Testimony to the House Energy and Commerce

Subcommittee Commerce, Manufacturing and Trade

Wednesday, September 14, 2016

Jeff Burnstein, President

Robotic Industries Association

Chairman Burgess, Chairman Upton, Ranking Member Schakowsky and Members of the Subcommittee,

Thank you for inviting me here today to participate in the Disrupter Series hearing on Advanced Robotics. I am Jeff Burnstein, President of the Robotic Industries Association, headquartered in Ann Arbor, Michigan. Our 400+ members drive innovation, growth, and safety in manufacturing and service industries through education, promotion, and advancement of robotics, including related automation technologies and integrated solutions.

Personally, I have been with the Robotic Industries Association for more than 33 years. According to many industry leaders in the late 1970s and early 1980s, robotics was going to be the next industrial revolution. In the mid-1980s, some wrote the robotics industry off as having failed since it didn't grow as quickly as predicted, and many U.S. companies exited the market such as IBM, General Electric, Westinghouse, and more. But, over time, with innovation and persistence, the robotics industry now offers technology and expertise from American companies that are disrupting industries all over the world. And, most importantly, robotics is saving and creating jobs as it helps develop the world in which we all have the opportunity to live longer, better, and more productive lives.

Testimony

Robotics has already changed the world, but more fundamental change is clearly ahead. It is much easier to see the outline of the eventual new world than to know how soon it will arrive.

We hear a lot these days about things like smart cities, smart mining, and smart farming. Let's remember that this all due to smart *people*. In the robotics industry, we take a perspective that goes beyond technology for technology's sake. We strive to understand the impact of our work on people's lives, and to make the world better instead of worse. This is an area where government has its own crucial perspective, and where partnership between industry and government is essential.

Together, we must embrace the reality that industry is driving change at an accelerating rate, and we can't slow this acceleration. It is driven by our human nature to positively disrupt and push the innovative boundaries. This passion for change leverages our competitive advantage to be the world-wide leader in the advancement of robotics, which will be key to the manufacturing revival in the Unites States. When companies improve their competitiveness through the implementation of advanced robotics, they are saving jobs and creating ripples of positive change and economic impact in their workplace and communities.

Advanced Robotics: Engaging Challenges in Every Industry

Behind every technological innovation is a human that identified a real-world problem worth solving. In a sense, robotics is less a standalone industry than a way of engaging challenges in every industry.

In the history of the industrialized world, we have often asked people to perform work that is dirty, dangerous, repetitive, and ultimately unsatisfying. Robots allow people to use their brains, not their brawn and to perform this work more profitably and safely.

Included with the testimony is RIA's 20-year look at robots and the impact on jobs which shows that whenever robot sales rise, unemployment falls. Conversely, when robot sales fall, unemployment rises. This trend is visible in nearly every country where robot use is accelerating. This may seem counterintuitive, and is opposite of what is often portrayed in the media and by studies that fail to account for the job saving and creation that occurs because of robots.

Today, with advances in robotics and automation, companies are returning their manufacturing to the United States. A recent report by Boston Consulting Group states, "The share of executives saying that their companies are actively reshoring production increased by 9% since 2014 and by about 250% since 2012. This suggests that companies that were considering reshoring in the past three years are now taking action. By a two-to-one margin, executives said they believe that reshoring will help create U.S. jobs at their companies rather than lead to a net loss of jobs."

A great example of a company that has become more competitive through robotics is RIA member, Vickers Engineering of New Troy, Michigan. A medium-sized prototype and production supplier of CNC machining to automotive and other industries, Vickers had trouble finding and keeping people to do dull and repetitive jobs. They tried robotics and discovered that this saved the cost of constant hiring and retraining for positions people didn't want. Then, because of lower costs, improved productivity and greater product quality, they were able to win business that they couldn't win before. As a result, they hired more people than they had before they started using robotics.

This story is repeated at many small and medium sized companies throughout America, stories that we chronicle on our "Why I Automate" video series on the www.a3automate.org website. Another great example is Marlin Steel, a RIA member company from Baltimore, that determined they could no longer

compete in the bagel basket industry since Chinese companies could make and ship similar products to the US for less than it cost Marlin to buy the steel. They implemented robots, increased productivity, and improved the quality of their baskets so much that they were able to hold higher value products than bagels. They began selling baskets at much higher prices to automotive, aerospace, and medical customers. Like Vickers Engineering, Marlin ended up with more people who were in safer, better, and higher paying jobs. Best of all, they began exporting their products to China.

