

A woman with her hair in a bun, wearing safety glasses and a white lab coat, is focused on adjusting a blue and white robotic arm. She is in a laboratory or industrial setting with various pieces of equipment and shelves in the background. A large, semi-transparent pink circle is overlaid on the right side of the image, containing text.

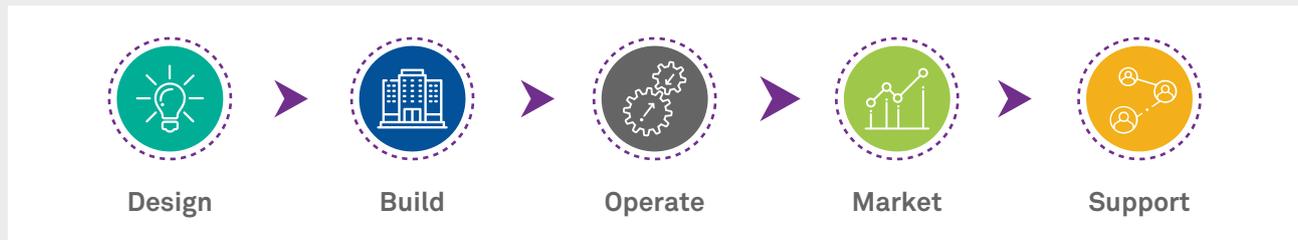
Artificial Intelligence in manufacturing

Reimagine the power of
AI for increased value to
your business

Artificial Intelligence (AI) will be changing the way we look at manufacturing value chain. It will not only scale the profitability, but also makes the process error free without much human intervention. Right from designing of the product to building, operating, marketing, selling to customer support, the whole value chain is going to be redefined to visualize faster time to market with more satisfied customers. A lot of insight from various silos can be taken up to design new

process and products. AI can be used for quality control to get the products without any defects and predictive maintenance can be carried out in time. Virtual agents can take care of most of the customer queries thereby reducing tech support expenses. AI algorithm will be helpful to automate tasks intelligently.

Artificial Intelligence (AI) is affecting every aspect of the manufacturing value chain, from design to support, including Build, Operate and Market as shown in the diagram below.



AI in design

During the design phase, an engineer makes assumptions about the characteristics of the deployment environment of a product which may or may not be accurate due to various reasons. Until recently, it was neither feasible nor viable to gather and analyze field data for new product design. However, with the proliferation of sensors and IoT platforms, digital twins of physical assets are being created and observed to assess the impact of the real deployment environment on the assets in real-time. This has made possible the application of Artificial Intelligence algorithms to model the real world far more accurately, resulting in a better assessment of the effectiveness of the features and accurate evaluation of the performance of existing products. These insights powered by AI result in better product design and help in mass customization of products.

AI in build

After the design phase, comes the “build” phase. Ideally, in this phase, the right components must arrive at the right time for assembly to prevent the need for stocking. The challenge here is in demand planning - estimating the exact quantity of each component and the time when they are needed. AI algorithms play a critical role in accurately forecasting both.

- Cameras can be used in the production line to take pictures of the product and compared with the ideal picture in real-time, using visual analytics powered by AI algorithms to detect deviations in quality.

- Robots powered by AI can be used in the assembly line to pick defective products and discard them, thereby eliminating human errors and fatigue.
- Operational data obtained from the production machines and quality inspection data obtained from the components and from the finished product can be crunched by AI algorithms to do Root Cause Analysis (RCA) and pinpoint problems in near real-time.

AI in operate

Operational cost is an ongoing major expense in the manufacturing sector. One of the major impacts on the business comes from unplanned downtime of machines on the shop floor. Troubleshooting, getting the right expert to do the diagnosis, the right field engineer to fix the problem and even getting the right replacement parts are time-consuming and the result is high costs for the company.

AI helps mitigate this problem in the following manner:

- Operational data from various machines and control systems on the factory floor can be used to develop models using AI algorithms to predict potential problems with the machines. Once the problems are predicted, pre-emptive actions can be taken to avoid unplanned downtime, resulting in multi-million dollar savings.
- Even during the predictive maintenance operation, AI guides the maintenance engineer and even recommends the right tools and replacement parts.

AI in market

One of the key trends in discrete manufacturing is “direct to consumer” marketing and selling, as opposed to going the traditional way of reaching out to consumers through retailers. This requires the use of digital technology to do micro-segmentation of customers, tailor campaigns for the appropriate micro-segments, and deliver customized marketing messages to them. AI is critical for creating the micro-segments and understanding the “patterns” of messaging that work effectively in each micro-segment. AI-powered virtual sales agents help in attracting the attention of consumers and guide them in decision-making. The virtual agent, following the clickstream and observing the time spending pattern of the prospective buyer on specific webpages, is able to act as an online advisor.

While the “direct to consumer” is a B2C play; similar techniques are taking off in the B2B marketing and e-commerce space. Expectations of businesses making purchase decisions is also changing along similar lines. As a result, it is not just the discrete manufacturing but also process manufacturing industry that is being impacted by AI.

AI in support

After sales, service, and support contribute majorly to revenues. Traditionally, real Subject Matter Experts (SMEs) were required in the

support team to respond to customers’ queries. This led to high tech support expenses. With AI, tech support has been redefined.

Now, virtual agents powered by AI handle customer calls and converse with them in their preferred language. AI-powered speech recognition and Natural Language Understanding (NLU) help the agent comprehend customer intent. Beyond that, the virtual agent needs to search the “answer”, retrieve the most likely answer and respond to the customer. To do that, an intelligent data store needs to be built by extracting data from heterogeneous sources, such as, historical records, technical manuals, FAQs, self-help documents, etc. and converting them into a so-called “knowledge graph” that can be used by the virtual agent efficiently. All these are made possible by AI algorithms. Finally, the ability to seamlessly transfer the call to an SME in case the virtual agent is not able to solve the problem, allocate the ticket to the most relevant field engineer in case the SME recognizes that the problem needs to be fixed by paying a visit to the customer. Besides this, advising the field engineer about the most relevant cause of the problem, the tools needed, and the replacement parts required on the job, are all possible due to AI algorithms.

AI is playing a transformational role and will continue to play an even more significant role in the entire value chain of manufacturing.

Author’s Bio

Dr. Sanjoy Paul is an innovator with 88 granted US patents; author of two high-tech books and 200+ publications, Vice President and the Global Digital Head for Manufacturing Business Unit of Wipro. He is responsible for driving profitable growth of clients via business process transformation, leveraging innovative digital technologies, such as Industrial IoT (IIOT), Voice conversations, Cloud, Blockchain and Artificial Intelligence/Machine Learning. Sanjoy has over 25 years of experience, most recent 12 years being in the IT industry and remaining ones in Technology and Telecommunications domain. Most recently, he was the Managing Director in Accenture leading Digital go to Market for chemicals, Natural Resources and Energy industries in North America. Prior to that he was the Head of

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Sanjoy holds a Bachelor of Technology degree from IIT Kharagpur, an M.S and a Ph.D. degree from the University of Maryland, College Park, and an MBA from the Wharton Business School, University of Pennsylvania. He is a Fellow of IEEE and a fellow of the IET.

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