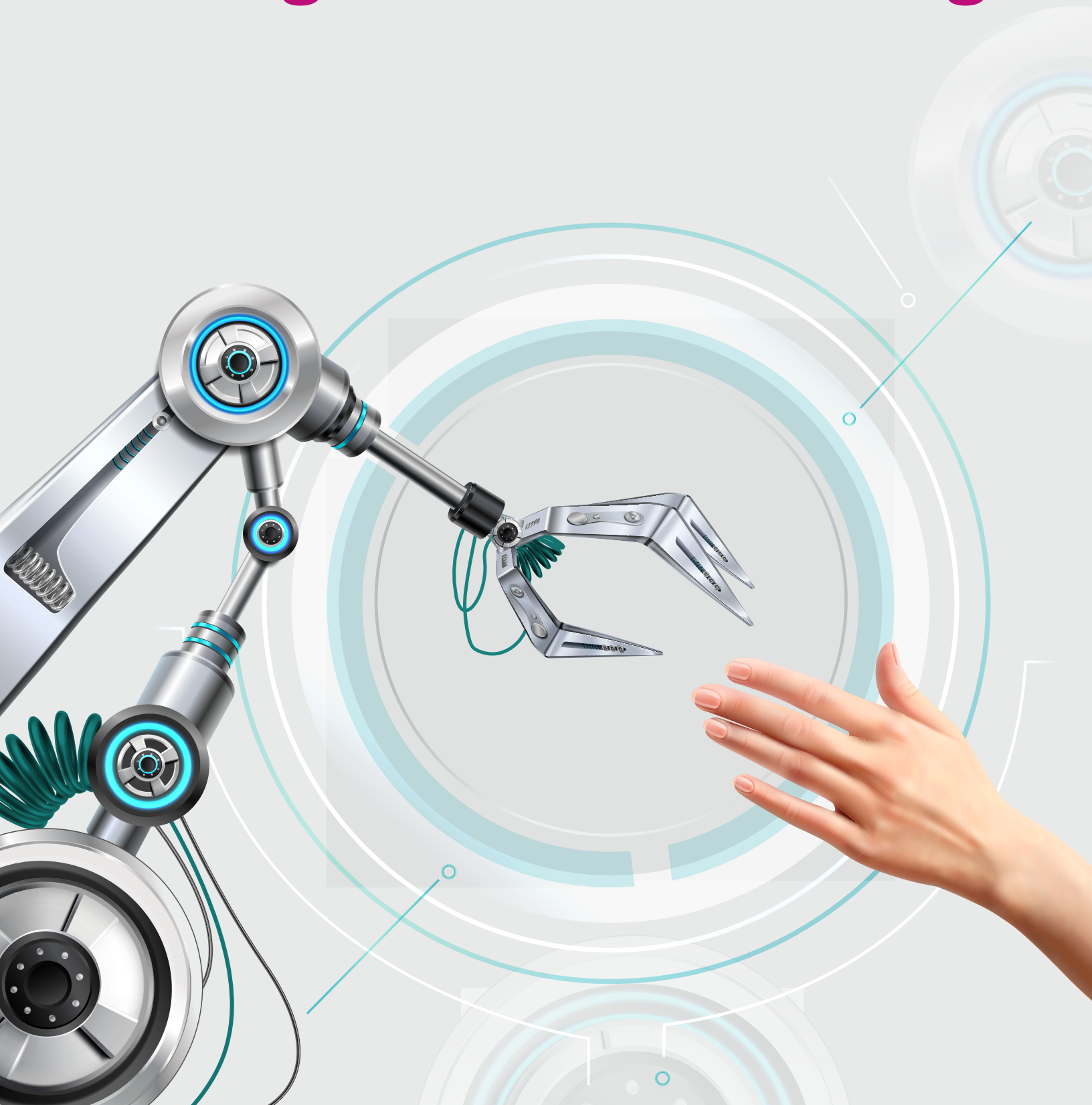


# The Future of Intelligent Manufacturing



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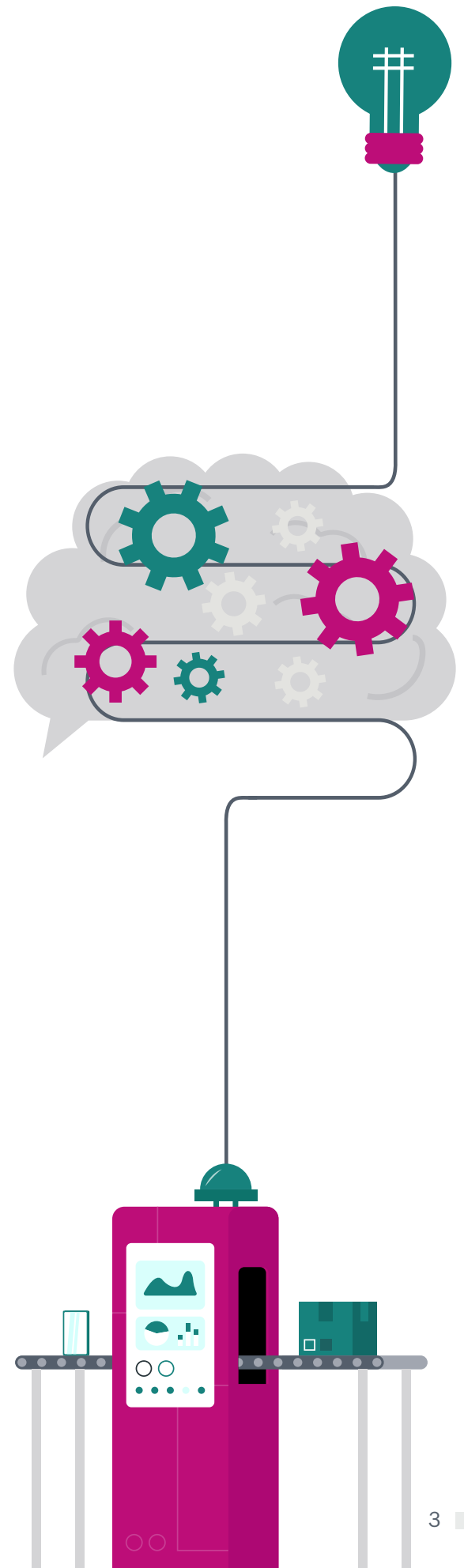
Evolving consumer behaviour has forced manufacturers to rethink their business models.

Modern manufacturing has seen tremendous upgrades - especially over the past few years as technological innovation drives changed the types of machines used and processes. For a company to survive in an ever-changing global market and retain a competitive edge over its competitors, it has to embrace innovation and adapt to the latest practices.

One of the biggest changes can be seen in the uniquely varying demands between customers. Companies cannot simply mass produce their products without considering the personalized experiences that customers demand. Thanks to ease of access and a connected ecosystem, the average consumer now has a plethora of options to choose from, increasing the benchmark of quality they expect. Manufacturing companies have realised this global shift to “lot size of one” - a concept where a single production run delivers a single product - and adopt a strong unique selling proposition that caters to the needs of a single customer. As difficult as that may sound, it is indeed very attainable. With strong core systems like S/4HANA or D365, Bosch’s connected solutions can integrate the entire ecosystem to effectively realise the dream of a manufacturing industry centered on low waste and high productivity.

The pandemic brought with it a number of challenges and restrictions across the supply chain, due to which industries have had to adapt, improve and rethink the way they function. A fundamental difference in the post-pandemic world can be seen in the newfound shift from global to local economies. Manufacturing industries are seeing massive adoption of automation, internet-of-things (IoT) and robotics, paving way for smart factories that are built on the foundation of deep learning, artificial intelligence (AI) and data analytics.