Ironically, the robotics industry's biggest challenge today is finding good people to fill the open jobs they have in designing, building, installing, operating and maintaining robots. While many of the positions require engineering backgrounds, there are also many that only require two-year degrees from community colleges or certificates from technical schools. This is true for almost every one of our 400+ member companies.

Agriculture

Agriculture has always been fertile ground for technological innovation – from the cotton gin and mechanical threshers to tractors, hydraulic implement lifts, and genetically-modified seeds. As we learn to feed and clothe more people with a limited supply of land, labor, and money, we are under pressure to accelerate this innovation due to the obstacles faced in the agriculture workforce along with the world's growing demand for quality food supply.

Farming can also be dangerous business. Office of Safety Health Administration (OSHA), reports that human workers are at risk exposure to an array of hazards from livestock handling injuries to chemical and pesticide exposure.

Advanced robotics is providing the solutions for a more efficient, productive, and safer farming environment. Today, in the fields, drones are 3D mapping fields to identify crop stress or issues with equipment, creating digital elevation models, and supplying a level of insight previously available only by physically walking the land. Modern precision farmers are largely data driven, using GPS data and aerial surveys to assess crop yield and soil health in numerous field locations then creating "prescription maps" of exactly where to apply precise amounts of fertilizer, other chemicals, and even seed at exactly the right time. One example is Rowbot, through a partnership with Rowbot Systems LLC and Carnegie Robotics LLC., the autonomous robot travels between rows of corn and applies nitrogen fertilizer more precisely and at the optimum time in the growing cycle to improve crop yields.

The obstacles facing the agricultural labor industry also impact the harvest of delicate crops like peaches and tomatoes. RIA member, Soft Robotics from Cambridge, Massachusetts has built a new class of adaptive and inexpensive robotic grippers that can pick and handle delicate crops like peaches and tomatoes, supplementing human pickers and enabling higher yields.

Health Care

From surgical robots that can mill out precise fittings for a hip replacement to personal assistant robots that help care for patients, medical robots are transforming the face of healthcare. For an industry challenged by out of control costs, explosive amounts of information and technology, labor shortages, and an aging and increasingly sick population, advanced robotics can ease the labor gap and improve efficiency and safety to serve more patients with higher quality.

Robots in the operating room enable less invasive surgical techniques that improve patient care and reduce recovery time. In 2000, Intuitive Surgical's da Vinci Surgery System from broke new ground by

becoming the first robotic surgery system approved by the U.S. Food and Drug Administration (FDA) for general laparoscopic surgery. The da Vinci system facilitates complex surgery with a minimally invasive approach, powered by robotic technology that allows the surgeon's hand movements to be translated into smaller, precise movements of tiny instruments inside the patient's body. Robot-assisted surgery, coupled with advances in telemedicine and faster internet, will enable surgeons to operate on a patient in another city, state, or even on another continent. The first long-distance telesurgery was performed successfully in 2001 between New York and Strasbourg, France.

The single-incision port is another robotic surgery innovation, where a doctor could make a tiny incision then, using an access port something like RIA member, Medtronic's SILS port, insert the snake-like arms of a robot through that incision. According to Dr. Michael Palese, a urological surgeon and the Director of Minimally Invasive Urology at Mount Sinai Hospital in New York City who specializes in robotic, laparoscopic, and endoscopic surgery, "The next generation of this technology will mean that you put one little hole in the patient and then put snake-like arms through that hole … That would change the nature of surgery forever."

Outside the operating room, robots are supporting a more reliable and efficient pharmaceutical tracking distribution system. RIA member Aethon has developed a chain of custody system that tracks a medication from the initial order from the physician to the final distribution to the patient. The MedEx software solution secures and tracks medications in real time while giving the medical staff visibility into the status and delivery of the medication. Once the medication is ready for distribution, Aethon's TUG, an autonomous mobile robot, travels hallways, rides elevators, and navigates obstacles to deliver it to the nursing unit. This eliminates distractions for pharmacy staff and boosts accuracy and productivity,

ability to track medication also allows pharmaceutical staff less distractions in their environment, rather than taking calls from staff, they are able focus on the accuracy of filling and distributing medications.

In RIA's Robots and Healthcare Saving Lives Together, Aethon reported that their software helped hospitals that typically receive 200 missing medication requests a day to reduce that number to 10. TUG also works 24/7 to transport goods, materials, and clinical supplies throughout the hospital. This means that staff can focus on patient interaction and assisting with nursing instead of dealing with logistics or pushing of heavy, clumsy carts throughout the hospital.

