WHITEPAPER

Industry Artificial Intelligence - a Game Changer in Manufacturing

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Industry artificial intelligence (IAI) is a literal light bulb moment for manufacturers. Electricity – and particularly the facility to work safely beyond daylight hours – drove industry into the 20th century. The switching-on of artificial intelligence on factory floors will power the next generation of industrial manufacturing, sparking unimaginable enhancements in productivity and product quality through manufacturing process optimization.

Artificial intelligence is a method of processing data to automate the decision-making, problem-solving, and execution involved in manufacturing process management. A factory powered by the Internet of Things (IoT) can expect its IAI to:

1. **Automate** complex tasks
2. **Monitor** and **respond** to data in real-time
3. **Increase** efficiency and quality of production
4. **Communicate** internally and with remote suppliers or customers
5. **Learn** and **improve** by itself and with human input.

Taken by themselves, these seem like fairly straightforward advances. Combined, facilities like these can transform the industrial landscape, resolving challenges that have plagued manufacturing since long before the invention of the light bulb.

Optimize asset, supply chain, and inventory management

The smarter 'smart factories' get, the more optimized manufacturing management will become. **Machine learning** is the element of artificial intelligence that deals with the way computers can produce better, more decisive analysis with each roll of the dice.

Algorithms not so very different from those Google uses to deliver targeted ads to your browser are being employed to predict market changes on the micro and macro level.

In the past, management would respond to market changes retrospectively – like slamming on the breaks (or hitting the gas!) right after they'd passed the window of opportunity. This **time lag** is becoming a thing of the past.

AI algorithms are becoming more and more adept at analysing growth trends. But as they get smarter, the patterns that they identify will take into account not just sales and supply chains, but every little detail that affects the market, from location and economic conditions to politics and the weather. And they'll tell manufacturers before it happens.

Working **strategically** rather than responsively allows manufacturers to optimize the entire production process. Staffing levels can be more efficient. Energy use may fall – or at least be directed more efficiently. Manufacturers are **gaining more control** over the raw materials they buy and the saleability of the end product, with obvious benefits for warehouse costs and wholesaling.

In fact, the pairing of IoT with manufacturing analysis has already **boosted manufacturing productivity by 15%** in terms of innovation delivery and supply chain performance.

Improving machinery acquisition and maintenance

Unexpected technical hitches cost manufacturers $50 billion annually. But remember how IAI can see into the future? It works for machine maintenance, too.

Predictive maintenance is the use of algorithms that learn from a factory's patterns of work and maintenance, and from external data to create accurate forecasts of how and when a machine will fail.

This can have three key benefits for a manufacturer:

1. Knowing in advance how and when machinery is likely to fail allows for pre-emptive maintenance, which can be **cheaper and quicker** than fixing a machine that's gone wrong.

2. Preventing a machine from breaking, rather than fixing it after the fact, **extends the machine's Remaining Useful Life** (RUL).

3. Predictive maintenance **reduces the risk** of faulty machinery continuing to underperform or over-consume energy without users noticing.

What's more, sensors and productivity analysis within a manufacturer's machinery can allow them to make more **informed choices** when the time comes to replace or upgrade it.

Improve your products

Generative design allows engineers to try out multiple configurations of all the potential design variables for any given product – a process that would be unfeasible without AI, for both economic and timescale reasons. When you're happy with your prototype, testing can begin virtually to pre-empt design flaws.

And those same algorithms that spotted problems with the machinery can be used to analyse the performance of a manufacturer's products after they hit the market. Manufacturing at a large scale has always involved the risk of identifying production faults once the bird has flown. It's not good news to end up with a warehouse full of less than perfect goods or to develop a reputation as a manufacturer whose products don't stand up to real-world use.

IAI can continue to highlight deviations or abnormalities in the production process so that designers can address these problems before significant damage is done.

And if your product has a digital or connectivity element to it, it is, of course, possible to **relay performance feedback from the field**, as consumers use it in real-world scenarios.

Reduce your environmental impact

People commonly misunderstand that the digital replacement of analog systems, for example storing the equivalent of hundreds of paper books on a Kindle, is good for the environment.

It's important to realize that there is always an **environmental footprint** with electronic advances like this, whether it's the aggressive mining of nickel, cobalt, and graphite for lithium-ion batteries or the rare earth elements that make advanced AI and super-intensive computer processing feasible. Already, **2% of all electricity** used in the US is eaten up by data centers.

But even taking that into account, secondary effects of IAI may help reduce a manufacturer's impact on the environment. **Improvements in manufacturing planning** are forecast to **cut supply chain forecasting errors in half** and reduce lost sales by 65% which is a significant economic and ecological boon for business. We've already seen how energy usage can be slashed with productivity optimization. And predictive maintenance processes mean less waste.

Forward-thinking manufacturers are also using the power of AI to develop **new, eco-friendly materials.** These operate either as alternatives to existing materials such as plastics or to make existing processes more **energy-efficient**, such as the use of metal oxides to improve cell efficiency.

Steps like this are essential for the future of our immediate environment, planet, and descendants. But they also have direct appeal for manufacturers, for whom disposing of toxic materials and other side-products is costly and time-consuming, and who understand that **today's consumer shops with their conscience**.

Create jobs, improve conditions, raise wages

While many are concerned that increasing automation will cost jobs, it is likely that increases in productivity and IAI-driven safety mechanisms will improve conditions and job prospects as manufacturers flourish.

“This is a history that goes back to the beginning of the Industrial Revolution,” as Mark Johnson, former director of the Advanced Manufacturing Office in the U.S. Department of Energy, puts it.

“The one thing is that as we wind up with **more technology**, you end up with **more productivity**, and that firm winds up being **more competitive**. Their business grows, and you end up with more jobs.”

The shape of work may change, and it will be in flux as manufacturers introduce and develop their AI systems. But ultimately, we will always need human labour to **bridge the gap** between the robot way of seeing things, and the complex moral and systemic nature of the ‘world outside.’

Manufacturers are divided into IAI ‘believers’ and IAI ‘doers’

Artificial intelligence in manufacturing has been on the horizon for long enough that **70% of businesspeople** believe in its **power to transform their industry**. But AI remains a somewhat alien concept to a lot of us, so those who are actually taking bold steps to make it happen are in the minority.

More than **60% of global manufacturers** are flirting with the use of IoT to process data from connected products and manufacturing. But those who **envision**, **invest**, and **develop their IAI strategy at scale** represent just the tip of the iceberg. Only 2% of companies have achieved this successfully so far, with over 50% falling at the first hurdle: transforming that belief in AI into a vision for their company’s future.

What this represents is a massive opportunity to **get ahead of the pack**. To research, plan, evangelize, and get senior management onboard for changes that may make the difference between failure, mild success, or phenomenal growth over the next five-ten years.

IAI solves traditional manufacturing problems

By collecting and processing data on a scale that's unfeasible without machine learning, artificial intelligence can provide **productivity insights** beyond that which could have been imagined during industry's previous 'light bulb' moments.

You can also use IAI to put these insights into action through the **automation** of manufacturing and administrative processes. And because it's all about efficiency and better returns on investment, when you get it right you get to **build on your success** with further development. You make better use of your existing workforce and create a better product that encourages a bigger customer base.

Discover how things work in one example and see how it can benefit you.

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