



flex®

5 Types of
Manufacturing
Technology That
Increase Speed
and Efficiency

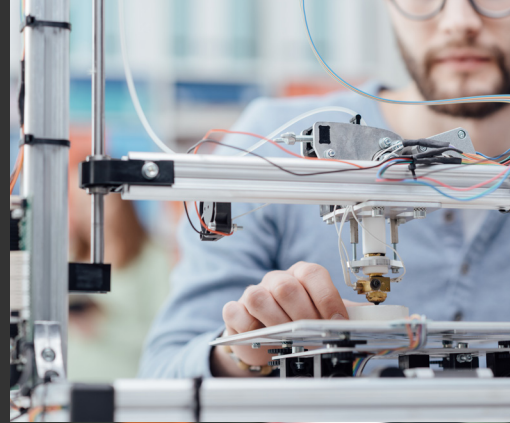
As a manufacturer, you know that one of the most effective ways to increase revenue at your plant is via increasing efficiency.

The solution: strategically integrating technology into your entire Sketch-to-Scale® process, including design, engineering, production and supply chain.

According to GT Nexus, 75 percent of executives surveyed said that digitally transforming the supply chain is important. However, many manufacturers struggle with deciding which technology to choose and how to implement it to increase productivity and efficiency.

It's common to fall prey to the "shiny object syndrome" – adopting the latest trend of technology. Instead, first determine what business problem the new technology will solve, and then make a business case for the purchase. By using data to make the decision, you can quickly see if the technology will either increase revenue or save money, which shows a clear return on investment (ROI).

Here are five technologies that currently help manufacturers improve efficiency and are expected to significantly influence the future of industry:



1. Robotics

While some industries, such as automotive, have been using robots for years, the overall use of robotics in manufacturing has dramatically increased recently. Many industries, such as sports equipment and electronics, are beginning to use robots for the first time.

Robots are used to automate repetitive tasks as well as tasks that are difficult for humans due to physical constraints, such as getting into a small place. Their use in tight spots has become increasingly popular as the market for miniaturized electronics has grown. While some robots perform independent tasks, many robots collaborate with humans to complete their work. Automating tasks through robotics have other benefits too:



Reduced safety risk

Manufacturing processes can involve variables that are unsafe for humans, such as ergonomics issues or the release of gas, chemicals, or fumes. Manufacturers can use robots in these scenarios to create a safer, lower-risk work environment.

Consistent quality and repeatability

Robots mitigate human error by consistently performing an exact task repeatedly for as long as needed. This leads to highly predictable production outputs.

Increased insights and intelligence

Robots add a layer of intelligence and automation into the supply chain to provide feedback, visibility, and insight into the production process.

Best Practices for Using Robotics

Reduce variability in product and supply chain by adding intelligence

By adding data intelligence to your automation system through sensors for identification & measurement, the robot “knows” exactly what type of product is coming, at what position and location, and any accommodations that must be made for it, such as picking up or scanning the product in a specific way.

Use offline software for simulation

By using offline software simulation tools, you can create a blueprint of the production floor before installing a robotics solution. This allows you to minimize your risk, because you haven't yet invested in the space and hardware platforms. You can then troubleshoot potential issues to be solved, and iterate many times to optimize your processes.

The Future of Robotics in Manufacturing

Soon we will see greater collaboration between people and robots. People will work alongside robots, while robots will supplement people by layering data intelligence into the process. While there is concern about robots taking jobs, there is no reason to view robots in a negative light. They are helping us do tasks that are difficult, time-consuming and challenging, especially in today's ever-changing supply chain.



2. Additive Manufacturing and 3-D Printing

Building prototypes for new products used to be time consuming and expensive. With the advent of additive manufacturing, also known as 3-D printing, manufacturers can print out specific parts much more economically for prototypes, as well as for use in actual products.

For example, marine-grade stainless steel, nanofiber materials and fuel nozzles can now be printed through additive manufacturing. While security is a concern for 3-D printing, Georgia Tech recently announced a three-layer technique that can significantly reduce these concerns. By integrating additive manufacturing, manufacturers can see the following benefits:

Creating prototypes throughout the design process

Because additive manufacturing is much less expensive than building a traditional prototype, companies can create prototypes several times during the design process.

