Addressing Training Challenges in Manufacturing

Addressing the labor shortage

Manufacturers are facing a shortage of skilled workers, and have been for years - even before the record lows in unemployment. Retiring workers, economic expansion, and a widening skills gap are all contributing factors. According to the U.S. Bureau of Labor Statistics, the average tenure of a new worker in manufacturing is just 5.3 years. The hardest positions to fill are typically the ones that have the biggest impact on performance. Technical positions such as controls engineers, skilled operators, technicians, and machinists, are critical to expanding operations and improving productivity. These are also the positions that require the most training and investment.

In a National Association of Manufacturers Outlook Survey (Fourth quarter 2018), 77 percent of manufacturers cited an inability to attract a quality workforce as their top challenge. Nearly 30 percent claims it has forced them to turn down new business opportunities. When asked how they are addressing the skills shortage, 65.5 percent of manufacturers mention the creation or expansion of internal training programs.

However, companies are struggling to train and cross-train people fast enough, to achieve the kind of labor flexibility needed in today's increasingly complex low volume - high variety environment. While different industries and manufacturing environments may have varying practices and priorities, no manufacturing professional will dispute the importance of high-quality training. The key question is how to provide this training in the most efficient and most effective way possible, using the best methods, tools and technologies available.

Figure 1: Most Effective Training Delivery Method

The latest Workforce Training Survey, collected by Informa Engage on behalf of IndustryWeek (June 2018), demonstrates that little has changed as far as industrial workforce training delivery methods are concerned. Manufacturing companies are still most likely to use hands-on training.

According to the survey, seventy-five percent of respondents indicate that on the floor (pairing) methods are most effective. Classroom training is a distant second in terms of use and effectiveness.

The Workforce Training Survey also suggests a disconnect between the practices and limitations of industrial companies. On the one hand, companies seem to be relying on traditional, in-house systems, which involve cumbersome tracking methods and require a significant amount of operational support. On the other hand, the majority of respondents indicate a lack of operational resources to sustain this strategy.

Informed reality as a training tool

Internal training programs are key to developing the talent manufacturers need. However, legacy methods such as training manuals and job shadowing are outdated, time consuming and not effective enough. Also, these methods do not optimally address the need to cater to the four main learning styles: visual, auditory, verbal and kinesthetic.

Informed Reality (IR) glasses provide a simple heads-up display, aimed at providing deskless workers with relevant information needed to perform their jobs efficiently and effectively, all without significantly impacting the user's field of view.

As informed reality base solutions deliver interactive, intuitive and hands-on guidance in real-time, they are starting to play a significant role in modern training approaches. Unlike traditional paper or monitor-based work instructions, informed reality is dynamic, interactive and adaptive – ensuring that operators complete tasks efficiently and without errors.

Flexible, scalable and customizable, these new informed reality tools are designed with integrated audio and visual cues that provide real-world and real-time guidance, pacing, and direction.

This No Fault Forward (NNF) type of technology makes these tools and ideal fit for training applications, teaching operators to use the right parts in the right sequence, all while collecting detailed data and providing detailed data analytics for trainers and supervisors to review process and progress more accurately, more efficiently, and in a lot more actionable detail."

Benefits of Training with Smart Glasses:

- *Make training visual, auditory, and kinesthetic*
- *Provide step-by-step visual and oral instructions, in real-time*
- *Help identify the proper tools and parts required for a task*
- *Provide step-by-step easy to follow instructions*
- *Alert and correct missteps along the way, providing real-time feedback*

