



The Great Skills Shortage

How Manufacturing Enterprises can overcome a \$2.5 trillion talent and skills shortage



Written by Young Oh

VP of Manufacturing Business Development,
Seertech Solutions



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INTRODUCTION

Modern economies rely on manufacturing as a crucial strategic asset, recognized by nations across the globe. This sector not only fosters job creation, innovation, export, and infrastructure development but also serves as a lifeline for economic growth. Despite its significance, the manufacturing industry faces a major challenge in the form of a burgeoning skills shortage.

Beyond the widely publicized geopolitical disruptions that have rattled the global supply chain, this shortage of skilled workers poses a serious and urgent concern for manufacturers. Its potential repercussions extend far beyond the manufacturing sector,

posing a substantial risk to both the US and global economies in the times ahead.

This white paper has a twofold objective. Firstly, it delves into the underlying reasons behind the skills shortage, shedding light on its potential economic implications. Secondly, it offers actionable strategies to mitigate these risks, providing valuable insights for industry stakeholders. Additionally, the paper will showcase a compelling case study that follows the journey of a high-tech manufacturing company as it endeavors to strengthen its competitive edge within the manufacturing landscape.

BY THE NUMBERS

82%

OF US MANUFACTURING LEADERS ARE CONCERNED ABOUT THE SHORTAGE OF SKILLED WORKERS

29%

OF MANUFACTURING WORKERS IN THE US ARE AGED 55+, TOTALING 2.7 MILLION

2.4M

MANUFACTURING JOBS ARE ESTIMATED TO GO UNFILLED DUE TO THE SKILLS GAPS BY 2030

\$2.5T

OF US ECONOMIC OUTPUT IS AT RISK DUE TO SKILLS SHORTAGE OVER THE NEXT DECADE

UNDERLYING FACTORS AFFECTING MANUFACTURING COMPETITIVENESS

The US manufacturing industry is experiencing a significant workforce skills challenge, which presents a genuine threat to the sector's projected growth over the next decade.

Several key underlying factors contribute to the growing skills shortage:



US Economic Growth

- **Historical Low Unemployment Rate**

The US is experiencing a historically low and downward trend in the unemployment rate for the past decade. In October 2009, the US unemployment rate was 10%. By 2014, it had decreased to 6.2%. In 2019, the rate further dropped to a low 3.5%. As of June 2023, it is still holding at 3.6%, despite the challenges of rising interest rates and indications of an overall weakening US economy. While a low unemployment rate is a positive news for the employees, the US manufacturing job openings have been growing at double-digit rates since mid-2017, exacerbating the struggles for companies to hire qualified candidates.

- **Increased Domestic Investments**

The recent geo-political and supply chain challenges have sparked a renewed emphasis on reshoring manufacturing back to the US, resulting in increased investments to build domestically. One significant initiative is the passage of the CHIPS Act, a substantial investment of \$52 billion aimed at expanding semiconductor manufacturing capacity within the US. Currently, the US accounts for about 10% of global chip production but aspires to 30% by the year 2030.



Aging Workforce

- **Loss of Knowledge Capital from Baby Boomers**

According to NAM (National Association of Manufacturers), approximately 10,000 baby boomers are retiring daily in the US. Moreover, there are approximately 2.7 million manufacturing workers aged 55 and above. Unlike any other time in the US economy, the rate of retirements is projected to surpass the growth of the working-age population. This trend is anticipated to continue through 2030.

Experienced manufacturing workers hold a breadth and depth of technical skills and problem-solving expertise that cannot be replicated solely through formal education. However, documenting and capturing this valuable knowledge capital proves to be a challenge for many organizations. This underscores the significance of enhancing knowledge retention and skills transfer processes, especially as experienced workers retire, and new employees with no industry experience join the workforce.



