the issue of the sourcing of manufacturing in a global supply chain network. As you know, most large companies today operate globally. They have factories all over the world. And in recent years, the last 10, 15 years, there have been major shifts in the locations where companies have sourced their production. In particular, there's been a major shift out of the developed economies, the U.S. in particular, to Asia — China in particular. This has, of course, led to a loss of millions of manufacturing jobs and a lot of consternation among the political classes and the commentators, and commentary as to how can we bring these jobs back? How can we revitalize our manufacturing sector? And this political season, these issues have not gone away. In fact, probably, the discussion has become even more heated.

The original purpose of the benchmark study was to gather, objectively, some empirically based information on what companies were actually doing. Not on stated intentions or not on predictions, but on actual decisions that were made.

Last time I was here, I discussed the first phase, which dealt with a benchmark study of about 50 global companies that were operating in China. And we talked

about the results we saw. Since that time, we did a second phase with about 75 companies that were much more globally dispersed. And we asked the same questions to see what their current set of decisions was, and what were the drivers of those decisions, what was the expected impact of those decisions.

"The drivers that are driving companies — particularly non-U.S. companies — to come to North America for manufacturing are market access and access to innovation, not for low labor costs."–Morris Cohen

Shifting Production

Cohen: Well, in phase one that is true: We did not observe too much of this reshoring or shifting of production into North America, or the U.S. in particular. In phase two, which had a bigger sample, and a much more diverse set of companies, we actually saw a significant amount of shifting production — I have to be careful — not "back," but into the U.S. What was surprising was where it was coming from. It was not coming from U.S.-based companies, *it was coming from Europe-based and Asia-based companies*. So they are shifting production into the U.S. Not so much American companies. Do you want to add to that, John?

John Cui: Yes. The statement Morris just gave was entirely correct. Part of the reason that we did not observe similar results in phase one was because the respondents that we had in phase one were Chinese divisions of global companies. So they may not have given us the complete picture of the companies' movement. But when we got to phase two, which involves a lot of U.S. and global companies' headquarters, we were able to identify this unique shift of non-U.S. companies entering the U.S.

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Decision Drivers

Cohen: As part of our study we ask companies, why are you making these decisions? What are the drivers of those decisions? And the drivers that are driving companies — particularly non-U.S. companies — to come to North America for manufacturing are market access and access to innovation, not for low labor costs, obviously. This is one of the biggest markets in the world, still — if not the biggest. But I should also

say that those are the same reasons that a lot of companies continue to go to China — not for low labor costs, but for access to its huge and growing market.

That raises another point: There was no dominant pattern in what we saw. We saw a very complex set of flows of manufacturing from one location to another. We call that "rebalancing of production." We also saw what we call "reloading of production," where some companies would increase their capacity in their domestic country, but not necessarily shift to another market.

"It had been perceived as a one-way flow — a 'your loss is my gain' type of thing. But now we see two-way streets. We see movement in both directions."–Morris Cohen

So to answer your question, I don't know if we have a definitive answer as to why we saw that. But clearly, they claim market access and innovation are what's driving them to this country. You might argue that the U.S. companies already have that access to the market, and therefore the incremental benefit to them is not as great.

Cui: Yes, I totally agree. We thought that that could explain why the U.S. companies do not benefit as much as foreign companies entering the market. Also, I agree with Morris that cost is no longer the single dominant factor that firms consider when making those reshoring decisions. It used to be dictating their decisions, but these days, we observe much more complexity in their decision-making, and in terms of the outcomes that we observed.

Surprising Conclusions

Cohen: I think that there were a couple of things that we saw in the second phase that reinforced what we saw in the first phase. I think I had already mentioned that there was no one dominant reason, there was not one dominant flow. There seems to be a complex trade-off analysis that companies are undergoing. What's really interesting to us is that this is pervasive. We are in the midst of a major restructuring of global supply chains. In region after region, company after company, companies are asking the questions: Do we have the right structure? Do we have the right sourcing locations? Are we bringing our product to market in the most effective way? And they're oftentimes shifting capacity, changing the way in

which they produce products, adding technology.

For example, technology and R&D — across the board, everybody's invested in this. So I think that we're in the midst of a period of flux, of change, which is redefining the way the world produces its products.

Two-Way Streets

Cohen: [Offshoring] had been perceived as a one-way flow — a "your loss is my gain" type of thing. But now we see two-way streets. We see movement in both directions. And that's why we call it a rebalancing, which is one of the dominant modes. A lot of companies are making multiple decisions — sometimes offsetting decisions — to gain access to developing economies and their markets, to gain access to their labor, to their suppliers.

