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SKILLING FOR AUTOMATION

Manufacturing in the age of the robot



Summary

Digital technologies, such as automation and AI, are set to alter the composition and capabilities of the manufacturing workforce forever. Disrupting how things are made, they are transforming the skills and labour markets around the globe. Tasks and jobs are changing; manufacturers require different capabilities and skill sets from their employees.

> ...new technologies like AI and robotics will create many new jobs. Some of these new jobs will relate directly to these new technologies, but most will just result from the general boost to productivity, incomes and wealth that these technologies will bring. As these additional incomes are spent, this will generate additional demand for labour and so new jobs, as such technologies have done throughout history².

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Advances in automation technologies mean that people will increasingly work side by side with robots, smart automation and artificial intelligence. How will humans and machines combine to add value?

As PwC asserts: "Technology will create jobs for people who can design, monitor, maintain and fix technology; jobs for people who can optimise human-technology interaction, e.g., behavioural economics; jobs for people in sectors that benefit indirectly from technology; and new versions of 'old-world' jobs"¹.

With this change upon us, the sector's workforce will continue to transform. As old jobs become redundant, new roles are created. New skills are needed. And retraining programmes are required to help workers shift to new roles and take on new tasks.

This report is for policymakers, educational institutions, employers and training organisations charged with helping the manufacturing sector to transform. It looks at the evolution of roles in the new look workforce, and some of the skills needed for the sector to capitalise upon the opportunities already upon us.

AI (Artificial Intelligence)

Artificial Intelligence, also known as machine intelligence, is a branch of computer science that focuses on building and managing technology that can learn to autonomously make decisions and carry out actions on behalf of a human being.

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AI

(Technopedia)

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Automation

Automation is the creation and application of technologies to produce and deliver goods and services with minimal human intervention. The implementation of automation technologies, techniques and processes improve the efficiency, reliability, and/or speed of many tasks that were previously performed by humans.

(Technopedia)

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Automation adds value

Disrupting all aspects of manufacturing, automation takes many forms. Robotic arms on production lines, cobots that assist humans in manual tasks, and robotic process automation (RPA) to automate routine business processes to name just a few. Beyond enabling reduction in labour costs, automation can raise throughput, increase reliability, and improve quality, among other performance gains³.

Automation will change the shape of the manufacturing workforce forever. It will continue to drive productivity gains, and economic performance.

Organisations including the World Economic Forum, PwC and Deloitte predict a range of gains and changes associated with automation and Al.

42%

Machines and algorithms predicted to contribute 42 per cent of total task hours by 2022, compared to 29 per cent in 2018⁴.

45%

of existing jobs in manufacturing could potentially be automated by 2030².



97 million

The shift to automation could create 97 million new jobs by 2025. However, it will disrupt 85 million jobs in the process⁵.

By 2025

the time spent on current tasks at work by humans and machines will be equal⁵.



1.4%

Automation could raise productivity growth globally by 0.8 to 1.4 per cent annually³.





Technologies such as AI, robotics and other forms of 'smart automation' could contribute up to 14 per cent to global GDP by 2030⁶.





of manufacturing respondents reported using advanced technologies to redesign job tasks (e.g. automating previously manual tasks)⁷.

75%

of industrial organisations identified reskilling the workforce as important or very important for their success over the next year, but only 10 per cent said they were very ready to address this trend⁷.



Global perspectives

The top 25 countries prepared for the rise of automation³

CANADA 5 RUSSIA 16 GERMANY 2 US 9 UK 8 **ESTONIA** FRANCE 12 11 ITALY 23 MEXICO 15 TURKEY 21 SAUDI ARABIA 18 INDIA COLOMBIA 20 14 19 BRAZIL SOUTH AFRICA 22 ARGENTINA 17

The increasing use of advanced technologies, such as automation and Al, is expected to have a major impact on the manufacturing sector globally. Not in a consistent way, though. Manufacturing automation is more likely to be adopted sooner in countries with high manufacturing wages, such as North America and Western Europe, than in developing countries with lower wages³.

"The Automation Readiness Index (ARI): Who Is Ready for the Coming Wave of Innovation?" from ABB and The Economist Intelligence Unit found that even the best-prepared countries must develop even more effective education policies and training programs, as well as place a new emphasis on continual learning over the course of a career⁹.



The upskilling and reskilling challenge

Automation and AI have the potential to transform manufacturing into a highly connected, intelligent, and more productive industry. Adding more sources of automation could help maintain or enhance production, but do they put additional pressure on manufacturers to upskill workers quickly to work alongside the new technology?