Shrinking Labor Supply

- **Decreasing US Birth Rate**

The overall available workforce pool is shrinking in the US as a result of a declining birth rate observed over the past few decades. According to the CDC (Centers for Disease Control and Prevention), the fertility rate hit a historical low in 2020, with 55.8 births per 1,000 women aged 15-44. This reflects a 4% decline from the rate in 2019 and a significant 19% decline since 2007. Compounding this issue, the US is also not producing enough workers with relevant education to support the manufacturing industry.

- **STEM Education Graduates vs Job Growth**

According to the National Science Foundation (NSF), the number of bachelor's degrees in STEM (science, technology, engineering, and math) has been steadily rising since the mid-2000s, with an increase of approximately 47% between 2000 and 2018. While this is encouraging news, the difficulty lies in the fact that the projected annual growth of STEM jobs is expected to far outpace the growth rate of STEM degree graduates.

- **Disproportionate Decrease in Non-college Degree Workers**

According to The Conference Board's research in 2020, the overall trend of slowing growth in the working-age population is exacerbated by two opposing trends. On one hand, the proportion of the population with a bachelor's degree is steadily increasing, while on the other hand, the share without a bachelor's degree is consistently declining. This means that blue-collar jobs, such as mechanical technicians, will become even more challenging in the future. As a result, manufacturing companies that rely heavily on blue-collar talent for their factory operations will continue to face the tightest labor markets seen in decades.



Modernizing Skill Sets

- **Technological Advancements**

Automation, robotics, and AI have shifted the necessary skills needed for the manufacturing workforce. According to the World Economic Forum's "The Future of Jobs Report", around **47% of today's jobs are expected to be obsolete in the next 10 years**, including 20% of low-skilled operator jobs in manufacturing. However, the overall headcount is expected to increase, indicating that the workers will need to transition into new jobs with new technology-driven skills.

The top 5 skill sets to become more important due to the rise of automation, robotics, and digitalization are: 1) computer skills, 2) digital skills, 3) programming skills for robots/automation, 4) working on advanced equipment, and 5) critical thinking skills. Upskilling the existing workforce on such a scale poses a challenge that requires collaborative efforts from both the public and private sectors.

CURRENT AND FUTURE ECONOMIC IMPACTS

The job creation in the manufacturing sector is outpacing the industry's capacity to attract, hire and train new workers. This challenge is impacting many manufacturing companies as they strive to expand their production footprint. According to data from Bureau of Labor Statistics (BLS) and the Oxford Economics Model, the skills shortage could jeopardize \$454 billion of manufacturing GDP in 2028 alone, with the total economic output at risk estimated to reach **\$2.5 trillion** over the next decade.

While the skills shortage is impacting many industries, it is particularly severe in the manufacturing sector, where the competition for a limited pool of talent is intense. Case in point, Deloitte research estimates that the global semiconductor industry will require over **one million additional skilled workers by 2030**, translating to the need for more than 100,000 new workers annually.

Consequently, the intense talent competition has led to historically high employee turnover rates at numerous manufacturing companies. During the period of 2020-2022, some companies have reported turnover rates exceeding 100%, indicating that they are losing more employees than they can hire and train. This situation places tremendous strain on all aspects of an organization and poses a genuine threat to manufacturing companies working to expand their operations and meet production demands.

To address these challenges, manufacturing companies must **rethink their entire workforce and talent development strategy end-to-end**. This includes focusing on both external and internal candidate recruitment pipelines, effective onboarding processes, comprehensive training programs, well-defined career progression paths, and competitive compensation models.



WHAT CAN BE DONE TO IMPROVE MANUFACTURING COMPETITIVENESS?