So there is no one way to go. But there is a lot of shifting back and forth.

'The Biggest Flow Was Still *Into* China'

Cui: We found that companies — European companies and non-Chinese companies — are moving to China for market reasons. China is growing to be the largest market in the world. But at the same time, we also observed companies moving out of China, not for market reasons, but this time for cost reasons. For example, in the apparel industry, there were a lot of companies moving out of China and going to South Asia countries like Vietnam, Bangladesh — countries that have even lower costs than China. So I just found it amazing that companies are going in and are going out of China for different reasons.

Cohen: Let me add that what we saw in phase two, consistent with phase one, is that the biggest flow was still *into* China. Even now, in spite of the rising labor costs, in front of the fact that some companies in China are moving out of China, if we asked, "Where are you going, what are you doing?" the biggest observed flow was companies moving into China. Oftentimes, Chinese companies were expanding within China — we call that reloading — or foreign companies were moving into China. That was still the most popular decision.…

"What's really interesting to us is that this is pervasive. We are in the midst

of a major restructuring of global supply chains."–Morris Cohen

Another thing that we saw very pronouncedly in phase two was that quality was a positive reason to go into China, not a negative.

At some stage, years back, one might have said, "Oh, if you leave the U.S. and go to Asia, you may have quality problems." But certainly that has not been true in Japan for a long time. And it seems to not be a problem in China. High-quality, complex products — not necessarily labor intensive, but complicated products — are being produced in China at very high quality.

The U.S. and Europe

Cohen: Now, Europe is a very interesting point. In both studies — and I think even more in the second study — Western Europe was the one place that we saw a decline, shifting production. In North America, there was actually stuff coming in from other places. If we add it up, all over the world, we're gaining. Not at a great speed, but we are gaining ground or recovering…. But Europe is a net loss — except, of course, for Eastern Europe and Russia, which is perceived to be a nearshoring location, just as Mexico is to the U.S. So they're gaining, but Western Europe is declining.

'The Global Economy Is Not Flat'

Cohen: I'd say that the global economy is not flat, that there are many possibilities and many opportunities. One thing in particular that we should bear in mind is that *there are opportunities in this country to grow our manufacturing and to grow our economy*. It may be based on innovation, it may be based on different types of technology, but we should recognize that the world will come to our door *as long as we manage that process correctly*.

Boosting Productivity Today with Tomorrow's Technologies

written by admin | March 28, 2016

While technology conversations frequently have a future focus, plenty of manufacturing companies are using the IoT, Big Data and more to reimagine the workforce of the present.

(IW – Jill Jusko: 2-29-16) Big data. The Internet of Things. Smart devices. Advanced robotics. The manufacturing world is abuzz with the promises of increased productivity, better information and improved margins at the metaphorical hands of these technological advances.

However, two things often are missing from these conversations, and one is the element of time. While much of the conversation is about the future benefits of these technologies, the truth is the future is now, at least in part. Manufacturers are deploying these advanced technologies today, and their use will only continue to grow. Pratt & Whitney, for example, has big plans for Big Data. Yet its benefits have already been proving instructive for years.

The second element perhaps missing in these conversations is enough detail about the human element. How does the introduction of these advanced technologies – and many more — change the workforce's relationship with manufacturing? How do they build a better workforce, as well as a better workplace?

Ed Rodden of food processor SugarCreek can tell you that connected devices will aid in building a safer workplace. Japan's Denso believes in IoT's potential to augment employee involvement in continuous improvement. And General Electric talks about robots in terms of partners. In short, these new technologies are reimagining the workforce's relationship with manufacturing and will continue to do so.

Communicate and Connect

Like many companies, SugarCreek keeps its eye on building a better enterprise. Recently the food processor began production at its newest manufacturing plant in

pursuit of that aim. The 418,000-square-foot facility, located in Cambridge City, Ind., is noteworthy on several fronts. One, it is nearly four times larger than any of SugarCreek's five other locations. Two, three high-volume cooking cells, including what the company says is the nation's largest sous vide line, will allow SugarCreek to compete in food categories it couldn't previously. And three, it's been developed to take advantage of advances in technology, including the Internet of Things and collaborative technologies.

"The IoT … is a bit of a buzzword as many companies, including manufacturing operations, have been connecting things for many years. What's different today is the enormous variety and numbers of 'things' being connected," says Rodden, SugarCreek CIO. "At [Cambridge City] we built our network to maximize the ease and opportunity of connecting things."

