

WHAT CAN **AI**  
DO FOR YOU:

LEVERAGING **AI**  
**TO MITIGATE**  
RISK IN THE  
**CONSTRUCTION &**  
**MANUFACTURING**  
VERTICALS

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 **imagin.ai**

AI or Artificial Intelligence is already working in manufacturing and construction — you just might not realize it. While AI has appeared in various forms on the manufacturing floor or job site, it has yet to take hold in a revolutionary way. But that revolution is coming.

People often think of AI as robots, machines that will automate manufacturing and construction processes and replace humans at their jobs. Not so. Recent changes in AI have made much more possible. Our vision of AI is to mitigate risk and help these industries operate more safely and efficiently.

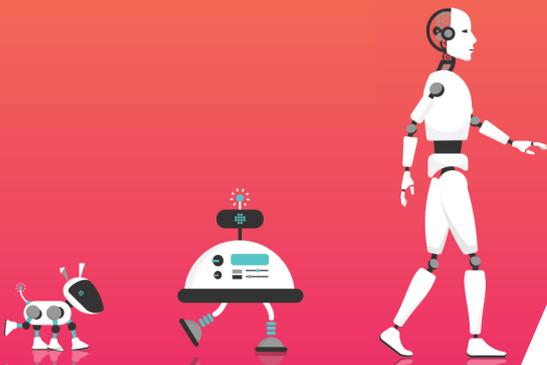
# What is AI?



First, let's take a look at the basics. What is AI? English mathematician Alan Turing created the phrase "artificial intelligence" in the 1950s. The goal was (and is) to build machines (computers) that we consider "smart," and have the ability to learn. Applied AI has led to systems that can trade stocks and drive an autonomous vehicle. With AI, computers are trained either through human interaction or by themselves.

Thus far, AI has been limited by our technology and its abilities. However, computers have become far more powerful in the last decade; we can now ask machines to do more. The dream was always to create computers that could almost think like a human. While that goal is not yet realized, large companies such as IBM, Google, Microsoft, and others have made significant improvements in both machine learning and deep learning, two subsets of AI.

Machine learning refers to computers that learn how to do a task on their own based on large amounts of data. With deep learning, the program's many layers inside neural networks build upon each other to process information so well that it can teach itself tasks and use context to reach conclusions.



1. Robotic Industries Association. Unimate - The First Industrial Robot. Retrieved from <https://www.robotics.org/joseph-engelberger/unimate.cfm>

2. Green, Peter (2017, April 10). The Failure of Artificial Intelligence in Manufacturing. Retrieved from <https://www.mbtmag.com/article/2017/04/failure-artificial-intelligence-manufacturing>

# AI in Manufacturing

Robots famously debuted in the factory in 1962, when General Motors launched Unimate. Yet these dumb machines could only perform a single task. Today's robots are far smarter, often cause for concern among those who fear for their jobs. However, Dr. Peter Green observes that these systems cannot replace a human's capacity for general knowledge; they can only manage specific tasks. Further, companies that invested in robots are now world leaders, employing far more people than before.

Besides, AI is alive and well in manufacturing today in other areas — though you may not realize it. As Green puts it, AI in many industries is often a failure, because by the time it reaches the floor, it has another name.

Here is how  
**AI** is  
working  
for you today:

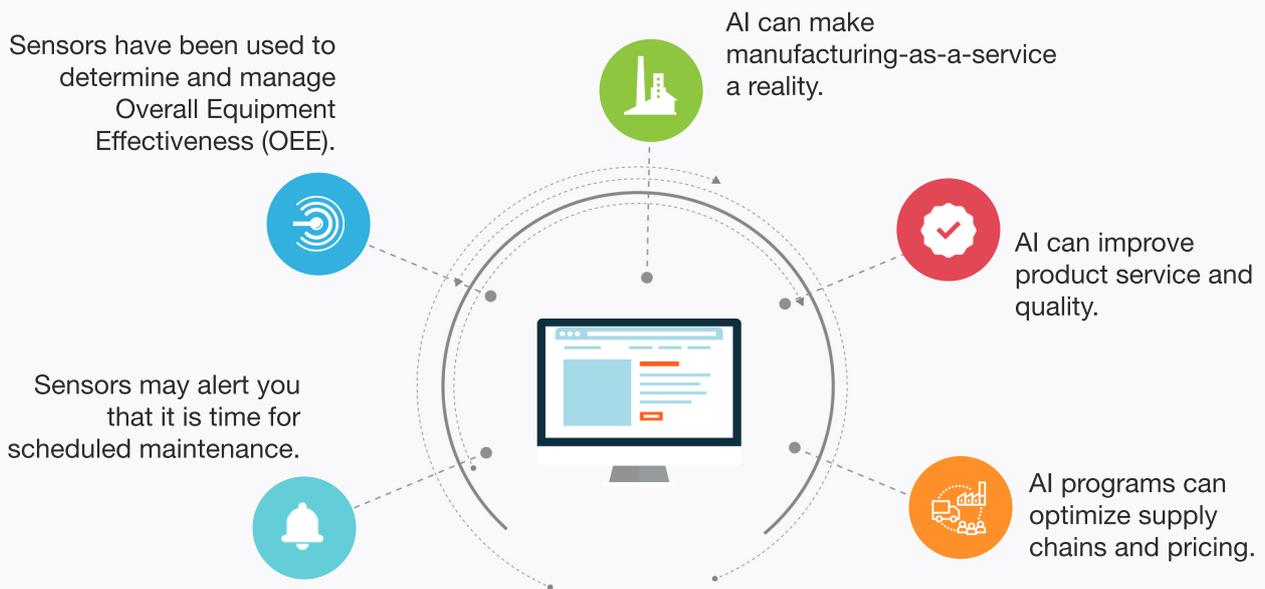


-  Assisting production managers with orders.
-  Warning managers if they are going to choose wrong or defective materials.
-  Preventing barcode labeling mistakes.
-  Rescheduling operations as new orders arrive.
-  Accounting for problems on the production floor.
-  Alerting managers to supply issues.

You know AI as Manufacturing Execution Systems (MES), Work-in-Process (WIP) tracking and Warehouse Management Systems (WMS). All of these systems are most likely leveraging some form of AI.

# Predictive Analysis

As AI continues to appear in manufacturing, it will likely improve upon those systems and add to them. We see a use for predictive analysis. The Internet of Things (IoT) has given us a way for sensors to communicate bits of data to a computer wirelessly. For example, if a sensor spots a defect on the production line, data is transmitted that notifies a computer, which then pulls the part and automatically orders a replacement. In the near future, a robot may receive the incoming part and install it.



Sensors will soon be everywhere doing these types of jobs. For example, based on vibrations, or changes in electrical signals, a sensor might alert the program that something is about to go wrong on the line, giving humans a chance to address problems proactively. We can pair the software with hardware now available: off-the-shelf sensors and microphones as well as thermometers, magnetometers, beacons, and thermal and regular cameras.

Manufacturing has touted efficiency, using Lean principles to make production faster and cheaper. The algorithms of AI can find ways to increase capacity, lower costs, and lower material use. AI can provide relevant data across all areas of a company, from finance to operations to supply. In many manufacturing companies, these systems are not connected. AI's machine learning can change that to optimize workflows.



# Risk Mitigation

Not only could AI programs use your past company data, but it would pull in real-time information such as news about the peak flu season each year and the weather forecast to warn you when 20 percent of your team is going to be out ill. AI could analyze past data, learn from it, and find patterns unrecognizable to humans. AI could provide insights never before possible.

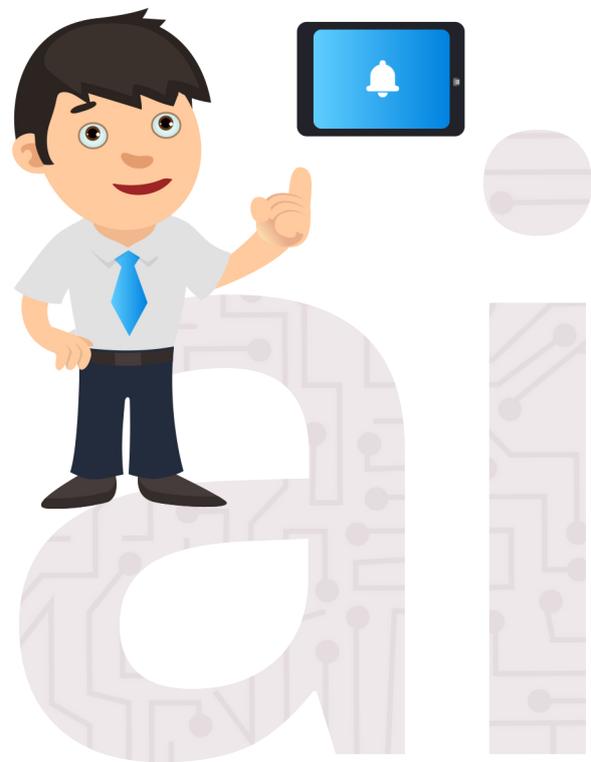
The real benefit: the program is continuously training itself, updating with new information and improving by the second. Soon, it could pinpoint the day when someone will be absent. Here are some other areas of risk in which AI programs could assist:



## Human Risk

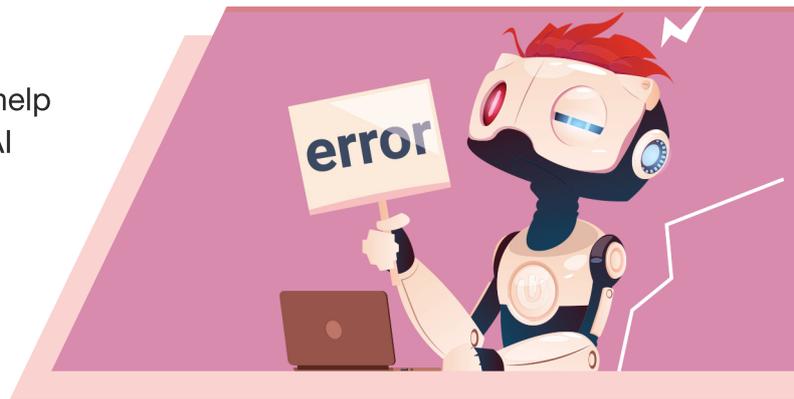
We mentioned sick days. What if more than one person is injured in a work accident? Both situations could mean higher costs for the company. An AI program might alert your temporary staffing agency in advance to prepare backup teams for these times.

What about human errors that cause problems? Paired with devices similar to a Fitbit, AI programs can monitor your team's levels of fatigue and dehydration. It might tell you that someone is 40 percent more likely to cause an error or have an accident during his or her shift today.

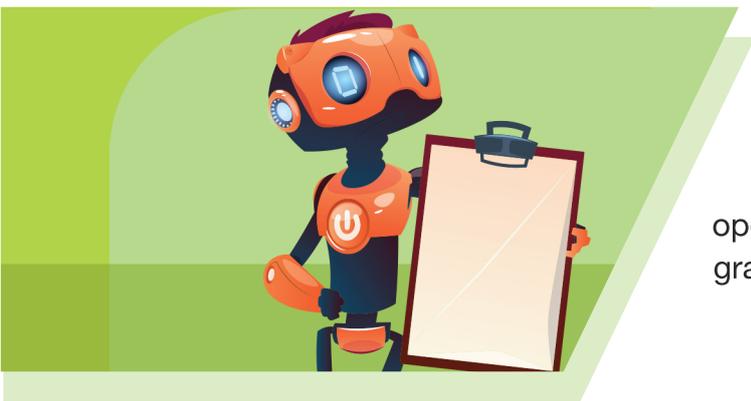


## Product Risk

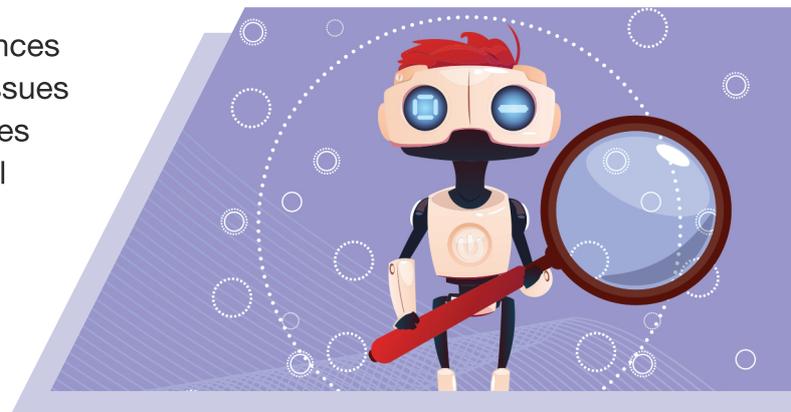
Some software programs available now can help with quality assurance, but they are limited. AI programs can catch errors made by humans and machines, making sure production is running properly.



