The New Manufacturing, Technology and Skill Shortages

Jerry Jasinowski
The Hardwood Manufacturers Association
Nashville, TN
March 26, 2015

I am here today to talk to you about the issue of human capital: the magnitude of the skills shortage problem, what's caused it, and how to find and retain the skilled workers you need. I'll turn to the skills shortage issue in a bit, but I think I need to put it into full context. To do that I need to talk about the major economic and technology changes impacting manufacturing, including the Hardwood Manufacturing Association.

The major factors impacting the Hardwood Manufacturing sector are the macroeconomic environment, government policy and related uncertainty, the exponential change technology is bringing to manufacturing, and of course the skills shortages you face.

Beware the Soaring Dollar

While I know you'll be getting a full economic review tomorrow, I wanted to highlight the adverse impact the soaring dollar is having on the global economy, emerging markets, U.S exports in manufacturing, and of course the price of commodities from oil to lumber. I highlighted this problem in an article I wrote for the Huffington Post last week.

While manufacturing is in recovery and has added 700,000 jobs, that recovery is threatened by the soaring dollar which has risen 18% in just the last 6 months. That makes U.S exports more expensive, it lowers prices of commodities that are denominated in dollars, it places emerging markets at a competitive disadvantage, and it creates a general credit squeeze. The U.S. economy could show economic growth of only about 1% in the first quarter, partly because of the poor weather, partly because of slow growth abroad, but also because of the rising dollar and slowing exports.

The rising dollar is a threat to the global recovery and that is why the Fed began to talk the dollar down in its comments last week and will not raise interest rates until end of this year at the earliest. Hopefully, the Fed's reluctance to raise interest rates at this time, the quantitative easing that's taking place in Japan, and the European massive injection of liquidity, is likely to keep the dollar from rising further. Assuming the dollar can be kept at bay, we can probably get back on a 3% growth path in the second half of 2015. The February housing numbers showing at 7.8% increase is an indication that the economy is picking up steam.

But this is probably a good place to emphasize that the President and Congress ought to move forward with a trade agreement that expands U.S. exports, opens international markets where appropriate, and provides proper regulation and labeling of products in international trade, including Hardwood products. The current trade proposal with respect to the Pacific economies provides a proper vehicle for putting the U.S in a more proactive trade position.

One of the reasons that the U.S. will continue to be the strongest economy in the global environment is because of the structural transformation of manufacturing into a new technology-service model. This transformation is also one of the causes of the skill shortages we face across the board.

1. More Manufacturing Jobs

The post-industrial myth that we lost all of our manufacturing strength is due to the huge loss of manufacturing jobs in recent years. While millions of jobs were lost, they were primarily low skill jobs in the old manufacturing model. While those jobs were being lost, new jobs were being created that for a variety of reasons are not adequately accounted for by the Bureau of Labor Statistics (BLS) which is still locked into obsolete work categories.

In any event, the perception that we have lost most of our manufacturing jobs is way off base. By the most conservative count conducted by the BLS we still have more than 12 million manufacturing jobs. That is a lot of jobs by anyone's definition and a variety of data confirm that manufacturing jobs pay significantly more than service jobs.

The reality is that manufacturing represents a much larger headcount than the BLS would have us believe. This is not news, or at least it shouldn't be. A continuing series of studies by the Manufacturing Institute, where I served as President for two years after stepping down from leadership of the NAM, and reinforced by other research organizations and think tanks, has demonstrated that those 12 million manufacturing jobs support more than half as many more jobs in other sectors, which would put the total job count directly attributable to manufacturing well north of 18 million.

2. A New Service Synergy

But even that reality does not accurately reflect the true impact of manufacturing on total employment in our economy. Manufacturing is in transition. There is a rapidly evolving synergy between manufacturing and services that is blurring the traditional distinction between the two. As manufactured products and processes become more complex and high tech, they give rise to a host of skilled positions in nonmanufacturing such as logistics and transportation, customer service, technical support, regulatory and safety specialists, distribution employees trained in use of information driven tools for receiving, storing and picking, the list goes on and on.

According to a recent study by the McKinsey Global Institute, 34 percent of manufacturing jobs are service-type functions. And there are millions more in service industries that tend to spring up around manufacturing facilities.

