



Setting the Standard for Automation™

WHITE PAPER

Addressing the Workforce Demands of Modern Industry

**Building the next generation of
automation professionals**

Standards
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Building the next generation of automation professionals

The situation

There is a resurgence of manufacturing—both process and discrete—in the developed world, due to highly efficient automated processes, integration with execution systems and enterprise levels, less reliance on assembly line labor, and emerging technologies such as additive manufacturing. This progress is possible because of global competition and the world economy, driven by automation talent developed over years of evolutionary and experiential knowledge. The crystal ball looks pretty cloudy, however, as aging baby-boomers and their knowledge are leaving the workforce; society has geared itself and academia more toward sustaining a service economy; fewer students are pursuing engineering or technology degrees with a tail effect of less emphasis on math and science in K-12; automation, the primary enabler for advanced manufacturing, is a very broad discipline, which was not well defined until recent years, and there is still not a clearly defined direct education track to produce the automation professionals at all levels necessary to satisfy the demands of modern industry. The perfect storm is gathering.

How did we get here?

Many years ago, America worked its way to the top of the economic food chain through the concept of wealth creation. A substantial middle class emerged as the engine of economic growth, which was primarily driven by labor intensive industry until that model was forced to obsolescence by third world labor and raw materials. Today, politicians keep insisting that America must get back to creating wealth but seem misguided in how to do so by suggesting Americans borrow more money to buy more “stuff,” most of which is made offshore. Increasing consumer debt to increase consumption does not create wealth. In fact, it is consumption of wealth without replacing it. There are only three “base sources” of wealth creation: natural resources, labor, and knowledge. Natural resources (oil, minerals, and the like) are tied to geography. The largest transfer of wealth in history occurred within the past half-century, from countries that had generated wealth through

productive knowledge, innovation, and enterprise, to areas that had little else than their oil. Manufacturing is the foundation of economic growth, the key to higher living standards, and the future of the middle class. In the US, this recognition is generating the re-birth of manufacturing, but the circumstances have evolved. Assembly line labor is inefficient and not competitive. Automation has successfully supplanted that labor, however, the great labor need now exists for technology workers—people who design, create, engineer to application, support, repair, and maintain automation systems and subsystems from plant floor primary control elements to top floor interfaces with the enterprise system. According to Rockwell CEO Keith Nosbusch, for every job supplanted on the assembly line, a “multiplier effect” of approximately 8X technology workers is added within the facility and supply chain. Service industries and government jobs do not increase wealth, they merely circulate money. Manufacturing creates wealth by taking goods of lower value, adding knowledge and labor, and creating higher value. So, do our leaders and the public grasp how this happens? High tech manufacturing jobs are often misunderstood by the masses and beholden to the misperceptions and stereotypes surrounding manufacturing from decades long past. Often, a stigma exists, and it is hard for many to correlate education to careers in manufacturing...so 600,000 real manufacturing jobs go unfilled, according to a report by NAM Manufacturing Institute last year. Not part-time, not fast food, not government....but wealth-generating jobs that will result in successful careers for decades to come.

Who are the Automation Professionals?

Automation professionals are not niche players, and they do not represent a niche discipline. Their knowledge must be a mile wide and a mile deep. Complex manufacturing and processing involve systems of systems, which require a systems engineering mindset coupled with traditional engineering expertise to control and optimize results. When we talk about automation, we now also include such things as wireless monitoring, control system cybersecurity, safety instrumented systems,

alarm management, etc. The well-rounded automation professional understands the many and varied critical work functions of automation, is competent in many of the traditional engineering disciplines, and also understands the overall goals & objectives and business drivers of the unit/enterprise for the purpose of optimizing the complete system, rather than being a specialist who can optimize any one of the subsystems. This is a unique combination of skills and knowledge that has never before been formally and broadly recognized in a single package. To make a point: optimized subsystems rarely aggregate to provide an optimized system. Production, quality, and inventory are all subsystems that are optimized at the system level through the appreciation of automation fundamentals that bring the real-time nature of control to business management. This goes far beyond the contribution of IT in the optimization equation. Improved business performance is based upon the lessons learned from classical process control applied to the business process.