For example, you can create a rough prototype in the early design phase, a functional prototype during the actual design phase, and a validation

of the product during the testing phase. This helps prevent expensive design mistakes and reduces time to market, because issues can be corrected much sooner.

Low-production volume

When producing a product traditionally, the costs are typically higher for low-production volume. Therefore, additive manufacturing is most cost-effective for low production volume, while injection molding is more cost effective for high-volume production.

Printing on demand

Instead of a long lead time for production, you can generate products within 24 hours. This is especially beneficial for printing tools for production-to-fabrication. Additionally, this allows you to edit the design on the spot, which is another key benefit of additive manufacturing.

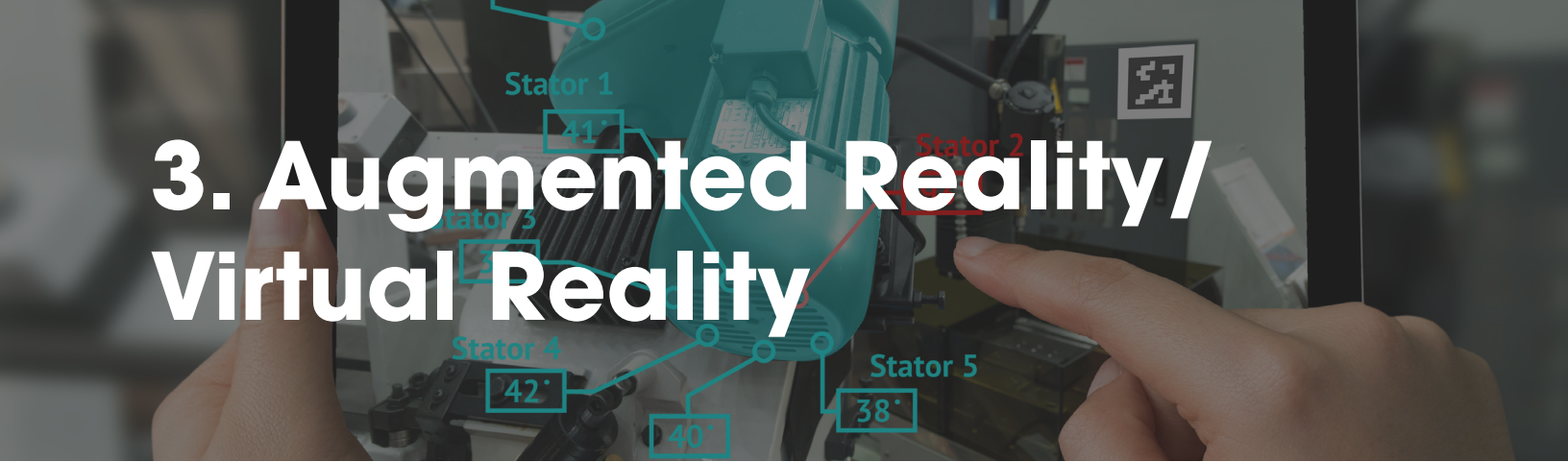
Best Practices for Additive Manufacturing/3-D Printing

Create the design for additive manufacturing

When you design products to be manufactured using additive manufacturing, you get the added benefits that come along with it, such as the ability to edit the design during the process or cost-effectively produce low volumes. It also helps you anticipate and reduce the secondary steps required after the design is printed, which reduces lead time. Retrofitting products created with traditional design methods deprives your team of those benefits.

The Future of Additive Manufacturing/3-D Printing in Manufacturing

Industrialization of printers with more automation in the process is predicted to be the future of additive manufacturing. This reduces cost per part as well as reduces time to part. In addition, material options that will be available in the future with improved processes will generate better mechanical and cosmetic properties for the parts.



3. Augmented Reality/ Virtual Reality

Augmented and virtual reality is no longer a technology for the future, but one that manufacturers are using to improve productivity and training right now.

According to a [PWC survey](#), one of third of U.S. manufacturers are already using AR/VR or plan to begin in the next three years. The survey found that most companies are employing the technology for product design and development, safety and manufacturing skills training, maintenance, repair or equipment operations and remote collaboration.