Thus, we are seeing growing evidence that manufacturing supports far more jobs in other sectors than previously thought. For example, Intel Corporation has a plant in Washington County, Oregon, employing 16,250 people in the design, manufacture and marketing of microprocessors. A recent study by ECONorthwest, a credible research group, concluded that every 10 jobs at that Intel installation supported another 31 jobs in other sectors at above average wages -- a three to one job creation ratio.

3. New Technology, Entrepreneurship, and Advanced Manufacturing

Technology is the major factor defining the innovation in the new manufacturing and much of it applies to the Hardwood Manufacturing sector. Two-thirds of R&D funding is in manufacturing and the majority of patents – about 90 percent -- are acquired in manufacturing. The chemical industry is not surprisingly one of the strongest manufacturing sectors in innovation, spurring new material development which in turn relates to the use of wood for the development of new materials. As you know, work is being done to develop a tree based alternatives to fiberglass for use in autos and other products.

There is no great mystery why manufacturers are so focused on technology and innovation. Manufacturers are under tremendous pressure to constantly improve quality and reduce costs, and also to bring new products and processes to market. The factory floor is the best place to find out if new ideas actually work as intended and work out the kinks.

The best summary of these new technologies comes from McKinsey: *Disruptive Technologies Advances that will Transform Life, Business, and the Global Economy*. That study analyzes about a dozen disruptive technologies including mobile Internet, the Internet of things, advanced robotics, 3D printing, and so forth. Another summary of these technological trends is included in the new book: *Bold—How to Go Big, Create Wealth, and Impact the World*. Let me make brief comments on three of these technologies.

Robotics

A major key to growing competitiveness of U.S. manufacturing is increasing reliance on advanced robotics, which is at last fulfilling the imagination of science fiction writers. Some factories and distribution centers today are almost empty of people as robots scurry to and fro performing a variety of functions in closely timed synchronization.

In 2012, U.S. manufacturers designed and shipped about 180,000 industrial robots, about 50 percent more than the year before. By 2015, annual sales are expected to top 200,000. Robots of course make a tremendous contribution to the quality revolution because they don't make mistakes. You are seeing more robotics, in the production of auto, healthcare products and services, hotel service and many other areas. I am sure some of you are using robotics, or a similar technology adjustment that allows you to substitute capital and automation for a human being.

Additive 3D Manufacturing

Additive manufacturing –sometimes called 3D printing– represents another sea change in the way we make things. The old way was subtractive manufacturing – you take a block of metal, wood or something else and chip away with stamping machines and lathes until you have the desired shape you want for whatever purpose. Additive manufacturing turns this process on its head. It creates three-dimensional products based on computer files by sequentially depositing thin layers of liquid or powdered metals, polymers or other materials on a substrate.

3D manufacturing has made major gains that are likely to disrupt substantial parts of the manufacturing environment: commercial aerospace and defense, automotive and transportation, healthcare products, and consumer products. Major companies have emerged to make these products such as Stratasys, and 3D systems. Charles Hall who took a small company in California that did conventional printing into layers of a solid mass printing that were able to make major auto and healthcare parts—a $6 billion 3D systems company.

Unfortunately, as pointed out in a Barron's column this last weekend, 3D technology was not yet refined enough from a production point of view to consistently execute making products in a timely cost effective way. After being hyped to the point that they were being written about in front page New York Times Stories in 2013, the major 3D companies tumbled and have lost roughly 50% of their value over the last year.

But don't write the 3D printing off because the manufacturing production process will be perfected. Think of 3D technology as being where the internet was when Mark Andreessen launched Mosaic.

Although it's not 3D manufacturing, it's interesting how companies are now looking at a tree alternative to fiber glass for use in auto parts. The new material uses wood fibers in place of conventional glass based fibers to provide a lighter, green fiber glass substitute.

Digital Technology

But it might be worthwhile in order to understand the speed of digital; technology change to go back and visit "The Kodak Moment." In 1996, Kodak had 140,000 employees and a $20 billion market cap, and controlled 90% of the film and camera market. But my missing the importance and speed of digital technology, Kodak began to lose money in the latter part of the 90s, stopped turning a profit by 2007, and filed for bankruptcy in 2012.

Manufacturing companies quickly learned the power of digital technology, and Moore's Law about the speed of change. The use of digital technology became the leading driver of the manufacturing comeback. The digital revolution has now been with us for a while in creating everything to supply chains and Enterprise Resource Planning systems.

