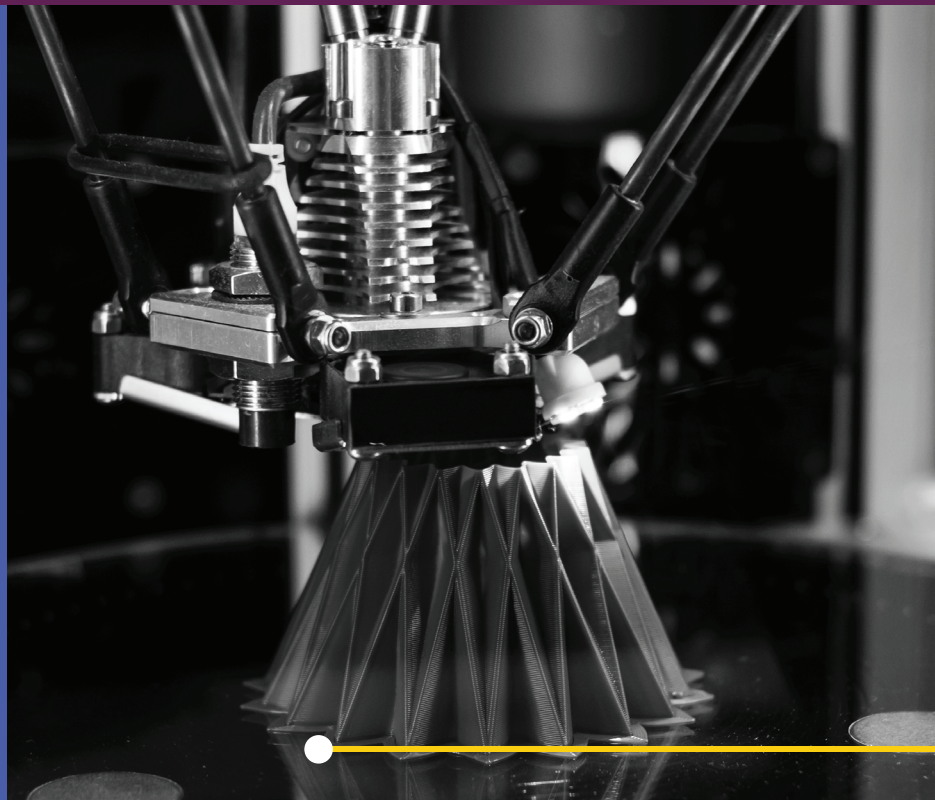


# Additive manufacturing's arrival on the main stage



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Additive manufacturing, once confined to prototyping and small-scale production, is now breaking barriers and stepping into the world of mass manufacturing. The technological advances that began in the 1990s are finally reaching maturity, offering solutions for Original Equipment Manufacturers (OEMs). Additionally, the advent of Industry 4.0 plays a pivotal role in this transformation, and industry pioneers are harnessing additive manufacturing capabilities for mass production.



## Not a new phenomenon

Additive manufacturing has evolved far beyond its origins, transforming into a tool for mass production. Now, as industry pioneers embrace its capabilities, it is shifting from the fringes of manufacturing into a mainstream, revolutionary force that is redefining the production landscape. A chronological perspective of its evolution reminds us how quickly the technology is moving towards industry-wide adoption:

- **1980s - Prototyping era:** Additive manufacturing's initial purpose was prototyping, with technologies like Stereolithography (SLA) emerging.
- **1990s - Rapid manufacturing evolution:** A shift towards more advanced techniques, including Selective Laser Sintering (SLS) and Fused Deposition Modeling (FDM).
- **2000s - The rise of 3D printing:** A broader acceptance of 3D printing, with applications in industries like healthcare, aerospace, and automotive.
- **2010s - Integration with Industry 4.0:** Collaborative robots, IoT, and AI brought additive manufacturing closer to mass production capabilities.



## The advantages of additive manufacturing

Additive manufacturing's inherent advantages lie in its ability to reduce costs, delivery, time and enhance quality. Its flexibility in material optimization gives a high factor of safety and the ability to manufacture intricate parts that were previously unthinkable.

- **Cost optimisation:** Using only essential materials, additive manufacturing makes the entire process and BOM (bill of materials) extremely optimized and reduces wastage.
- **Quality enhancement:** With a high factor of safety and the ability to produce complex geometries, additive manufacturing ensures a superior quality product.
- **Time efficiency:** Despite historical limitations, additive manufacturing now presents solutions to expedite delivery timelines.





## Shortcomings cited thus far

However, the road to mass manufacturing through additive manufacturing was not without bumps. The challenges are two-fold:

- **Speed of production:** Additive manufacturing's speed has been a limiting factor in mass production. The process was deemed to be painfully slow for meeting mass demands.
- **Quality control and anomalies:** A minor parameter error can lead to scrapping an entire part, resulting in significant loss and delays.
- **Non-availability:** A wide range of gas-atomized metal powders may not be readily available across all parts of the world.

Industry pioneers in countries like Germany, the US, and Sweden are addressing these challenges, though full-scale solutions are still in development.