Addressing the overall skills gap challenges requires that manufacturing companies develop a long-term and comprehensive strategy that focuses on:

Attract & Recruit

- Forming workforce development partnership with local talent feeder institutions, such as schools, community colleges, private organizations, and military outplacement services
- Strengthening apprenticeship programs, commencing as early as middle schools, with the aim of cultivating brand loyalty
- Adopting a skill-based hiring approach by relaxing degree requirements and focusing on relevant skills
- Recruiting new talent from adjacent industries with transferable skills
- Open job opportunities to underrepresented groups by bolstering internal skills development programs and structured on-the-job training
- Promoting clear career growth and development opportunities to potential candidates
- Improving working conditions and offering scheduling flexibility at the factory floor
- Improving the overall compensation plan to attract and retain talent

Although these measures help attract skilled workers, retaining them requires enhancing onboarding, training, and ongoing development programs. Studies indicate that **56% of manufacturing employees want more training opportunities** for job satisfaction and a clear path to advancement.



Develop & Retain

Provide Structured Onboarding Experience

- The initial weeks on the job play a crucial role in shaping an employee's first impression of the company. A disorganized and unstructured onboarding experience can lead to increased employee anxiety and consequently, higher turnover rates. Studies indicate that a more structured onboarding process can result in 54% lower turnover rates during the first year

Improve Knowledge Capital and Consistency of Skills Training Program

- 53% of manufacturers believe that the quality of workers' skills and knowledge is uneven across their workforce, posing risks to both quality and productivity.
- According to a study by the National Institute for Occupational Safety and Health (NIOSH), **50% of serious workplace injuries and fatalities in the manufacturing industry could be prevented by better training completion accountability.**
- Focusing on knowledge retention and documentation is crucial, as much of the valuable knowledge is currently at risk due to its tribal nature and poor documentation.

- The potential loss of skills is expected to accelerate as experienced workers retire, taking their knowledge with them. To bridge the skills gap, standardized and consistent training quality is vital. 84% of manufacturers believe a skills gap exists due to a lack of standardization in training. Implementing a more formalized and structured training program will ensure consistency, efficiency, and standardization across the workforce.

Provide a Clear and Transparent Career Path

- According to a LinkedIn study, the lack of career growth opportunities was the top reason for employees to leave their jobs. The younger generation of employees places less emphasis on job tenure as a determining factor for career advancements, and 56% of manufacturing employees want more training opportunities for job satisfaction. The study also revealed that employees who perceive a clear career path are 2.5 times more likely to remain with the company.

“84% of manufacturers believe a skills gap exists due to a lack of standardization in training”



CASE STUDY: HIGH-TECH MANUFACTURING

While the previous section outlined strategies to improve manufacturers' ability to overcome the skills gap challenges, this section presents an actual case study of Seertech Solutions' successful partnership with a high-tech manufacturing company. This company is headquartered in the US employing over 20,000 employees with more than a dozen manufacturing sites across the globe. The case study will highlight the strategies employed to address the skills gap and how they have yielded substantial and measurable results, with an estimated ROI (Return on Investment) of 3x or greater to date.

Business Growth

This global high-tech manufacturing company was experiencing aggressive business growth driven by increasing demand. As a result, they expanded their manufacturing capacity by adding more equipment to the existing facilities and by constructing new manufacturing sites around the world. To understand the magnitude of the challenge, this organization's hiring rate increased 55% YOY in 2021 which amounts to thousands of new employees onboarding and training. To support this aggressive growth, the organization recognized the need to invest in a globally scalable solution to bolster the efficiency and efficacy of its workforce development program.



Business Challenges

Inconsistent Training Methodologies Impacting Productivity, Consistency, Scalability, and Cost

- **Variations in training methodologies due to poor governance**

With more than a dozen manufacturing sites worldwide, the training methodologies for factory employees varied significantly. Most of the manufacturing sites operated in silos, leading to isolated practices for training. In many instances, even within the same site, the training processes differed between day shift to night shift operations.

Examples of variation included:

- Employee onboarding ranged from a concise 1-day process at one site to as long as 90 days at other sites. The scope and definition of effective onboarding differed significantly, leading to wide variations in outcomes.
- Training methodologies for the same equipment or processes varied between different factories, resulting in significant variations in both training quality and duration, making time-to-contribution difficult to manage.
- The organizational structure for supporting local factory training also varied significantly. Some sites distributed training and onboarding responsibilities across the entire organization with ambiguous ownership, while others centralized them with a formalized training team, ensuring clear ownership.