The major world corporations are today interconnected like never before and that enables senior corporate managers to monitor company activities daily – hourly, by the minute – on the factory floor, even if that factory floor is in a foreign land. It enables them to monitor, respond to and anticipate consumer needs and desires, wherever that consumer is a customer in a store or a vendor buying robots.

We are embarked upon a new Internet era that aims to integrate the full range of corporate activity. Some call it the Internet of Things – or the IoT. Cisco CEO John Chambers called it the "fourth wave of the Internet." Simply put it is "the marriage of minds and machines."

Whatever you call it, it means corporate management is finding creative new ways to employ digital technology to improve quality, productivity, and the bottom line. The IoT will provide senior management with a steady flow of information that will take much of the guess work out of running an organization. It will also minimize the threat of surprises – such as power outages and flight delays.

The other day I had real life opportunity to observe a digital technology connected to Goggle Glasses, which allowed a factory worker to take pictures and input data into the company digital system for maintenance and regulatory purposes, and to provide data to the worker that allows making real time decisions on issues such as quality control. This remarkable technology is being marketed by a Virginia company, APX Laboratories, which is just one example of the new wearable technologies that further extends the digital network of the company.

While we don't have time to develop it in detail today, it's obvious that business intelligence and the analysis of large volumes of data are a further extension of this growing technology and digital network.

4. Making it in America

Many years ago, I wrote a book called, "Making it in America" which focused on keeping production in the US. Interestingly, a growing number of manufacturing companies are bringing production back to the U.S. from overseas. This began as a trickle a few years ago, but it is today picking up steam and for several immensely practical reasons – including rising production costs overseas, low energy costs here, concerns about quality, and the costs of transportation.

But other more significant factors are at work. Because of advances in gadget wizardry and more exacting consumer demand, many companies are finding it more convenient to make their products closer to home. The cycle life for many major consumer products such as refrigerators and ovens has been shortened from seven years or so to two or three years as more innovations improve the product and make it more attractive to consumers. If you are going to be upgrading your product every two or three years, you need to be closer to production, and you need to be able to work directly with the people on the production lines – which can be a problem if they are thousands of miles away and speak a different language.

I should mention also that at long last there does appear to be a growing movement in our country to buy American. More and more people are becoming aware of the economic disruption caused by offshoring. Some major retailers are making a big splash out of shifting to domestic suppliers. This movement was a long time in the making. Businesses and consumers are both coming to the conclusion that making things in America is a good idea.

Finally, yesterday we saw the President and U.S Secretary of Commerce, Penny Pritzker, host a White House conference that stressed the importance of foreign countries making direct investments in the United States. While foreign countries directly invest over $4 trillion in the U.S economy, Secretary Pritzker correctly argues that there is room for dramatic expansion of that investment. Notwithstanding the current run up in the dollar, the fundamental advantages of

investing the U.S are enormous: a political stability, patent protection and strong rule of law, a huge consumer and business market, an exceptional robust financial system, leader universities and a culture of innovation, and a high quality workforce.

5. **Energy Changes Positively Impact Manufacturing**

Manufacturing is heavily dependent on energy – it takes a lot of energy to transform raw materials into finished products – and manufacturing is especially dependent on natural gas, none more so than the chemical industry that uses natural gas both as a source of energy and as a feedstock. It is especially critical for paints, plastics, fertilizers and some lumber products.

And now all of a sudden thanks to the new fracking technology, we are vast in relatively cheap natural gas. Cheap natural gas is here to stay, at least for the foreseeable future, and it gives us a tremendous competitive advantage over China, Japan and the European Union. Foreign corporations are today building factories in our country to take advantage of our low gas prices. By 2016 we will be producing 16 million barrels of oil a day – the same as Saudi Arabia is producing today.

There is no question that the extent new production techniques have lowered oil and gases have caused a reaction from Saudi Arabia to lower the price from petroleum products. This in turn has cause adverse effects in those areas that rely on fracking technology as well as the petroleum industry. These are likely to continue to be both a stimulus and a drag on growth in the next several quarters. Unbalance however it is positive for the economy and manufacturing.

6. Sustainable Manufacturing

Finally, as I speak with CEOs around the country, I am encountering a growing interest in sustainable manufacturing, by which I mean essentially the creation of manufactured products with processes that minimize negative environmental impacts, conserve energy and natural resources, are safe for employees, communities and consumers, are economically competitive and add value.