A Planned and Coordinated Approach to Solving the Automation Workforce Problem

Mitigating the brain drain must begin with analyzing the primary foundations of career building, and there is a role to play for all of the stakeholders:

- **Academia**
 - K-12 STEM progression, career counseling with advice from industry professionals, and extracurricular activities showing relevance to careers (i.e., FIRST Robotics, www.usfirst.org)
 - Practical and theoretical automation curriculum based upon an endorsed body of knowledge and implemented through universities, community colleges, and trade schools
 - Transferability of technical credit hours from community colleges to BS engineering degree programs
 - Established and recognized Automation Engineering BS and MS degree programs
 - Process/Manufacturing Control electives within engineering vertical BS programs (EE, ME, ChemE)
- **Industry**
 - Automation is not IT and should not be perceived as such internally or externally
- Automation includes knowledge of plant process/ discrete manufacturing
- Recognition and support of existing certifications, certificate programs, and licensure
- Wide recognition and implementation of ISA/ANSI/ IEC standards and active compliance
- Support and promotion of intern and co-op programs with academia for automation
- Investment in training education for employees, benchmarking, and gap analysis of talent using the universally recognized Automation Competency Model
- Community investment and partnership with local schools to fill the talent pipeline and dispel the stigma that industrial jobs have no future
- **Government**
 - Academia plays a primary role in producing the quality professionals that industry will employ, but lawmakers and federal agencies create the support network necessary for academic validation. Law makers and federal agencies will need a thorough understanding of the economic and societal impact of automation, grounded in federally funded research & development.
 - Recognition and standardization of automation job descriptions top to bottom, full spectrum; evergreen maintenance and promotion of Automation Competency Model, an official framework/model to define the profession, developed by consensus through subject matter experts
 - Awareness among lawmakers and agencies of issues facing industry pertaining to automation in advanced manufacturing and processing
 - Grant programs for automation careers; tax incentives to promote manufacturing growth; legislation to promote safety, security, technical education, et al.
 - Veterans technical education transition programs into industry
- **Professional Technical Organizations and Non-Profits**
 - Serve as the glue between industry, academia, and government facilitating the conversations and brokering the deals to change the future



- The conduit to meet the evolving and changing needs of industry when it comes to the workforce of today and tomorrow
- Education and training outreach: alliances, partnerships, conferences
- Consensus standards development and compliance for the benefit of industry and practitioners
- Certifications, certificate programs, and licensure—particularly for multi-national companies and H1B visa workers—enabling 3rd party verification of automation skills
- Voice of the profession: tell the true story and showcase the positive stories, advocate for automation, safety, and security issues
- Government relations: inform and educate our leaders on the issues related to automation and the realized benefits

Is there a solution? What has been done?

The re-emergence of manufacturing is key to the solution. Thanks to automation, smart manufacturing, and the recent discovery of substantial deposits of fossil fuels, there is a renewed chance to create wealth once again using the three “base sources” of natural resources, technical labor, and, this time around, the broad plant floor to boardroom automation knowledge. The future will belong to those companies that recognize the pivotal role of automation. Increased investment in automation projects, the growth of industry, and ultimate success depend not only on the technology, but on the competency of the practitioners.

ISA and the Automation Federation have a unique understanding and appreciation of the workforce challenge your company faces, and we have training and education tools and programs that align with the Automation Competency Model to bring you well-qualified and productive professionals.

ISA and its 30,000+ members—and the Automation Federation (chartered by ISA in 2006) and its 16 member organizations representing 500,000+ global automation-related practitioners—are actively working together on the issues of the three supporting legs of the automation stool: Industry, Academia, and Government. AF members, including ISA, are being recognized as the

Voice of Automation, tackling the macro issues facing the profession, and thus the industries we serve. ISA has the core competencies of standards development and compliance, education, training, and certifications to create high quality technicians, technologists, engineers, specialists, and managers by supplementing their formal

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technical education and on the job experience: certifying it, benchmarking it for new hires, and evaluating it for skills gaps. Not only does this system benefit the technical resource and his/her employer, but it also has an inherent feedback loop that allows for the continuous evolution of the body of knowledge of automation that will benefit future generations. This dynamic process manifests itself in the form of the Automation Competency Model. New technology areas for the times such as industrial control system cybersecurity, process safety/safety instrumented systems, wireless technology, and manufacturing operations management, to name a few, are emerging because of newly developed standards. Access to those subject matter experts, certificate programs, and standards compliance tools reside at ISA. Let ISA partner with you to help your company field the most competent automation professionals to secure success for the future.

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