- **Multiple disparate learning systems resulted from fragmented organizational design**

The high variations in processes were further exacerbated by having different systems across the company. Like many other global manufacturing companies with multiple locations, it is common to find a lack of enterprise approach to training systems to support all employee skills development needs. Partially, this can be attributed to perceived differences in the learning needs of factory employees vs non-factory employees. Compounding the issue, this manufacturing company's organizational design created a clear separation between the manufacturing business and other non-manufacturing business entities.

Due to this separation, the centralized Talent Development groups focused more of their energies on addressing the broader business needs, such as leadership training, performance management, and succession planning. As a result, the Talent Development groups were not adequately integrated into the manufacturing organization, making it difficult for them to effectively support the specific operational needs of the manufacturing company.

Meanwhile, the training and development needs of the factory employees were typically supported by the local operations team, which was organically formed at each factory site.

“In many cases, the training processes differed between day shift to night shift”

This decentralized organizational design resulted in notable fragmentation and competing priorities across the company, leading to systemic inconsistencies, inefficiencies, and cost implications.

The variation in learning systems was not only between the manufacturing business and the non-manufacturing business. Even within the manufacturing business entity itself, certain factories had adopted their own home-grown training applications and/or offline training tracking method, often utilizing tools like Microsoft Excel. This is partly because this global organization grew through acquisitions, resulting in the incorporation of legacy processes and systems from the acquired companies. Such challenges are commonplace for many other global organizations.

Across their manufacturing sites, this high-tech organization had at least four disparate learning systems and even wider definitions for employee competencies to perform the work.

As a consequence, each factory site had its own training system administration support model. Lacking an overarching global learning governance framework, these local administration teams developed their unique processes to manage the learning and development needs of their employees.

The inconsistencies in both process and system posed a significant challenge in achieving quality and predictable outcomes.

Difficult to Track and Manage

Employees' **time-to-contribution** was difficult to track. Time-to-Contribution (also known as Time-to-Competency or Time-to-Productivity) is a critical KPI

in manufacturing. However, without a consistent definition of when an employee is competent and an enterprise system to support it, the Time-to-Contribution varied between 2 weeks to 9 months, from one factory to another. This level of unpredictability is not acceptable in any high-volume manufacturing facility.

“Time-to-Contribution varied between 2 weeks to 9 months”

Moreover, with thousands of skilled employees operating sophisticated machinery and dealing with hazardous chemicals and gases, many mandatory training courses had to be assigned based on their specific job function. However, without a systematic approach, the **assignment of the mandatory training was highly manual and prone to errors**. With growth and an increased employee hiring rate, this manual training assignment method became an administrative burden, increased audit risk, and posed potential safety and health liabilities for the employees.

Next, generating a report summarizing the workforce skills matrix was challenging, making it difficult to accurately analyze the factory's staffing needs and potential risks to business continuity. The absence of such reporting capabilities made it challenging to manage production risks, especially when experienced employees with critical skills departed from the company. As a result, the management team often remained unaware of these risks until they materialized.



SOLUTION APPROACH TO ADDRESS THE BUSINESS CHALLENGE

The first and perhaps most important step to achieving a best-in-class employee experience and closing the skills gap is the **leadership team's commitment to a strong change management process**. Streamlining fragmented processes and centralizing disparate systems demands disciplined project management skills, support from all key stakeholders, and proper team resources. This commitment lays the foundation for a successful transformation.