Creating smart factories is pivotal for success for almost every industry. Manufacturers are making this shift with the ever-changing demands of customers, all whilst finding ways to drive innovation, reduce wastage and amplify efficiency. Emerging as a frontrunner is crucial in this highly competitive market and intelligent manufacturing with SAP provides a roadmap to a successful future.



# Key Market Drivers for Modernization



## Volatile markets

The volatility of the global market is an undeniable motivator for modernization. Manufacturing industries have been facing unprecedented fluctuations in customer demand; characterized by shorter lead times and increasing unpredictability.

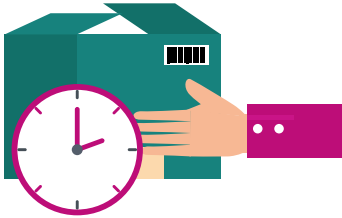
Tackling these issues of the volatile market has necessitated much higher flexibility and responsiveness from manufacturing companies. Industries are now required to adopt technologically advanced tools and systems in the fields of manufacturing technology, digital factory, and automation.



## Personalized Customer requirements leading to Lot size of One

The success of a manufacturing company is now measured in its ability to cater to the needs of a single customer. Personalization has become a key metric in a market riddled with a multitude of manufacturers competing for the same customers. These personalized requirements are driving manufacturers to new horizons of modernization governed by the blossoming concept of 'lot size of one'.

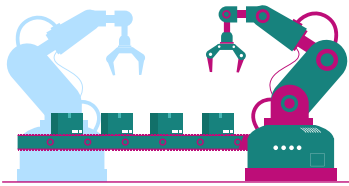
'Lot size of one' refers to the new and improved idea of manufacturing a product that is personalized to satisfy the requirements of a single customer. Being able to achieve this requires highly flexible manufacturing lines and the utilization of AI technologies that are capable of analysing and understanding the diverse expectations of the customer.



## Shortened delivery times

Adoption of any new process or technology is based on the efficiency it can generate for the manufacturer, and shorter delivery time is one of the biggest payoffs of innovation. Customers not only demand personalized products, but also require the products to be delivered on-demand. Being able to deliver products promptly means incorporating a number of changes in manufacturing strategies and operations.

Achieving shorter delivery times essentially means shortening the supply chain processes. Manufacturers are now utilizing domestic materials and comply with local vendors in order to maximize efficiency and subsequently minimize the time for delivery. Moreover, customers demand a high level of reliability which can only be achieved through transparency and horizontal integration.



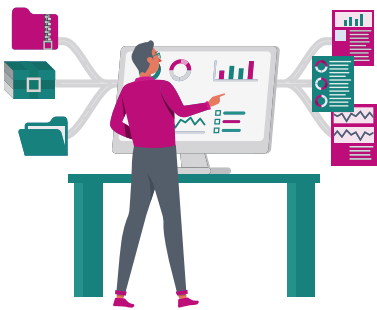
## True North Operational Excellence

While incorporating new processes and systems delivers some essential benefits, a key metric is achieving operational excellence with the combination of available resources. True North Operational Excellence refers to the upward trajectory of your organization, striving to become the best version of itself.

With increasing demands for product value and the requirement for zero defects, manufacturers are implementing modern tools and techniques to provide excellence. In an increasingly competitive market, striving for true north excellence can be more beneficial than ever for manufacturers.

# Challenges in a Traditional Manufacturing Setup

Outdated setups are detrimental to the progress of an organization. When the building blocks of the company do not adhere to the changing times, success can be hard to achieve. The following are the challenges in a traditional manufacturing setup.



## Lack of data integration

Companies that still have traditional manufacturing setups have a fundamental drawback; they lack the necessary emphasis on data integration, without which industries cannot develop proper insights from the data that they collect.

Without proper analysis and usage, data is just bits and pieces of information that cannot be sensibly used to drive businesses. Moreover, an absence of data models in business decisions results in a lack of collaboration between various departments of the organization. When the departments of a company are unable to work in synchronization, business processes can become unbearably sluggish, resulting in an organization that struggles to perform in the competitive market.