As manufacturers deploy automation, replacing legacy processes and systems with those that are more suited to handle newer technologies, they will need to consider the skills requirements of the new look workforce. The sector needs to make sure jobs and associated skills keep pace with advances in automation. As technologies advance, new jobs and career pathways will emerge. How can the manufacturing industry ready its workforce to work beside robots and advanced technologies? What skills are needed? How does industry, academia and other training providers work together to make sure these skills are available, when needed?

Training will be needed to help workers acquire both the digital and softer skills which will be demanded in the future and to support for those who lose out from the impact of automation².

The World Economic Forum talks about "Closer collaboration between individuals, educationalists, education innovators, policy-makers, and businesses can introduce greater efficiency and allow for the scaling of re- and upskilling efforts. A programme of updating work, talent frameworks and certifications, with a focus on skills as the core currency of the labour market, has the potential for wide-ranging positive consequences on how we learn and earn, with positive repercussions for business, individuals, economies and societies"¹⁰.

As automation and work converge, skills gaps are set to change at a faster pace and at a greater volume - leading to both talent shortages and job redundancies. To remain relevant and employable, workers are faced with the need to re-evaluate and update their skillsets; companies face a pressing need for innovative talent sourcing, matching and development strategies; and educators face pressure to update the focus of their courses and offerings¹⁰.

Evolution of roles

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The workforce and workplace practices will continue to evolve as automation becomes more and more commonplace. Increasingly blending human capabilities with technology, factories of the future will look very different to the ones we see today. As a result, some roles will become obsolete, and new ones will be created. Existing roles will change – Deloitte highlighted five roles experiencing a high level of evolution¹¹.

To remain relevant and employable, workers are faced with the need to re-evaluate and update their skillsets. Companies face a pressing need for innovative talent sourcing, matching and development strategies; and educators face pressure to update the focus of their courses and offerings¹⁰.

Production planner

Changes

- From reactively managing shop floor issues to analysing data insights, managing exceptions and identifying opportunities for continuous improvement
- From manual processes for monitoring supply and inventory positions to using predictive analytics and digital twins to create optimised production schedules and proactively manage supply issues

The industrial engineer

Changes

- Increasing use of digital twins and other methods of automation, to create greater connectivity between manufacturing processes and optimise shop floor operations
- Focus on optimising human-machine interactions

The operator

Changes

- In the future, operators will use digital tools, such as digital twins and AI "recommendation engine" support, to proactively identify and solve issues
- They will be trained as generalists who can work across machines and product lines

Line leaders

Changes

 Line leaders will move from manual work and reactive problem solving to proactive issue identification and prevention through automated processes and tools

Quality engineers

Changes

- In the future, they will be able to monitor processes in real time, predict quality issues before they occur
- They will trace and diagnose any issues through the use of digital twins, machine learning models, advanced analytics and the ability to embed intelligence quality controls

New skills include

- Business acumen
- Continuous improvement
- Data analysis and visualisation
- Digital twins
- Understanding of the impact of robotics and IoT sensors

New skills include

- Greater technical acumen
- Design for manufacturability
- Data science
- Programming languages such as python and R
- Implementation of technologies including co-bots, IoT sensors and digital twins

New skills include

- 3D models for model-based manufacturing
- Predictive and prescriptive maintenance practices

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- Interpret and act on insights from digital twins
- Work collaboratively with robots on automated production lines

New skills include

- Coaching
- Team management
- Using real-time production data to determine root causes and prevent recurring issues
- Predictive and prescriptive maintenance
- Understanding of IoT, digital twins, robotics, and automated machinery

New skills include

- Analytical thinking skills
- Ability to use 3D models for model-based manufacturing
- Understanding of how to collaborate during design iterations as part of an agile team
- Understanding of big data, data science and machine learning
- Ability to create, manipulate and interpret data insights from virtual models of production processes such as digital twins

Make skilling automatic



40%

Automation will double the gross value added across 12 developed economies by 2035, with labour productivity levels rising by up to 40%¹².

30%

As the relative unit labour costs fall in developing economies and small and medium-sized enterprises (SMEs) take to production using robots, productivity can rise by 30%¹³.

A collaborative approach is needed. Government, employers and education providers, should invest in the types of education and training most useful to people in this increasingly automated world.

Education systems should be upgraded to provide digital skills and critical thinking skills, alongside job-specific skills, through schools and universities. Reskilling, upskilling and education curricula updates are central to equip existing and new workers for success. Existing workers need access to training programmes, allowing them to develop the skills they need to ensure they don't become obsolete as their roles disappear.

In order to stay one step ahead of the robots, there needs to be increasing focus on lifelong learning. Academia, industry and training providers can all play a part.

For further information about KnowledgePoint and our role as the Autodesk Learning Partner Distributor for the EMEAR territory, or to find out about training local to you, visit:

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