The scale of transformation for this global organization was immense, deeply entrenched in its long history. Over several years, a complex and multifaceted change management project was undertaken, requiring meticulous planning, communication, and continuous stakeholder engagement to sustain momentum. Addressing the change management challenge went beyond a technological solution. The more **significant obstacle was overcoming cultural and people challenges**. To put this into a better context, many of the manufacturing sites have not changed their processes in over a decade, and some employees' entire career was defined by supporting antiquated processes and systems. Thus, overcoming the change resistance required a compelling vision of the future state, cohesive cross-functional teamwork, and strong influencing skills to navigate the complex needs and interconnections across multiple stakeholders.

The first step in the change management process was to secure strong executive leadership support and form an internal project team responsible for overseeing the global project, in partnership with Seertech Solution's functional and technical consultation. One of the initial actions was for

the project team to conduct a formal **Change Impact Analysis** for all sites worldwide. Over the course of a year, the project team held multiple discovery sessions to uncover and understand the unique local business needs and processes. To implement more scalable, efficient, and effective business processes, it is crucial for the organization first align to a globally consistent process and system. This requires all stakeholders to be committed to fundamentally thinking differently and putting aside local interests for greater **enterprise-wide strategies**.

“Overcoming the change resistance required a compelling vision of the future state, solid cross-functional teamwork, and strong influencing skills”

After extensive negotiation and collaboration with key stakeholders from each site, a new, globally consistent training process flow was defined. Furthermore, Seertech Solutions' learning management system (LMS) capabilities reinforced this process to improve efficiency and effectiveness at both operational and strategic levels.

Given the complexity and global scale of this organization, the project took multiple years to complete across all 20+ factories, but it has yielded tangible and positive results.

Some of the key solution components included:

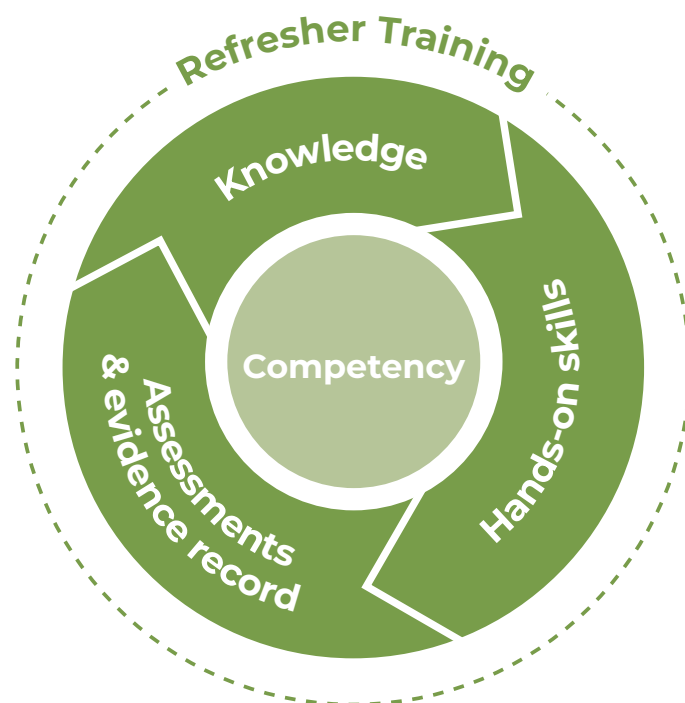
- **Consolidation of multiple Learning Systems**

This high-tech manufacturer previously utilized several different learning systems across the company. This was partly due to the differing learning needs between factory employees, who required operational-focused training, and non-factory business employees, who focused on professional skills like leadership training. To improve efficiency and consistency, this organization consolidated all of their learning platforms for the entire company onto Seertech Solutions' LMS. Centralization into a single, unified system that is flexible and scalable was the key step to gaining efficiency and consistency. It enabled data capture and reporting from a single system, enabling a scalable and centralized administrative support model for cost savings and consistent learning governance.

- **Improved Workforce Competence with Structured On-the-Job Training (OJT)**

One of the most important goals for achieving training consistency on the factory floor was to **standardize and systemize the OJT process**. According to a study done by R. Jacobs, a professor of Workforce Development and Education at the Ohio State University, a structured OJT approach reduces the training time by approximately 80% compared to an unstructured OJT approach.