In some capacity, human interaction is still needed to monitor systems and processes, ensuring safe levels of operation. Now, a computer running an AI program can handle those tasks with far more accuracy than humanly possible.



A program might analyze your facility's tolerances to extreme heat or cold and alert you about issues due to the forecast of 100-degree temperatures this week. For example, "Combining historical data and other metrics, your XYZ widget comes off with 0.02 percent error per 1,000." The program could inform you so you can take action, or even change settings based on that information.



Is something malfunctioning frequently? AI programs can tell you when a machine is going to fail, giving you time to shut down and fix it at a more convenient time.



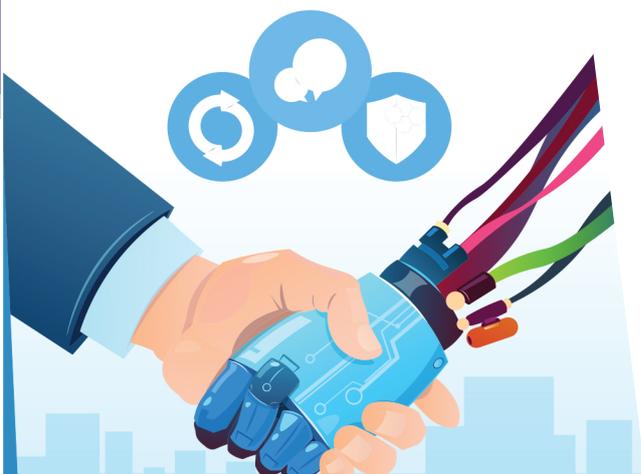
# AI in Construction

Of course, equipment comes to mind when you ponder AI in construction. Drones are already hard at work in the survey field and also managing scans and inspections.

But predictive analysis has uses here, too. Imagine you are building on a site and discover, despite earlier testing, that the site has clay instead of loam. You have to adjust your plans, which costs time and money.



Now, imagine giving a price estimate on a job based on hundreds of thousands of previous builds. The model would create the average timeline, accounting for weather, your team's sick days, errors that had to be corrected, and unforeseen problems such as the soil example. Banks might happily supply data from existing projects to lower their risk with construction loans.



AI can easily find patterns where humans see none. Those patterns might show periods of higher absenteeism or the average length of delays based on weather. While project managers plan a job based on the order in which tasks must be done — cabinets are not installed before dry-wall — an AI program could also devise a project roadmap based on historical weather patterns and the current forecast, meaning fewer days wasted, saving the company money.

Combine those powers with drones, who can watch job sites and predict daily changes. Now project managers have even more information to create a daily schedule for machines and people and allocate resources.

AI might predict on-the-job injuries based on data from the last 50 years, enabling companies to view patterns and habits that led to preventable injuries. Thus, companies could tweak processes to make the site safer.

Construction companies today are starting to use BIM (building information modeling), which is the process of designing a building collaboratively using a system of computer models instead of separate sets of drawings. By combining this practice with AI, construction teams can identify missing elements and discover problems in advance.

Similarly, data analyzed by machines can help engineers develop stronger plans, compiling information about similar projects for the past several decades, including designs. After examining them, an AI system might suggest changes to the proposed plan that will improve safety and efficiency.

# AI can also work in these ways:

**Automated Data** - Infrastructure inspection is a necessary but risky job. Drones led by humans are now gathering data without risking someone to climb to the top of the cell tower or wind turbines. AT&T and others are working to put drones or unmanned aerial vehicles (UAVs) to the task. They won't need a human to drive, and they'll recommend whether maintenance is needed.



**Virtual Reality** - Robots could someday work in inaccessible locations such as underwater or underground, alleviating human risk. Meanwhile, VR headsets can give crews new insights and tools, leveraging technology to analyze plans and maps — and even view an entire building before construction starts.

4. Green, Erin. (2016, February 3). BIM 101: What is Building Information Modeling? Retrieved from <http://www.engineering.com/BIM/ArticleID/11436/BIM-101-What-is-Building-Information-Modeling.aspx>

5. Glaser, April. (2016, October 13). AT&T technicians use drones to test signal strength and find birds' nests. Retrieved from <http://bit.ly/2gc0d25>

**New Workforce** - Construction has suffered labor shortages in recent years. As technology becomes more important than ever in this field, we may see a boom in younger generations heading into the construction sector.