Training Uses Cases

Use Case	Pain Points	Solution Description	Benefits
On-the-job training	• Companies are struggling to cross-train people and achieve the kind of labor flexibility needed in today's low volume - high variety and increasingly complex environment. • Companies are struggling with an aging workforce and a "boomer" generation that is retiring at a high pace.	• Proceedix helps speed up training and improve ongoing job performance by making work instructions readily available. • Proceedix supports cross-training and enhances people's skills to where they are able to easily switch between different jobs. • Proceedix makes it possible to standardize training and make it much more consistent.	• Reduce training time by up to 70% while increasing operator skill levels and performance. • Instantly increase productivity of new hires as they no longer need to go back-and-forth to check procedures on a computer work station, or flip through binders full of paper-based work instructions.
Training Efficiency	• Operators are not trained well enough due to ineffective training tools, both from a content and a delivery perspective. • Training is not very consistent, as it is performed by different people in different ways.	• Proceedix tracks how much time a trainee spends on each step of a work instruction, and allows for picture- or video-taking to help assess the trainee's performance.	• Provide self-training of new associates, instead of experienced workers losing hours of productivity while training others. • Deploy new employees on your production line, not only as productive workers, but also as data collection agents.
Best Practices consistency	• Widening skills gap between experienced workers and new hires by not capturing the "tacit knowledge" and best practices present in experienced workers - before they retire.	• Proceedix helps bridge the widening skills gap, allowing experienced workers to capture their processes and best practices ("tips & tricks") to improve the skills of new and less-experienced employees.	• Capture the "tacit knowledge" present in experienced workers, to help prepare the next generation of factory workers.

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Return on Investment

It is rare to encounter a new technology that has such incredible impact on people's productivity as smart glasses and informed reality. Costs, benefits, and returns will of course depend on the specific situation and use case. According to the Workforce Training Survey, new operators receive an average of 18 days of training, and some jobs require a lot more time than that, for a new operator to become fully productive. By using smart glasses for operator and inspector training, AGCO has been able to reduce the time needed to train new employees by 50-70%.

Operator Efficiency:	week 1	week 2	week 3	week 4	Results Over 4 Weeks		
Perfomance efficiency without smart glasses:	25%	50%	75%	100%			
Cycle Time over the training weeks:	180	90	60	45	Average Time Cycle :	93.75	Min
Productive output per 8 hours shift:	2.4	4.8	7.2	9.6	Average production:	5.97	Units
						Performance Improvement:	
Perfomance efficiency with smart glasses	50%	100%	100%	100%			
Cycle Time over the training weeks:	90	45	45	45	Average Time Cycle :	56.25	Min
Productive output per 8 hours shift:	4.8	9.6	9.6	9.6	Average production:	8.36	Units
						40%	

Figure 2: Average cycle time improvement during training period

The example in figure 2 above assumes a normal training time of 4 weeks for an operator to achieve the standard cycle time of 45 minutes for a complex job: starting at 180 minutes and improving performance by an average of 25% every week. Reducing training time on cross-functional operations fourfold would reduce the average learning time from 4 weeks to one week. Using digital work instructions on smart glasses, the target cycle time can be achieved by the end of week one already.

During the 4 weeks' training period, the manufacturer in our example above is not just able to reduce the average cycle time by 40%, but - in line with the achievements demonstrated at AGCO - can also reduce the total quality defects by up to 25%. This combination of performance and quality improvements results in an increase in productive capacity of 77.1% over the course of the training period.

> *Using digital work instructions on smart glasses, a 75% reduction in training time combined with a 25% reduction in quality defects, even for just 10 operators per year, could provide 114 % in extra operating profit over the course of the training period.*

(To calculate OEE based ROI of smart glasses implementations in manual assembly environments, read our white paper: "Smart Glasses on the Shop Floor: ROI Assessment based on OEE Improvement".)

About Gemba Systems Inc.

Gemba Systems Inc. supports manufacturing companies in the digitalization of their operations, especially focused on improving their manufacturing execution systems. We help companies navigate the complex and fast-evolving landscape of "smart manufacturing" and the Industrial Internet of Things. We offer guidance, tools, and hands-on support in the selection and implementation of those industry 4.0 technologies that will best support our clients' most critical business processes, and the people who perform them.

For more information, please visit www.gemba.systems or
to receive your own training use case ROI, contact us at alain@gemba.systems.