## Supply and demand gaps

The existence of a supply-demand gap means one of two things - either your business is losing orders or your employees are staying idle - both of these result in the organization losing revenue. Outdated manufacturing setups lack the necessary strategies and data analytics that help to make accurate estimates of supply and demand.

Matching demand and supply is vital for a lean manufacturing organization wishing to control wastage and improve efficiency. Only by incorporating intelligent manufacturing techniques, driven by smart technologies and data analytics, can a company ensure that the supplies are ideally generated for the demand.



## Low visibility across the supply chain

Incumbent manufacturing processes are highly opaque and leave little room for tracking them. The most prominent cause for this is a noticeable lack of modern technologies and analytics. Due to inadequate modernization and digitalization, companies tend to lose track of their supply lines, especially with businesses that depend largely on materials coming in from a widely distributed network.

An organization with high visibility across the supply chain should be able to confidently determine that all necessary inputs are readily available for demand-oriented manufacturing. To be able to do this, manufacturers need to embrace modern technology that permits accurate demand forecasts.



## Lack of agility

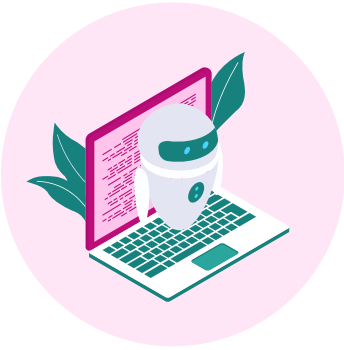
Consumerism is a prominent facet that drives manufacturing and wider choices for the customer means business uncertainties are more prevalent than ever. Firms that can quickly adapt and eventually thrive in the face of these adversities are the ones that conquer the market and drive profitability. Traditional manufacturing setups leave much to be desired with their rigid processes, slow decision-making abilities and lack of agility.

In order to succeed against any uncertainty, an organization needs to adopt modern processes to scale the speed of any service on offer. Sophisticated technology needs to be utilized throughout the company to ensure employees are provided with ample information so that swift decisions can be made when necessary, resulting in higher performance.



# Intelligent Manufacturing with Bosch

*Clubbing industry best practices with Bosch's practitioner approach.*



## Modern Core systems powered by S/4HANA

Intelligent manufacturing requires an intelligent core, and SAP S/4HANA, SAP's newest and smartest ERP system, can help industries achieve this goal. Modern core systems are drivers for business progress that promote new technologies, automation, artificial intelligence, elastic processing and real-time event handling; all of which are essential for an organization in 2022.

At Bosch, our core systems utilize the power of SAP S/4HANA to deliver excellence. By integrating the S/4HANA system into our foundation along with Bosch's practitioner approach, we look to strengthen our services and expand existing products into new markets and sectors. With the utilization of advanced technologies and integrated data along with a core powered by S/4HANA, we intend to optimize product production and transactions to become a stronger intelligent manufacturing organization.



## Scalable Interconnectedness

A benefit of having a strong core is the ability to integrate existing factory systems into the new foundation. At Bosch, this integration happens seamlessly with the use of S/4HANA to achieve unparalleled levels of automation and flexibility at scale.

Reliable connections across the organization are more important than ever. To be able to provide the best products and services, systems across the organization need to work in harmony. Bosch is responsible for the connection of over 100,000 machines, 4,000 connection lines that have helped other industries realize the benefits of integration. These machines and connection lines are integrated with the SAP ERP system and Manufacturing Data Platforms through TCP/IP, MQTT, HTTPS, JSON and Web API. The industry device layer consisting of PLCs and SCADAs are also integrated into an extensible framework allowing easy scalability.





## Integrated Supply Chain

An integrated supply chain is fundamental to an intelligent manufacturing organization. Optimization of supply chains is an ongoing process that helps close functional gaps and increase overall proficiency. By integrating the various steps across the chain, organizations can seek to gain greater control of their costs and the market as a whole.

