

aPriori Supports Arrival's "Microfactory" Approach to Manufacturing Zero-Emission Vehicles

CASE STUDY

Like Arrival's Microfactories, aPriori's digital factories are flexible, fast, and can be customized to reflect the capabilities of different suppliers in different regions. They allow for rapid design and sourcing iterations, with automated cost and manufacturability insights available almost immediately.

THE CHALLENGE

Support Flexible Supply Chain Development for Distributed, Small-Footprint Automotive Microfactories

Arrival's goal of developing unprecedented cost-competitive EVs fuels an organizational culture dedicated to driving down the cost of products wherever possible. Their cost engineering group wanted to implement systematic use of a manufacturing cost modeling tool capable of supporting this mission-critical focus on cost optimization.

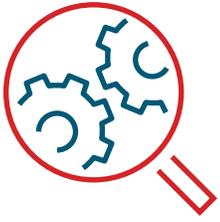
The Arrival Microfactory would also require these cost modeling capabilities to work quickly when scaling up new facilities, reflect regional variations in manufacturing cost drivers, and support manufacturability and cost analysis that could be configured to reflect the capabilities of local suppliers. Finally, it would need to bring the

automation necessary to align with plans for an agile cost engineering team that can work cross-functionally across different manufacturing processes.

Microfactories will be used to support not only localized supply chains, but products tuned to customer needs in local markets. Henry Ford famously proclaimed that customers could have cars "in any color as long as it is black." Arrival plans to overcome this longstanding tension between cost and customization. Their vehicles can be custom-tailored to the functional and budgetary requirements of different regions, organizations, and use cases. The scale of traditional automotive manufacturing means that designs are only viable if they can command large global sales volume for years at a time. Because the Microfactory enables sustainable unit economics even at smaller production volumes, Arrival has the freedom to produce vehicles purpose-built for end user needs. If these needs change, the Microfactory has the agility required to adapt in short order.

The Arrival logo consists of the word "ARRIVAL" in a bold, black, sans-serif font. The letters are widely spaced, giving it a modern and industrial feel.

Arrival aims to disrupt the automotive market by developing electric vehicles (EVs) that are competitive in price with traditional, internal combustion-based designs. They are currently working to bring their electric vehicles to market, with initial offerings to include two zero-emission commercial vehicles, a van and bus. Plans for a smaller vehicle in 2023 (alongside a recently announced collaboration with Uber to develop an EV tailor-made for ride sharing) showcase the breadth of Arrival's imminent impact in the automotive industry. Arrival's culture of innovation is not only centered around its vehicle products, but also its manufacturing and supply chain strategy. Every Arrival vehicle is produced in a low-cost, small-footprint factory - The Arrival Microfactory. These manufacturing facilities are carefully designed to offer flexibility, scalability, and the ability to support to local economies. Arrival's Microfactories scale seamlessly to match sales volume, locating additional factories around the world near areas of demand.



Arrival uses aPriori Cost Insight Design (CID) to identify manufacturability issues to meet or **beat their cost targets** on their designs.

To support this Microfactory model, Arrival needs the ability to rapidly:

- Analyze cost and manufacturability for new designs
- Source new parts and scale up local supply chains
- Do so without impinging engineers' ability to focus on great design

THE SOLUTION

aPriori 's Cost Insight Design and Cost Insight Generate Products Generate Design-Stage Cost and Manufacturability Intelligence

aPriori was initially introduced at Arrival to support Design for Assembly work. Early successes led Arrival's newly created cost engineering group to see clear value in expanding aPriori's footprint at the organizational level. Ultimately, Arrival wanted to establish a single source of truth for cost and manufacturability analysis.

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With no input required from the designer, aPriori 's Cost Insight Generate (CIG) automatically initiates a comprehensive manufacturing simulation as soon as the designer checks in a new or modified design to their PLM system. If some manufacturing anomaly is identified, CIG proactively notifies the designer with an email communication directly to their inbox. Either manually or by clicking on a hyperlink from the notification, CID allows the designer to quickly upload and evaluate the identified component or assembly. They can study design variants and different material, process, and sourcing options that could address the manufacturability issue identified, and publish the best options for review with the broader team.

THE RESULTS

Flexible, Fast Digital Factories Enable Rapid Design and Sourcing for Localized Microfactories

Like Arrival's Microfactories, aPriori's digital factories are flexible, fast, and can be customized to reflect the capabilities of different suppliers in different regions. They allow for rapid design and sourcing iterations, with automated cost and manufacturability insights available almost immediately. With these capabilities, non-manufacturable or costly designs can be identified quickly, when engineers still have time to model design alternatives (and before waiting weeks for an RFQ response, only to discover a manufacturability issue).

aPriori allows Arrival to confidently generate manufacturing cost models as soon as the CAD-based design is ready.

By bringing detailed cost and manufacturability intelligence as early as possible into the design process, digital manufacturing simulation also allows Arrival to eliminate wasteful feasibility loops and design churn with suppliers. Rather than using the quoting process to gauge cost and manufacturability, aPriori allows Arrival to confidently generate manufacturing cost models as soon as the CAD-based design is ready.

When a new part is sourced, Arrival uses aPriori simulations to pinpoint the best country, most cost-effective machine, and ultimately, a target price. These manufacturing cost models offer guidance for overall sourcing strategy while also providing a firm data-point for anchoring discussions with new suppliers.

NEXT STEPS

Expanding aPriori Digital Manufacturing Simulation Software to Streamline the Quoting Process

Arrival's early cost engineering priorities with aPriori have focused on supplied parts. Over time, they will expand its use internally manufactured parts as well.

Currently, Arrival uses aPriori manufacturing cost models to support fact-based negotiations with suppliers. Over time, they hope to expand cooperation with trusted suppliers, refining aPriori cost models to the point where quotes can be predicted with near certainty.

Looking forward, aPriori will enable Arrival to benefit from manufacturing simulation capabilities while maintaining a strong cross-functional team leveraging aPriori's manufacturing expertise. The digital manufacturing simulation software can provide detailed manufacturing cost models in minutes, rather than weeks using traditional tools like spreadsheets.



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