In the manufacturing context, most of the skills needed are mission-critical to the operation. Therefore, it is critical to **document** and **validate** employee competency to ensure consistent product quality, employee safety, and compliance with legal/regulatory requirements. The basic framework of mission-critical employee **competency** is illustrated below:



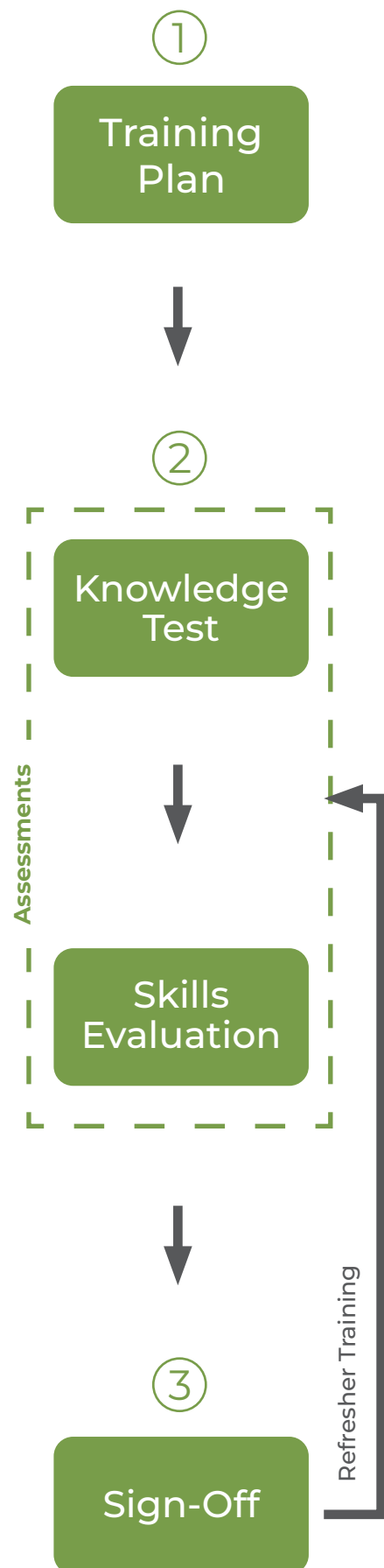
By systemizing the OJT process steps, Seertech Solutions provided the functional capability to satisfy this competency framework model. This new system solution enforces global consistency and governance, leading to improved training quality and accelerated skills development.

The **first step** in the process is the systemized **training plan**, where comprehensive skills and knowledge requirements are documented using embedded system functionality. This fully configurable solution displays a checklist of key learning objectives, tasks, and critical milestones of the training process. By adopting this approach, the organization was encouraged to improve the documentation of skills and knowledge while ensuring consistent delivery of training by all trainers, **reducing dependency on tribal knowledge**. Moreover, the training plan checklist was “save-as-you-go” to prevent the oversight of critical steps during multi-day, multi-modal training.

The **second step** involves assessing the trainees’ competence in both knowledge and hands-on skills, upon completing the training plan. This validation process consists of two parts: an online **knowledge test** and a face-to-face **skills evaluation**, conducted by another peer employee or an auditor. Like the training plan module, the skills evaluation checklist captures all the criteria to ensure that trainees are evaluated against a **consistent set of standards**. This assessment step provides assurance that trainees are ready to perform their job tasks, and it provides **robust evidence for future audits**.

In addition, supervisors or training coordinators often face a heavy burden in manually managing the training schedule, pairing up the right trainer with the trainee, and tracking their progress. To address this challenge, the Seertech Solutions’ LMS was configured to automate and maintain an up-to-date list of qualified trainers and skills evaluators. By leveraging the system’s capabilities, supervisors can easily assign trainers and skills evaluators to trainees in the system, streamlining the entire training management process. Moreover, the assignment record provides an audit trail and **improves ownership of the training program** by the entire team.