Manufacturers are using AR/VR for remote assistance, which allows an experienced worker to assist another worker. This allows two or more people in a different geographic region to see exactly the same thing that the person needing assistance can see. Because this augmented reality application enables annotating, the expert can write or use overlays directly on the other user's field of view to provide the knowledge that workers needs to complete the task.

By using virtual reality and/or augmented reality for remote assistance, manufacturers can see the following benefits:

Increased productivity

Instead of an experienced employee traveling to assist a

newer worker, a team of experts can be devoted to providing remote assistance to all locations. This reduces the productivity loss of workers leaving their post to help another worker. Additionally, remote assistance typically helps workers learn tasks more quickly because the instructions are directly in their line of sight.

Therefore, newer workers are often able to produce at a higher level much sooner.

Reduced travel expenses

Previously, when a plant had a specialized problem, the expert had to travel there to resolve it, which could cost thousands of dollars. When remote assistance is used, travel expenses are reduced or eliminated.

Faster resolution time

Travel and training take time, which can be crucial in a 24/7 manufacturing environment. Instead of waiting for days, problems can be resolved in minutes.

Best Practices for Augmented Reality/ Virtual Reality

Understand the manufacturing process before adding AR/VR

Many manufacturing workers simply use a work instruction document because that is how they were taught to assemble the product. However, by carefully looking at the process, you often learn that there is an easier or more efficient way. Instead of simply copying and pasting what was written on a paper into an animation or simulation, take the time to really understand how the product is made.

Gather as much detail as possible

Because there are so many nuances in manufacturing, AR/VR is effective only when all the details are understood. If you are using AR/VR for remote assistance, this means having the best subject matter expert for each type of question. Your AR/VR is going to assist your workers only if the person on the other end of the technology has the answers that they need.

The Future of Augmented Reality/Virtual Reality

If you think back 15 years, it was a time when not everyone had a cellphone. Now most people have cellphones. This will very soon be true of augmented reality – it will be the next personal computing phenomena. With virtual reality, the business use will grow, especially in the people and resources area. The industry will mature – it's not there yet, but we will be there very soon. [Learn how Flex is doing this today.](#)



4. Internet of Things (IoT)

Throughout the manufacturing process, there are many data sets to measure and track, which can be used to help improve both productivity and quality. Using humans to collect this data is time consuming, error prone, and often simply not possible.

By using Internet of Things/Intelligence of Things™ (IoT), such as sensors on production floors, manufacturers can see real-time data from these sensors and have the latest information to make real-time decisions. While only 43 percent of manufacturers are fully connected with IoT technology today, [Zebra predicts](#) that 64 percent will be fully connected by 2022.

Sensors are commonly used to collect measurement data such as temperature, energy consumption and materials consumption. However, many manufacturers are using IoT to also collect data on how their overall process works in relation to overall quality performance. For example, by using intelligent video analytics, managers can see how people are actually performing their job tasks, which assists in improving processes and providing training. New employees can immediately receive feedback and additional education on the spot instead of at the end of the shift or even end of the month.

By using IoT technology, manufacturers can see the following benefits:

Real-time data

With manual data collection, there is a time lag for collecting and processing the information. With IoT technology, data collection is instant, which provides managers a real-time view of the production floor.

Ability to process large volume of data

Humans can consume only so much data. When IoT is combined with analytics software, manufacturers have access to a much larger pool of data than humanly possible.

Collection of data in unsafe locations

Sensors can be placed in locations where humans cannot go for safety reasons, either due to fumes, high temperatures or unstable structures. These sensors give manufacturers access to data that was previously impossible to collect.

Best Practices for IoT

Use standard processing times and methods

Without IoT, engineers use stopwatches to measure process times and results. Using sensors is much more efficient, but the results are not usable if the measurements are not apples to apples. By using standard and consistent measurements, the collected data is high quality and can be used for analytics as well as artificial intelligence.