The benefits of automating a medical research lab include sifting through massive amounts of data in a short period of time. Scientists at a National Institutes of Health laboratory search for the right combinations of chemicals to fight diseases. Robots can test millions of potential drug combinations that would overwhelm human capabilities. Robots that are traditionally used in the manufacturing space can also be specially engineered to work in a clean laboratory environment. They handle plates with diseased cells and test against 450,000 different chemical combinations to find solutions. Not one of the tests is duplicated and this shows how automated equipment can learn to handle unique data.

Robotics equipment in labs can work without harm near biological contaminants, radioactive material, and toxic chemotherapy compounds. Companies in all industries handling hazardous materials can automate and make more strategic use of people and keep them safe.

Manufacturing

Manufacturers are adopting more automation than ever before. For many, it's no longer a question of whether to automate, only when and to what extent. With wages offshore rising, robot prices down, and performance up, robot sales are at an all all-time high. In August, RIA reported the first half 2016, a total of 14,583 robots valued at approximately $817 million were ordered from North American companies during the first half of 2016. The number of units ordered in the first six months marks a new record to begin the year, growing two percent over the same period in 2015, which held the previous record.

Automation changes the kinds of jobs that are available. A skills gap report by Deloitte says that, in the coming decade, there will be 3.4 million available automation jobs but only 1. 4 million qualified workers. To fill these jobs with qualified workers, we need deep partnership between industry and government. We need automation suppliers and users, colleges, technical and career centers, government, parents and teachers, mentors and volunteers – all working together.

Humans and robots working side-by-side leverage the best of both worlds. Collaborative robots are designed to work alongside employees to handle the repetitive and mundane tasks of picking and handling, while employees focus on the actions that require human judgment (e.g., fitting components). RIA member Rethink Robotics developed two lines of robots, *Sawyer* and *Baxter*, which are working side by side with employees of General Electric. At RIA's International Collaborative Robots Workshop, Roland Menassa, Global Research Automation Center Leader for GE Global Research in Van Buren Township, Michigan, said, "Sawyer was grabbing parts and putting them in the assembly. But the human was making sure it was fitting properly and inserting the last screws, using

what humans are good at – dexterity, perception, and logic. For us, elevating the role of the human on the assembly line to focus on quality – to focus on the value-added – is very important."

Human-robot collaboration increases output, lowers costs, and produces a higher quality product. MIT researchers have found that robots collaborating efficiently can be more productive than teams made of either humans or robots alone, and reduced human idle time by 85 percent. Centers such as the Advanced Robotics Manufacturing Institute aims to work with industry, governments, and academia to develop and implement advanced robotics into the next generation of manufacturing facilities.

Robotic Systems Integration and Component Manufacturing

One thing that isn't well known about the robotics industry is that the robot arm itself is only one element of a successful robot system. The US is fortunate to have the world's most experienced and talented base of system integrators – the companies who build entire factory floor automation systems, in which the robot is just one component. Robot systems integration is the hub of all communication, coordination, purchasing, logistics, and planning in an automation project. The goal of the integrator is to provide a turnkey automation solution while optimizing efficiency, safety and quality. My own organization's RIA Certified Robot Integrator Program has gained recognition for providing robot integrators with a way to benchmark against industry best practices while at the same time allowing robot users to develop a baseline for evaluating robot integrators.

Many robotic systems integrators are enjoying great business success, creating new jobs across the US. One RIA member, Genesis Systems in Davenport, Iowa, has performed over 4,500 robotic system installations and integrated 5,535 robots in the automotive, aerospace, and light and heavy industrial markets. Genesis has work cells located in 42 states and 15 countries. Another RIA member, Matrix

Design in South Eglin, Illinois, reported that incoming orders for the first half of 2016 increased significantly compared to the prior year. As a result, Matrix has expanded its operations in South Eglin and opened a new office in Indianapolis.

System integrators, in turn, rely on manufacturers of robotic system components. These manufacturers provide highly innovative parts for robotics systems, such as tool changers, machine vision systems, and robotic accessories. They are expanding, growing jobs, and supporting their local economies through the expansion of the use or robotics.

For example, RIA member ATI Industrial Automation from Apex, North Carolina, manufactures robotic accessories and products that can be found in thousands of applications. ATI has grown its workforce from 5 to over 200 employees, while supporting commercial, government and university partners in advancing robotic solutions.