The sustainability movement can be historically traced to the focus on total quality improvements popularized by the great W. Edwards Deming whose genius inspired the Japanese quality revolution in the 1950s, and eventually had a tremendous impact on U.S. industry that continues to this day. I have no doubt Deming would be an enthusiastic champion of sustainable manufacturing.

To some, sustainable manufacturing is synonymous with “green manufacturing” and without question environmental concerns are a key aspect of it. The movement is being driven in large part by a new generation of young Americans who are acutely conscious of threats to our environment and are determined to improve the communities they live in. A recent survey of nearly 3,000 companies, reported on the Environmental Protection Agency’s web site, found that two-thirds agreed that “sustainability is critically important to being competitive in today’s marketplace.”

As a member of the Dean's Council at the School of Public and Environmental Affairs at Indiana University, I am currently overseeing a white paper on sustainable manufacturing success stories. We have interviewed about fifteen major companies and the interviews confirm that companies now see that sustainable manufacturing has economic benefits and large improvements in the environment. Their economic gains come from efficiencies in energy and water, to new product development, to a high priority on the elimination of waste. We are seeing the emergence of a holistic attraction to a close loop manufacturing process.

The Hardwood Manufacturing industry has been at the forefront of sustainable development practices through its private management of the forest, to water and energy conservation to ensuring that the manufacturing process does not add harmful chemicals. Hardwood Manufacturing products have been labeled by the U.S government as green and sustainable.

7. Mergers and Acquisitions

The last few years have seen a flurry of mergers and acquisitions as a growing number of businesses are seeking to grow the easy way – simply buying up other companies that are already established. Sometimes mergers and acquisitions make a lot of sense leading to economies of scale and strengthening a company's skill base. But they are always hazardous undertakings as senior management tries to seamlessly blend different workplace cultures which never comes easy.

But it's also clear that the Fed's extended policy to hold interests near zero has encouraged a lot of consolidation. I am sure you are seeing a substantial amount of consolidation in the Hardwood industry, partly because of weaker prices, but also because cheap financing is so easy.

I would judge each merger or acquisition on its own merits, but if it comes with a cutback in R&D or reflects a lack of commitment to R&D, it is a poor choice.

8. The Skills Shortage

Along with disruptive technologies come disruptive skill requirements and shortages. Manufacturers around the country are loudly lamenting the difficulty they have finding applicants qualified to work in modern manufacturing. 80% of manufacturers report mild to severe skill shortages, with estimates of the magnitude ranging from 1 million to 2 million jobs depending upon the definition and timeframe of the analysis.

The causes of the manufacturing skill gap ranges from the negative perception of manufacturing, to the retirement of the baby boomers, to the lack of basic skills among many new workers entering the labor force, to the need for more advanced skills associated with STEM: science, technology, engineering and mathematics. Today's manufacturing company requires a high performance workforce to achieve both basic and advanced manufacturing production and distribution. This in turn requires a multi-dimensional, private and public set of efforts to increase communications with and develop the pipeline of better skilled workers available to manufacturing companies. Let me emphasize that this should include the use of the social media communications techniques to maintain connections with students that are initially

contacted in the K-12 grades. Let me now mention several key ways to expand your company talent pipeline.

(1.) Industry must do a better job of highlighting the exciting good jobs that can be found in manufacturing ranging from autos, aerospace, heavy equipment and transportation to electronics, energy and chemical products, to medical products and healthcare. And don't forget that since manufacturing is a hybrid with services, that there will be a high number of new jobs in digital communications, 3D manufacturing, and robotics. This applies to the Hardwood Manufacturing industry, which has new technology and sustainable green products.

(2.) But employers must also find ways to understand their workers better and recharge their motivation and work ethic. This means changing your culture from checking on workers to consistently explaining to them how important their job is to satisfying customers and achieving success. And that means you have to also explain how your product is good for society and the economy. This is particularly true for the millennials who want to do good as well as make money in their jobs. If you want a full checklist for what you want to do consult Eric Chester's Book: *Reviving Work Ethic: A Leader's Guide to Ending Entitlement and Restoring Pride in the Emerging Workforce.*

(3.) We have to strengthen our efforts to back basic K-12 education reform as new ideas are presented. These include improving the quality of teachers, more professional school management, using charter schools to spur innovative change, a greater focus on curriculum embracing technology and innovation. We even have to look at how learning is provided in the classroom, moving away from lectures to encouraging student involvement and initiative.