**Greener Construction** - By leveraging AI programs, we can find greener and more sustainable ways to build the world around us.

**3D Printing** - While 3D printers can't quite construct a building, such printers have created small structures. Now, one company is pairing the hardware with AI software to build things, and the AI can learn from its mistakes.



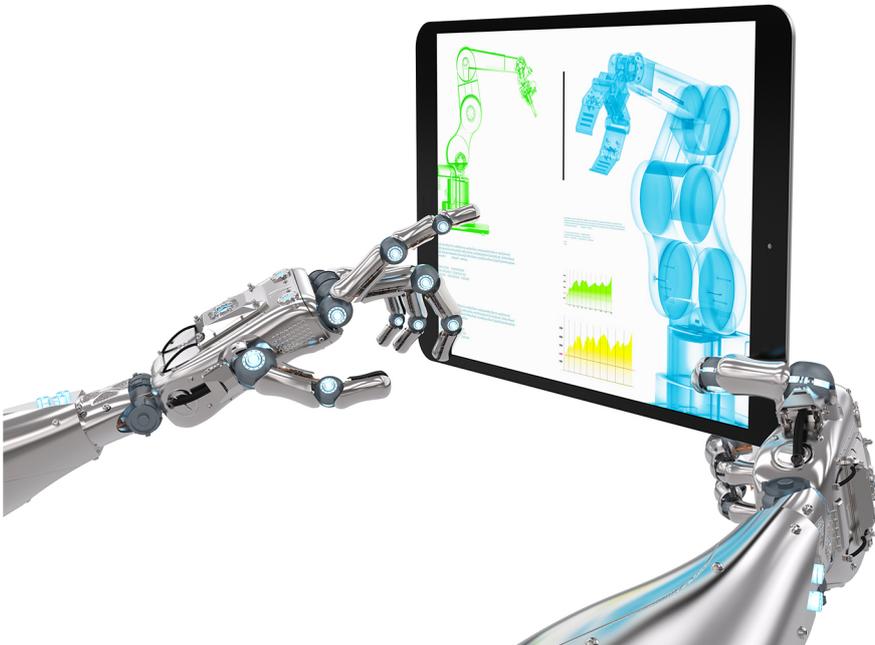
# Making **AI** Work for you

“A smart factory is a networked factory, in which data from supply chains, design teams, production lines and quality control are linked to form a highly integrated, intelligent creation engine,” according to Business Insider.

Further, as Harvard Business Review put it, “the companies that will succeed with AI are the ones that focus on creating organizational learning and changing organizational DNA. And the ones that embrace a portfolio approach rather than concentrating their efforts on that one big win will be best positioned to harness the transformative power of artificial learning.”

6. Gaudiosi, John. (2015, April 25). How This 150-Year-Old Company Uses Virtual Reality. Retrieved from <http://fortune.com/2015/08/25/mccarthys-construction-vr/>
7. Furness, Dyllan. (2016, October 16). Give a 3D Printer Artificial Intelligence and This is What You'll Get. Retrieved from <https://www.digitaltrends.com/cool-tech/ai-build-wants-to-change-the-way-we-build-the-future/>
8. Business Insider. (2016, July 9). These Factories are Crunching Production Time with AI. Retrieved from <http://www.businessinsider.com/sc/artificial-intelligence-change-manufacturing>
9. Harvard Business Review. (2017, April 18). The First Wave of AI is Doomed to Fail. Retrieved from <https://hbr.org/2017/04/the-first-wave-of-corporate-ai-is-doomed-to-fail>

While these are some ways AI could impact manufacturing and construction, the actual magnitude of how it might change the way we build and create has yet to be imagined. Imaginovation offers AI as a service, meaning our team can harness and create a custom AI solutions based on your company's needs. Construction and manufacturing have long been at the forefront of American innovation and a driving force forward. Really, where we take AI is up to you.



The missing piece necessary to bring AI to your construction site or manufacturing site is data. Company leaders who wish to leverage this power, must network production lines, quality control, orders, supply chains, and more. The good news is you most likely have this data. However, many manufacturers and construction teams rely on paper and pen for these processes.

## Contact us

to discuss how AI can be applied to improve your processes, safety, and overall business.

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