One growing area in robotic system components is machine vision, which serves as a robot's eyes. For example, RIA member Cognex Corporation of Natick, Massachusetts produces machine vision systems that are used in factories, warehouses and distributions centers around the world to guide, inspect, identify and assure the quality of items during the manufacturing and distribution process.

Overall Impact on Jobs and the Economy

From the many examples presented above, we see that robotics is an opportunity to innovate, not just with technology, but the types of jobs that are available. This is just a stage in a continuing process – technology has been changing the nature of jobs for hundreds of years. For example, a small fraction of the population work on farms today compared to the beginning of the century, but we now produce

more food that can be processed and distributed more quickly and safely, and farm workers have new jobs that more closely meet the current generation's lifestyle choices. Similarly, jobs as horse and buggy drivers, elevator operators, and gas station attendants (in most states) have largely gone away, thanks to technology.

But even in this era of exploding technological advances that has seen record shipments of robots in the U.S. and around the world, U.S. employment has continued to rise, along with improvements in labor productivity. (See the Association for Advancing Automation's (A3) report Robots Fuel the Next Wave of U.S. Productivity and Job Growth.) Over the years, predictors, have typically overestimated the ability of technology to replace human beings. It's been half a century since Rosie, the Jetson's maid, first appeared, but the closest we've come to a successful home robot is a vacuum cleaner.

In many cases, robots are used for the dull and dangerous jobs that today's workers simply don't want. Coupled with changing demographics and the graying of the manufacturing workforce, automation is ideally suited for many of the roles for which companies struggle to find workers.

Advancement of robotics and other automation often creates highly desirable new jobs. For example, the Deloitte report mentioned earlier posits that the next decade will see 3.4 million manufacturing jobs with only 1. 4 million qualified workers to fill them. We saw that, in many situations, robots augment and collaborate with human workers rather than replace them: robots do the heavy lifting while human workers program and monitor the process, applying their unique skills in new positions. At the same time, labor costs in emerging markets continue to rise, eroding the cost advantages of offshore manufacturing. As companies bring operations back to the U.S., they are often using robotics to help them remain cost-competitive in global markets by increasing product output, quality, and consistency.

When companies improve their competitiveness through automation, saving jobs in the process, they also create ripples of economic impact—and jobs—in their communities. If factories are shuttered, neighborhoods are destroyed. But when manufacturers instead maintain or regain competitiveness by automating effectively, they are able to grow their own businesses and also support other jobs in the community, including supplier companies, restaurants, stores, hospitals, schools, and other services that support local factory workers.

There is one critical area where we are seeing a robotics-related job crisis. The robotic industry's number one problem today is there aren't enough qualified people to design, program, install, operate, and maintain robots. Good, high-paying jobs are waiting for people with the right training, which can often be acquired at technical schools and community colleges. Companies need educated machine operators with basic skills in robot programming, integration, and maintenance, as well as specific expertise such as machine vision applications. This expertise must be built through science, technology, engineering, and math (STEM) programs in K-12, vocational and technical programs in robotics that are reinforced through industry-academia partnerships, as well as higher education programs in specific engineering fields.

A recent RIA article "Closing the Skills Gap in Automation: A Call for Action" identifies the importance of strong education and industry partnerships to support the current and future skills needed for the advancement of automation. An example, Robotics Advanced Manufacturing Technical Education Collaborative (RAMTEC), partnered with Yaskawa, FANUC, Honda, Lincoln Electric, and RobotWorx, to operate an industrial robotics and advanced manufacturing training center, located in Marion, Ohio.

RAMTEC provides training to high schoolers and college students, along with incumbent workers to support industry's need for training on robotics and automation equipment.

In 2014, PEW Research asked nearly 2,000 prominent technology experts to respond to a question on the economic impact of robotic advances and artificial intelligence. More than half (52 percent) believe technology will not displace more jobs than it creates over the next ten years. According to the PEW report AI, Robotics, and the Future of Jobs, these experts "have faith that human ingenuity will create new jobs, industries, and ways to make a living, just as it has been doing since the dawn of the Industrial Revolution."

Respondents on both sides of the debate share concerns that our educational institutions are not adequately preparing workers for the skills that will be needed in the job market of the future. Industry and government must work together to solve this problem. I appreciate the opportunity to be here with you today as one step toward this shared goal.