"For us, the most important things to connect are people, as collaboration, in all of its forms, is a key driver to success," he says.

Rodden's words aren't so different from those of Koji Arima, president and CEO of Japan's Denso Corp. In remarks at several events, including the 2015 Frankfurt Motor Show, Arima discussed how the auto supplier would build momentum. He, too, takes a human approach to IoT. "The key is people. The operating principle is to achieve sustainable momentum by getting everyone involved in making continual improvements and in achieving breakthrough innovations," he said, according to a press conference transcript.

Importantly, "A crucial dynamic is the cyber linkage of the Internet of Things. That linkage integrates the motivated people at our production workplaces around the world. Everyone shares information in real time, as if they were all working under the same roof. That speeds our progress in transforming production processes and in transforming products," he added.

Arima describes the cyber linkage as "synergistic." "Our production workplaces invigorate each other in a virtuous circle of problem finding and problem solving."

The Denso CEO noted that Denso has 150,000 pieces of equipment on 2,500 production lines at 130 plants. They are not all integrated in the desired single,

global production platform — yet. The company's goal is to complete that in the next few years.

Connections at SugarCreek's Cambridge City location include a network that supports internal collaboration via a wide variety of devices, from tablets, telephones and applications like Cisco's Jabber, which allows instant messaging and video conferencing among those devices, to external collaboration with vendors who can remotely yet securely access and diagnose machinery. Process sensors and machine data are connected to the network, via both wired and wireless fashions.

Video cameras are used extensively in SugarCreek's operations and on its networks. Approximately 250 high-definition cameras at the Cambridge City facility assist in the safety of people and food, and also provide a wealth of analytics. "We are using video software to look for objects that don't belong in a product stream, or for the presence of people in areas they should not be in," Rodden says.

And speaking of safety, the CIO said the company is preparing to implement RTLS, or real time location services. Specifically, SugarCreek will place "tags" in the bump caps everyone must wear at the facility. These tags will track the location of all personnel in real time. It's being done primarily for safety purposes, Rodden says, and in a video he describes an evacuation scenario in which everyone's location can be accounted for.

That said, "it will also allow us to evaluate job designs and gain a much deeper understanding of where labor hours are being consumed," he says.

Pratt & Whitney's Big Data Play

As you can well imagine, Pratt & Whitney is no newcomer to big data. The aircraft engine manufacturer, a United Technologies company, has more than 10,500 engines in service and it has been capturing and analyzing data associated with those engines for decades. But where once upon a time—data storage and computing power being what it was—only several hundred parameters could be analyzed, today that number has grown to thousands of parameters. And Pratt & Whitney says its aftermarket efforts, engine maintenance specifically, will be better for it.

Big data, the company says, will allow it to enhance its ability to predict not only when and what type of maintenance is required, but also how a wide variety of factors impact engine performance. “It’s not just about the maintenance. It’s really [about] optimizing the operation for the customer,” explains Eva Azoulay, vice president for Pratt & Whitney’s Engine Services business, which manages maintenance contracts for a variety of airlines and other customers. “Their focus is to keep the engine flying. So, to the extent that I can plan [maintenance] … and to the extent that I can mitigate the number of times it has to come off for maintenance without putting at risk the reliability, that’s our goal.”

Two contributing factors to the heightened expectations are a new product and a new analysis and modeling tool. The product is Pratt & Whitney’s Geared Turbofan family of engines, which recently entered service equipped, right from the start, with far more sensors than older models and therefore able to monitor a broader view of engine performance as well as performance by specific components. And its historical record will be complete.

The new modeling and analysis tool is an initiative launched approximately 18 months ago. Collecting more data is one thing, but how you use that data is the important thing. Pratt & Whitney is using the tool to build a better predictive model, using data collected over time from the engines, as well as actual maintenance records. If you’re curious about how nitty and gritty the data can get, consider that Pratt & Whitney will be able to analyze the impact geography, pollutants and even specific airports have on engine performance, and optimize maintenance practices using that knowledge.

Azoulay says the predictive model will continue to evolve as the breadth and amount of data grow, and analytics helps connect the dots among factors that impact engine performance. Today’s model is basic, she admits. “Are we going to have a better one tomorrow? Absolutely,” she says. “We’re investing on the product, on the integration and on this analytical capability. And we’re not doing it alone—we have a third-party like IBM, we have universities, we have our own United Technologies Research Center. We’re going to pull on all that capability to help refine … the analytical piece because otherwise it’s just a lot of data and it’s not telling us anything.”