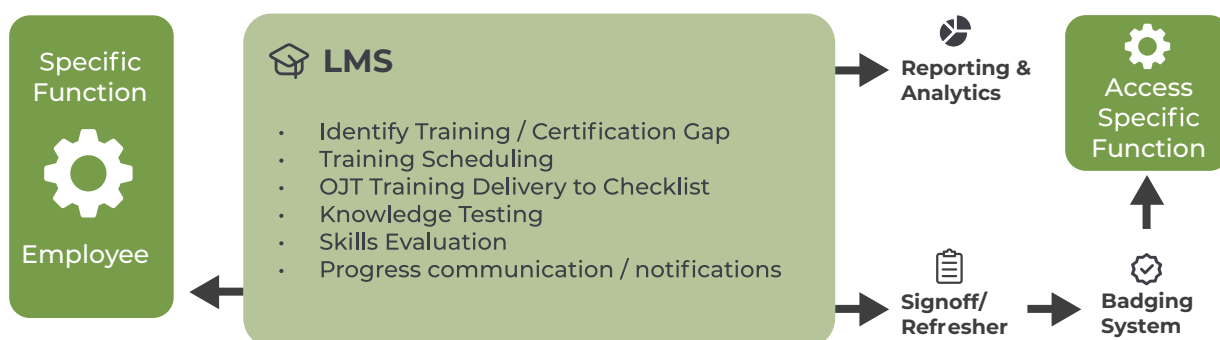
The **third step** is the supervisor’s **sign-off**. This final step completes the structured OJT process and signifies when the employee is **“certified” to work independently** on the process or equipment. Also, to maintain the employee’s knowledge and skills over the course of their career, a refresher training frequency can be configured in the system. This activates automated reminders for employees and their supervisors about upcoming training expiration.



- **Skills Matrix visibility** – the task of managing **shift coverage gap** and assessing workforce skills requirements can be challenging and time-consuming. However, with Seertech's automated skills matrix dashboard, supervisors can streamline this process, allowing them to efficiently handle their workforce and also offer transparent career development paths.

			<table border="1"> <tr> <td>C</td><td>Competent</td></tr> <tr> <td>I</td><td>Incomplete</td></tr> <tr> <td>D</td><td>Coming Due 30 days</td></tr> <tr> <td>X</td><td>Expired</td></tr> </table>											C	Competent	I	Incomplete	D	Coming Due 30 days	X	Expired
C	Competent																				
I	Incomplete																				
D	Coming Due 30 days																				
X	Expired																				
Name	Shift	Job Role	Safety Training	CPR Certification	Lockout / Tagout	Bloodborne Pathogens	Fall Protection	Electrical Safety	Equipment Group 1	Weekly Maintenance	Monthly Maintenance	Troubleshooting	Pump Rebuild	Annual Maintenance							
John	Day	Equipment Technician		C	C	C	C	I		C	C	C	C	I							
Danny	Day	Equipment Technician		C	C	I	C	I		C	I	I	I	I							
Sarah	Day	Equipment Technician		C	X	I	C	X		D	C	C	C	C							
Tom	Night	Equipment Technician		C	C	C	C	C		C	C	I	I	I							
Alice	Night	Equipment Technician		C	C	I	C	C		C	C	C	C	C							
Frank	Night	Equipment Technician		C	C	D	C	X		C	C	C	I	I							

- **Automating Training Assignments** – with hundreds of mandatory training assignments across thousands of employees with various job functions, manually assigning the correct set of training can be difficult. Using the Seertech Solutions' capabilities, most of the training assignment tasks are now automated, and **over 1 million automated assignments** have been executed since inception. This means that over 1 million opportunities for human error were avoided through automated, consistent, and controlled assignments.
- **Auto Gating Factory Equipment & Facility Access** – factories contain hundreds of pieces of equipment so ensuring that only qualified employees operate them safely and properly is a mission-critical need. An automated, integrated system solution was implemented to connect Seertech Solutions' training record status to the company's badge system. It provided the mechanism for employee access control for factory equipment operation and/or facility access. If the employee's training was not up-to-date, they would be automatically restricted from accessing equipment or facilities. This integration utilized the employee's badge as the access control vehicle, but other options like facial or fingerprint biometrics could also be utilized. The Seertech Solutions' unique flexibility to integrate with other business processes sets it apart from other learning systems on the market, and it has become a critical requirement for many manufacturing organizations.