Determine a common data structure that is useful to front-line employees

Collecting IoT data is helpful. However, the real benefits come from having orchestrated relay lines of sensors. In order to make this work, you must have a common denominator that works in all locations and all environments. For example, Flex has about 100 locations with thousands of manufacturing lines that operate in 12 different industries. By using a data structure that works for the people running the day-to-day operations, the data provides immediate value to the employees on the line because they can quickly make changes and work more efficiently.

The Future of IoT in Manufacturing

In the very near future, it will be almost impossible to provide customers the service they require unless you have a digitally connected factory using IoT technology. Manufacturers need to know what is going on in real time in their factories, be able to share the information, and have actionable business insights to improve their processes. In recent years, IoT has grown exponentially in manufacturing, and it will continue to grow at an expedited pace until it is the standard.

5. Cloud

Cloud technology allows manufacturers to integrate processes, allowing access to their data and systems from anywhere, including mobile devices. Since the manufacturing process doesn't happen behind a desk, but on the factory floor, a job site, or the field, the cloud allows a degree of collaboration from start to finish that wasn't possible with on-premise technology.

By using the cloud, manufacturers can enhance product capability, improve time to market, optimize resources and enhance the user experience. Because of the mobility and flexibility of the cloud, you can also improve cross-enterprise collaborations with suppliers.

Including cloud as part of the design-in service, in which hardware is a component by cloud integration, forces manufacturers to consider cloud in every step of the product life. Another option is to start with simple cloud solutions, such as Box, and then become more sophisticated by co-designing applications. For example, using portals to increase collaboration between engineers, or a cross-network supply chain.

With cloud technology, manufacturers can see the following benefits:

Decreased infrastructure costs

Instead of paying upfront for building a new data center and hardware, you can pay for cloud use through a subscription-based model. This allows

you to manage costs as well as use operational funds instead of capital funds.

Increased scalability and flexibility

In today's business landscape, the product cycle must be condensed to stay competitive. Because you are paying for usage with cloud, you can scale faster since you do not have to purchase and deploy the infrastructure needed for changes in production.

Liability protection

Mitigating risk is a top priority, especially with today's increased security concerns. With a vendor team responsible for protecting and maintaining your cloud securely, your liability is reduced.

More data collection

Greater data collection around user behavior and preferences allows you to improve your processes, prevent issues and improve product design. You can also access multiple data sources at the same time, giving you a more accurate picture of your customer.

Best Practices for Cloud

Understand your business needs

Be clear about the needs of your manufacturing business and the architecture needed to support these goals. For example, manufacturers looking to improve cross-enterprise collaboration are a natural fit for cloud services.

Consider a hybrid solution with on-premise and cloud

Some data, such as highly sensitive information and latency sensitive data, may be best served through an on-premise solution. For example, for a product system that must communicate very quickly with a production line module, any disruption has severe consequences.

Use a two-tiered ERP

Because enterprise resource planning (ERP) facilitates core manufacturing processes and you have likely made significant investments in your ERP, adding a cloud-based ERP allows for quick growth and development. For example, Flex has a standardized ERP infrastructure on site, but we also use a more agile cloud-based model for new businesses and startup ventures with customers.

The Future of Cloud in Manufacturing

The use of cloud technology will continue to grow. Companies will become more conscious of their needs and more effective at balancing their on-premises and cloud-based workloads. As cloud gets closer to consumer and point-of-sale data, manufacturers will be able to collect even more data to understand customers and capitalize on trends. Combining cloud with IoT will enable you to provide your customers with tailored products and affordable prices, and give you new levels of transparency within the supply chain and into goods in transition. Manufacturers that also use advanced machine learning and artificial intelligence technologies will be able to improve the overall velocity of their supply chain.

[Learn more about what Flex is doing with IoT and Cloud.](#)

Conclusion

Digital transformation is critical in increasing your efficiency. In order to enjoy the business benefits of technology:

- 1** Determine your current business problems – low quality, low production, high error rates, etc.
- 2** Evaluate which technology is best suited to help solve each problem.
- 3** Deploy and integrate the technology in a manner that directly addresses the specific business problem.

At Flex, we use a variety of technologies, including robotics, additive manufacturing, AR/VR, IoT and cloud, in our Sketch-to-Scale solutions. In addition, we help companies like yours integrate them into your own manufacturing and supply chain processes.

[Get in Touch](#)





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