General Electric: Robots as Partners

John Lizzi, manager of the Distributed Intelligent Systems Lab at General Electric, believes robotics has reached an inflection point, comparable in some respects to that of personal computing in the early 1980s. Then it was Steve Jobs, Bill Gates and others who took computing – which had long existed – and transformed it into the ubiquitous tool it remains today. Similarly, he notes, robotics has existed for a long time in manufacturing – primarily caged and offering benefits of high speed and high precision – but a confluence of trends, including cheaper sensors and improved computing power, is changing robotics traditional role.

"The number of applications, the number of use cases where we can start thinking about applying robotics expanded significantly in the last five years, and I think that's just going to continue in a significant way moving forward."

For example, consider Stinger, the swimming robot developed by GE Hitachi. Unlike humans, Stinger can swim in the reactor pool of a nuclear power plant. During scheduled refueling and inspection outages, Stinger is being used to conduct maintenance inspections and perform basic cleaning tasks, while its human operator remotely guides its action from a safe distance away. Similarly, Lizzi points to crawling robots that are inspecting pipes, others that skim the sea floor to examine cables and still others that crawl inside gas turbines to assess and repair. GE's own maintenance service operations are employing robots' unique capabilities.

Also in the mix of emerging robot trends are collaborative robots like Rethink Robotics' Baxter, designed to operate safely with humans on a production line and trainable to perform a host of tasks.

"We [at GE] believe that robotics are going to be partners that we rely on in very much the same way we rely on our smart phones," Lizzi says.

Advanced technologies are both the present and the future of manufacturing, in the field, on the shop floor and across the enterprise. Notes SugarCreek's Rodden: *"Technology is and should be an enabler of people inside the workplace and out."*

How to profit from Open Innovation

written by admin | March 28, 2016

Any conversation on business competitiveness begins and ends with a discussion on innovation, a practice defined as "the fusion of invention and commercialization."

(The Economist – Kate Rodriguez: 2-23-16) There are three general types of innovation – incremental, radical and open. Of the three, *open innovation (OI) appears best-suited for the fierce global competition among firms of all sizes as innovation cycles shorten.*

Open innovation refers to the practice of looking outside of your organization for ideas and technology to accelerate and improve business solutions. Formally conceptualized by Henry Chesbrough, the methodology is gaining a foothold in entrepreneurially-minded corporations even as it challenges organizational cultures.

How open innovation works

In a perfect OI world, new products, services and business models are produced faster and better through collaboration among company stakeholders, startups and universities. Why? Because "companies recognize that not all of the smart people work for them, and in-house R&D labs can't create all the innovation necessary to stay competitive," explains Morse. So, they bring their experience and ideas together in mutually beneficial partnerships.

First, large companies identify startups whose technology matches their needs and become their first customers. Then, they invest further to ensure supply. University R&D centres receive sponsorship for their research activities, and larger firms maintain their competitive advantage by getting new inventions to market faster: "continuous innovation is not an option, it is imperative to success," he stresses.

Keywords in OI are "inflows" and "outflows", referring to the direction that ideas and technology move. Firms incorporate knowledge and inventions from outside

sources into their innovation processes. Any ideas or developments that are not utilized, however, flow back outside for other organizations to take up, sometimes through joint ventures, licensing or spin offs.

Any company with ambition and global potential can benefit from OI

L Brands, owner of the Victoria's Secret and La Senza labels, for instance, collaborated with Mast Industries to revamp production, using Mast's deep expertise in rapid sourcing, manufacturing and logistics. L Brands ended up acquiring the company as Mast Global.

How do these disparate parties find each other for open innovation collaboration? That's a growing industry in itself. Consultancies now specialize in identifying and bringing partners together, and some large companies have in-house scouts, typically company veterans who know the products well and have easy access to the CEO.

Global players like GE and Lego have created their own platforms whereby anyone can share new product ideas, and the company supports implementation of the winning ones. University and government research centers like MIT's Startup Exchange, Startup NASA and UnternehmerTUM in Munich provide places for innovators to connect. Well-known entrepreneurs and networking aficionados like Morse also play a role. "Big companies don't know how to find those small companies, so they call me and people like me," he explains.