MEASURING SUCCESS

The multi-year change management and enterprise-wide system implementation have been a rewarding journey, seamlessly integrated without any disruption to factory production capacity. The key success metrics demonstrated significant **Cost Savings** and remarkable improvements in **Productivity, Quality,** and **Safety.**



38% reduction in time-to-contribution for US factory technicians



\$1M cost savings annually



~10K person-hours saved annually through going paperless and via system automation



1M+ automated training assignments, eliminating manual tasks



Developed over **13K structured OJT** and counting, as the organization continues its journey to better document skills and knowledge



Eliminated **~90% of human error** and safety incidents associated with inconsistent training



Achieved **>99%** on-time mandatory training completion rate across all factories worldwide

SUMMARY

To address the manufacturing skills gap and its impact on the US economy, it is essential to understand its root causes thoroughly. However, this is just the beginning of the journey. Manufacturing companies must adopt a strategic and holistic approach to bridge the skills gap effectively and become the employer of choice. This involves creating end-to-end talent processes to identify, recruit, onboard, retain, and develop employees more efficiently.

One of the most important first steps in this journey is to address the fragmentation and disparities in the training processes and supporting systems. Only by establishing enterprise-wide standardization, companies can begin to work on improving employee training consistency and effectiveness, but this requires a strong change management process.

Through standardization efforts for both business processes and the learning management system, companies can enhance the overall employee experience, boost productivity, ensure high-quality output, and achieve cost savings. A comprehensive solution will enable organizations to achieve their goal of developing a skilled and competent workforce capable of meeting the demands of the manufacturing industry.



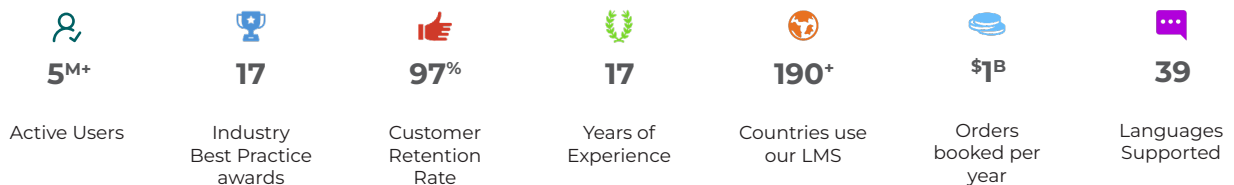
GET IN TOUCH

If you are interested in learning more about this case study and how it could benefit your organization, we encourage you to reach out to us. With over 20 years of experience, we have been assisting complex organizations, including manufacturing companies, in managing their enterprise-wide learning and certification requirements.

At Seertech Solutions, we have the expertise and flexibility to design and manage a comprehensive learning solution tailored to your specific needs. Our capabilities allow us to consolidate multiple learning systems into a single platform, providing support for a wide range of training requirements. Whether it's heavily regulated and compliance-driven training, revenue-driven learning e-commerce, or standard corporate learning needs, we have you covered.

Please feel free to contact us for an initial consultation to discuss how our solutions can address your organization's unique challenges and contribute to your success in developing a skilled and competent workforce. We look forward to the opportunity to collaborate with you and support your learning and development endeavors.

WE ARE THE LAST LMS YOU WILL EVER NEED



LET'S CHAT

www.seertechsolutions.com | info@seertechsolutions.com

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