(4.) Fourth, that means we need to look at how new technologies can become a platform for new learning. Some of the more important technologies are mobile learning, tablet utilization, games, 3D printing, and providing curriculum to both online and in work places. I am fortunate to be affiliated with a company called EverFi, which has a high tech platform that provides needed curriculum to classrooms on issues that include financial literacy and STEM skills. EverFi has a full developed national infrastructure of over of over 6,000 K-12 schools and 1,000 corporate and non-profit partners. Check it out.

(5.) We also need to understand that the skills gap can be closed by working with community colleges and technical schools to provide two year certifications in a whole range of skills, including a full range of advanced manufacturing skills. The Manufacturing Institute has a wonderful program called Dream It, Do It, created on my watch that is now operating worker training partnership programs in 25 states. They work with local schools, community colleges, businesses and community groups to train candidates to work in industries specific to their communities.

(6.) Sixth, more of the skill training for K-12 and post K-12 young people are taking place in the work place and there are almost no variations of what companies are doing to connect

with students. Companies are working to bring the workplace to the classroom through technologies such as robotics and 3D printing, and also giving students a look at future jobs through mentorships, apprenticeships and interning. Many corporations have also set up apprenticeship programs to train workers and specific skills including STEM related skills. Finally, companies are now certifying workers in particular skills programs like that established by the Manufacturing Institute where almost 300,000 workers have been certified in specific skills.

But I must say that it strikes me odd that almost all of the discussion of the skills shortages hinges on the supply side – that is preparing young people with the basic skills they will need to work in modern manufacturing. I believe we need to place a greater emphasis on the demand side of the equation. Manufacturers need to do a better job of letting people know about the opportunities available, and become more aggressive about seeking out potential applicants and enticing them into the fold. Let me again emphasize the importance of social media for maintaining connections with your talent pipeline.

And the most obvious way to do this – one that has been effective for a long time – is offering attractive awards for those who make the grade. Young people are receptive to the same incentives that attract executives – and foremost among these is better compensation. If you create an attractive, rewarding opportunity – the applicants will appear and they will eagerly acquire the skills they need to take advantage of the opportunity.

High Level of Economic Uncertainty

While I am not here to talk about Washington and global uncertainty, I would be remiss not to flag that as a major obstacle for manufacturing, the economy, and employment improvement.

For too long, the Federal Reserve's policy of quantitative easing has been distorting economic and asset markets across the board. At long last, the Fed has signaled it will stop buying more debt instruments. Unfortunately, it has already run up $4 trillion in new debt for which the Federal Government is ultimately responsible. And for the time being at least, it will continue what is essentially a zero interest policy which punishes savers and promotes irresponsible stock speculation.

The actions of both the Executive and Congress also create a substantial amount of uncertainty for businesses. The President's Affordable Care Act has been a massive source of uncertainty in terms of its implementation and its long-term impact on costs and the healthcare system. No one knows for sure where this ends up.

Nor can one give high marks for congressional actions that could help manufacturing and stabilize the economic environment. There have been no actions on long-term tax reform and dealing with the need for deficit reduction over the long return. Nor do we see action on other major issues such as immigration reform, infrastructure investment, and putting a budget together.

New Manufacturing on the Ascendency

But overall, in all my years in manufacturing, I can honestly say I have never felt so optimistic about our prospects for the future – in terms of productivity, in terms of quality, in terms of profitability, global competitiveness and job creation. Our economy is growing stronger and manufacturing is in the vanguard.

It is a truism that manufacturing is evolving into something new and that it will never again be the incubator of millions of middle class jobs for people with limited skills. But it will be an incubator for millions of more sophisticated jobs that bright young people will be increasingly attracted to as they come to appreciate the high tech environment of modern manufacturing.

I strongly suggest that leaders of the business community and as well as the loyal opposition in Congress put aside their partisan prejudices and work with the Obama Administration to encourage manufacturing and economic growth. This certainly involves all of the Hardwood Manufacturing industry. A strong, diverse manufacturing base is absolutely vital to our nation's future and this of course includes the Hardwood Manufacturing industry. That is at least one thing on which all political parties should be able to agree.

Thank you.