Being a global provider of technology and solutions, Bosch has extensive knowledge in the optimization and integration of supply chains to generate efficiency. When organizations integrate the various stages of their supply chains, they gain superior control and visibility of any necessary materials. Intelligent manufacturing focuses on making stronger connections across the supply chain to propel efficiency.

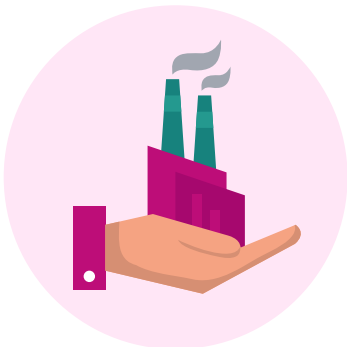
## Efficient Warehouse Management



At Bosch, we devise and implement an integrated plan with a state-of-the-art system for warehouse management that utilizes digitized inventories, automation, real-time information and connected solutions.

The results of implementing an efficient and modern warehouse management system are a smart company with reduced material supply delays by an incredible 80%. Similarly, timely deliveries are increased by an impressive 3.5%, along with a reduction in inventory holding. A well-planned and executed system covers everything from maximising space and lean inventories to optimizing labour efficiency and adopting smart technologies; all of which are crucial for intelligent manufacturing.

## Sustainability



Sustainability is key for a lean and intelligent manufacturing organization. In fact, a company cannot truly be an intelligent manufacturer without provisions for long-term sustainability. At Bosch, we integrate sustainable practices into our processes to reduce wastages, save costs and conserve operational energy; and we help our clients do the same as well.

In order to become a smart and sustainable organization, companies need to adopt modern tools and technologies to optimize their day-to-day operations. This includes taking advantage of leaps made in fields such as Cloud Computing, which allows organizations to utilize remote resources with high scalability instead of having to invest in creating their own infrastructures. These sustainable methods are integrated into Bosch and allow for business expansion as well as lean, intelligent manufacturing.

# MantHANA with S4/HANA



## Why S4/HANA

SAP S/4HANA is a state-of-the-art ERP system with highly advanced built-in technologies including AI, machine learning and data analytics. This system is utilized by businesses around the world to implement new and improved business models, manage internal and external resources, and forecast data-driven predictions for the overall growth and success of the organization.

The answer to “Why S/4HANA?” is very simple - a successful manufacturing organization requires a strong core system, and Bosch is able to provide the technology to build the foundations of a billion-dollar company. S/4HANA comes equipped with embedded AI, data analytics, in-memory databases and simplified data models that allow you to automate and optimize every business process of your organization. Additionally, S/4HANA provides highly scalable cloud resources along with a user-friendly interface to deliver personalized business insights. These tools and technologies guide you along your route to becoming a highly successful, intelligent manufacturing organization.



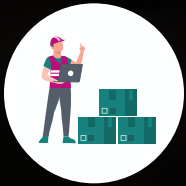
## Why MantHANA

Bosch’s MantHANA is a personalized template for assembly and manufacturing industries organized around the foundation of SAP S/4HANA. This customized template covers a wide range of business models applicable in the manufacturing industry and has proven advantages over competitors. Manufacturing industries that use the template profit from the expertise of BGSW along their transformational journey.

MantHANA on S/4HANA provides a number of benefits across the processes of the manufacturing industry. Since MantHANA is based on an impressive track record of implementing diverse business process scenarios in SAP S/4 HANA, following Industry Best Practices is made a lot easier. Furthermore, MantHANA allows the incorporation of advanced functionalities across the company, resulting in a profit-driven intelligent manufacturing organization.

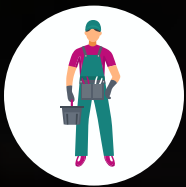
## The benefits

S/4HANA and MantHANA in unison provide a vast array of benefits for the assembly and manufacturing industries. They are summarized as follows:



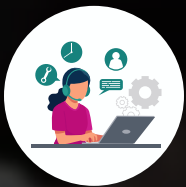
### ***MRP and Production Planning:***

Everything from the requirement of materials to the management of inventory and warehouses can be planned with the help of S/4HANA and MantHANA. These plans are highly scalable and based on real-time data from your organization and supply chain.