## Moving from prototyping to mass production

The shift from using additive manufacturing for prototyping to mass production has required a paradigm change. Additive manufacturing forums are now developing new-age printers capable of mass production. The integration with Industry 4.0 has been the catalyst for this transformation, fostering a connective link between design and manufacturing. Additive specific standards are available to work towards industry-wide acceptable norms and conditions. Some of the real-world use cases and industry-specific examples include:

- **Aerospace:** Major aerospace companies have leveraged additive manufacturing to produce complex geometries in aerostructures and engine components, reducing weight and enhancing fuel efficiency.
- **Healthcare:** Customized implants, dental crowns, and prosthetics are being manufactured using additive manufacturing, allowing for personalized care.

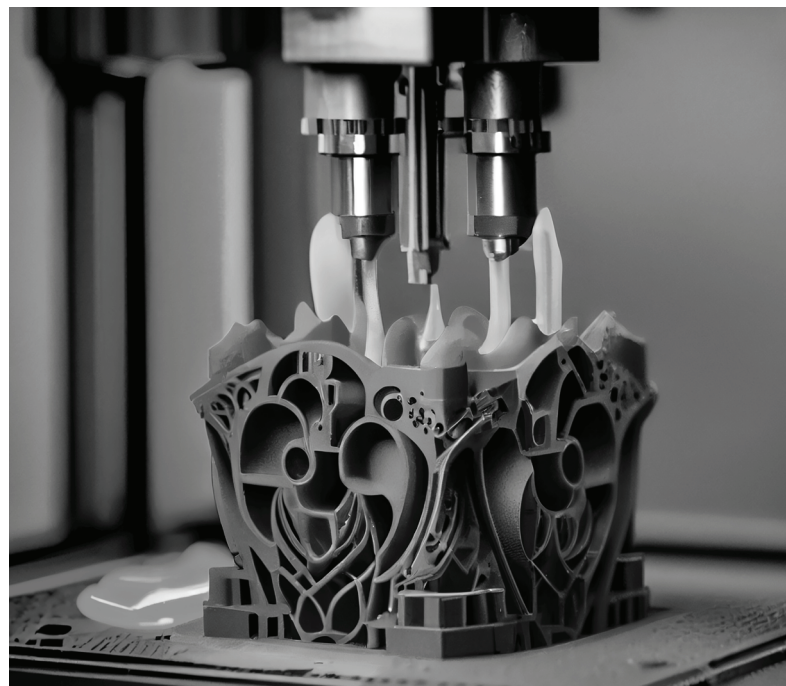
- **Automotive:** OEMs have leveraged additive manufacturing for creating specific parts, thereby cutting down on production times and increasing customization, especially in EVs.
- **Construction:** Large-scale 3D printers are now used to build entire structures, reducing labor costs and increasing design flexibility.



## The road ahead: proceeding with caution

As we stand on the brink of this new era, caution must be exercised, taking into consideration the following points:

- **Upfront investments:** The cost of integrating additive manufacturing into existing manufacturing lines could be high and require careful consideration.
- **Regulation and standardisation:** Compliance with various industrial standards must be meticulously maintained and adopted to avoid unnecessary fragmentation of the value chain, including health and safety.
- **Sustainability:** The material used in additive manufacturing must not inflict a very high environmental cost.
- **Intellectual property challenges:** Ensuring the protection of intellectual property is paramount as designs become more accessible.





## The role of engineering services partner

The role of an engineering partner in achieving mass manufacturing using additive manufacturing is multifaceted and critical in this transition to the new world for OEMs. A good partnership with an engineering services partner ensures the alignment of technology with strategic goals while navigating the complex road ahead with caution. It involves careful investment planning to integrate additive manufacturing, adherence to rigorous regulatory compliance, a focus on environmental sustainability in material selection, and vigilant protection of intellectual property. Their expertise forms the bedrock of this exciting yet delicate journey, balancing innovation with responsibility to forge a sustainable path towards the future of manufacturing. Some of the key areas in which your partner can assist you include:

- **Strategic roadmapping:** They assist in identifying opportunities, defining a clear roadmap, aligning technology with business goals, and ensuring compliance with industrial standards.
- **Technology integration:** This includes integrating additive manufacturing with existing manufacturing processes, enabling a seamless transition.
- **Quality control:** They help in setting up stringent quality control measures, ensuring that products meet the desired standards.
- **Training and skill development:** Training the workforce on new technologies, tools, and methodologies is vital to harness additive manufacturing's full potential.

Additive manufacturing's journey from prototyping to mass manufacturing is laden with innovation, challenges, and opportunities. The role of an engineering services partner in this transition can be pivotal. Collaborative efforts between industry players, technological pioneers, and service partners will drive additive manufacturing toward a future where mass manufacturing is not just feasible but optimal. Through strategic planning, compliance adherence, quality control, and continuous innovation, the mass adoption of additive manufacturing appears not just achievable but imminent. The key lies in embracing this technology with both optimism and caution, realizing a vision that could redefine manufacturing as we know it.

At Quest Global, we have been at the forefront of the additive manufacturing revolution, collaborating with some of the leading manufacturers on exciting and path-breaking Proof of Concepts (POCs) and projects. Leveraging their expertise and insights into the nuances of this transformative technology, they have played an instrumental role in shaping the future of manufacturing. If you are intrigued by the possibilities and potential of additive manufacturing, Quest Global's seasoned professionals in advanced manufacturing CoE would be delighted to engage with you, offering their consultation and guidance tailored to your unique needs and aspirations.



For further information or queries, please reach out to us at [info@quest-global.com](mailto:info@quest-global.com)