How to organize for an OI environment

Understandably, OI represents for most companies an entirely new way of developing products, and the culture change can be hard. Leadership makes the difference, Morse emphasizes: "All companies that are doing well with open innovation have made the decision from the top." Driving strategic innovation from the C-suite is crucial, he believes, in order to "prevent middle-management from watering down programs." Also important is the recognition at all levels that failure is inherent to the process of invention and should be seen as part of the learning curve.

Training for the shift

ESADE's open innovation program in Barcelona hosts 40 to 50 students each session for an intense five days — two days on OI methodology, two days on sales strategy and elevator pitching, and a wrap-up day of presenting business plans to juries of experienced entrepreneurs and innovators.

Morse considers the sales strategy part critical to the success of innovation as "commercialization is all about sales and acquiring customers." In his research at MIT, his team found that building the right sales model was actually a better determinant of corporate success than technology. "Pitching is key" to getting your ideas accepted throughout the innovation process, he adds. Morse and other course leaders – including Chesbrough, the "father" of OI – draw on exclusively European company case studies, and require students to prepare and deliver a pitch on a business idea. Most of the participants are executives in established companies in Europe and Asia.

Harvard Business School's Leading Product Innovation teaches participants to bring flexibility into the product development process, including OI methodology. Participants in The Innovative Organization program at Berkeley learn strategies to develop an innovative business culture within their organizations while receiving plenty of real-world open innovation examples from Silicon Valley. Finally, the joint MIT/IMD course Driving Strategic Innovation is similar to ESADE's minus the pitching element and engagement with real-world executives.

As revolutionary as it is, OI is not set to overtake other innovation methods. Morse is quick to acknowledge that *it is but one of the tools companies can use*, and that most should be pursuing innovation on several parallel tracks. A leader's job is "to consider alternatives, make investments and remember that it's all about people," adds Morse.

Corporate leaders who have not yet taken a close look at open innovation might want to start if they wish to keep their organizations out in front.

(Kate Rodriguez is a former senior career search researcher and government analyst who covers career development and higher education marketing for The Economist

Careers Network.)

“What’s So Cool About Manufacturing? Everything!”

written by admin | March 28, 2016

(Manufacturing Innovation Blog 3/4/16) As said by one of the students interviewed on her participation in the 3rd annual What’s So Cool About Manufacturing Student Video Contest in the Lehigh Valley (PA). I had the privilege to attend the awards ceremony of this awesome event ‘dreamed up’ by the Manufacturers Resource Center (MRC), the MEP affiliate in the Lehigh Valley region of Pennsylvania, held on February 23, 2016 with 800 people in attendance.

Jack Pfunder, President of MRC, and his team started this contest 3 years ago as an opportunity to expose middle school students to the wonders of manufacturing in their own back yard. As the Dream It, Do It lead for the state of Pennsylvania, MRC was wrestling with the talent pipeline issues faced by many manufacturers across the country. How do we excite the next generation of talented students to consider careers in this industry?

The Lehigh Valley has a wonderful network of Career and Technical High Schools with solid programs available for manufacturing careers, but they need to excite 7th and 8th graders to enroll. And of course parents need to get the message also that

there are many companies in their community looking for talented and smart ‘kids’ to take on the challenge of helping them grow their businesses. With a few dollars from local philanthropy, and a few companies willing to open their doors to teams of 7th and 8th graders and their video cameras, the first 10 teams of students, with teacher coaches, piloted this innovative program. Student teams learn about the company, its manufacturing process, and the jobs required and then they plan and “shoot” their footage to compete for the title of Coolest Video. Who votes? The community. With ads, billboards, and social media, the community is guided to a website hosting the videos, where they can vote for their favorite.

This year, there were 30 student teams matched with 30 manufacturing companies. Over 117,000 people throughout the Lehigh Valley viewed the videos and voted! The diverse teams of 4-8 students learned about local manufacturers with diverse products such as Peeps, guitars, electronic controls, polymer processing, pharmaceuticals, cranberry juice and trucks.

As I wandered through the awards celebration event that had displays from the sponsoring companies, I heard so many kudos to the team at MRC and how much they enjoyed participating. Participating company representatives shared with me their challenges in attracting high quality applicants for their workforce. Many are smaller organizations that are not well known, even in their own communities. They told me how much they enjoyed showcasing their companies and their enthusiasm for manufacturing with the students. Some are already seeing an improvement in their recruiting outcomes!

Talking with students and parents, many shared comments that before these past few years of the contest, they didn’t know many of these companies existed, and

thought manufacturing was not a large component of the region. They know better now! And are glad they could participate.

Check out the videos at www.DreamitdoitPA.com to see just how cool manufacturing really is!