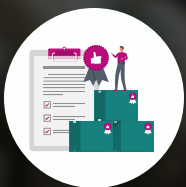
### ***Manufacturing Engineering:***

The quality of your products can be improved immensely as this system allows you to foster a stronger connection between your R&D and manufacturing teams. Leverage the many tools and technologies to facilitate seamless handovers of engineering documents, bills and design changes, all whilst decreasing the overall costs.



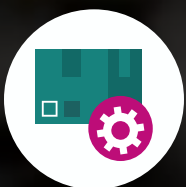
### ***Support Complex Assembly Processes:***

S/4HANA and MantHANA allow your manufacturing company to plan and execute complex assemblies covering all the dimensions of material requirement, demand estimation, capacity planning and finally production.



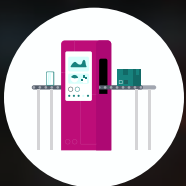
### ***Quality Management:***

This system facilitates the running of closed-loop quality management processes that allow you to take swift and decisive actions to correct or prevent any issues. Moreover, the various tools can be utilized to support continuous improvement across the many facets of the enterprise.



### ***Production Operations:***

Enable efficient and intelligent manufacturing by using methods such as lean control and just-in-time replenishments. Optimize the entire production cycle whilst carefully controlling the material flow and monitoring the supply-demand gap.



### ***Project Manufacturing:***

Automate the project of “true cost” for heavily engineered products with the help of S/4HANA and MantHANA. Utilize this system to carefully manage manufacturing logistics with transparency and efficiency.

The ultimate benefit of S/4HANA and MantHANA is the creation, development and success of your enterprise as a highly intelligent manufacturing organization.

# SOLVING FOR DISPATCH VALIDATION – A DIGITAL SUPPLY CHAIN SOLUTION TO IMPROVE EFFICIENCY AND PRODUCTIVITY

DEVELOPED FOR THE INDIAN SUBSIDIARY OF A GERMAN HEAVY VEHICLE OEM

Bosch designed and implemented a digital supply chain solution to improve the efficiency and productivity of dispatch validation of heavy trucks, which are individually driven to and from the plant. Dispatch validation was a manpower-intensive, time-consuming process at plant exit. Through intelligent integration of ERP and automation of key tasks, the RFID-based solution led to savings in process time, reduced the manpower required and resulted in improved delivery as well as enhanced employee experience.

## Customer Problem

## The Solution

### Time-consuming



Long wait times for vehicle dispatch  
Long working days for logistics teams, especially during peak production

A targeted digital solution to ease a cumbersome process:  
RFID-based dispatch validation solution



Integrated with ERP (SAP) system for quick validation with shipment order



### Risky



Security risks involved in manual barcode scanning of engine numbers under the Cabin

Safety-enhancing solution improving employee experience



Automated scanning of engine and chassis number of vehicle

### Manpower-dependent



Inefficient and suboptimal use of workforce on repetitive tasks

Increased efficiency through automation of repetitive tasks



Automation of other manual processes – confirmation of dispatch with date, timestamp, generation and printing of order sequence

Provision of printers and kiosks for quick and efficient processing



## The Results



Upto **70%** Reduced process time



Increased productivity through automation



Increased delivery capacity per hour

# About the Authors



AVV Subramanian is a highly experienced leader in driving business transformation led by enterprise solutions. He has been working in the area of strategy and transformation of Enterprise for over 30 years. As an expert in Digital Strategy, AVV helps organizations adopt digital technologies for business growth.



Nithin Ayathan P is a business area expert with over 18 years of experience in helping business in their digital transformation journey from conceptualizing to executing multiple Industry 4.0 and Digital Transformation projects. He has extensive experience in the Manufacturing Supply Chain, focusing on Warehousing and In-Plant logistics using emerging technologies such as AIoT.



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