



Enabling Digital Transformation in Manufacturing



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1. Executive Summary

At the heart of digital transformation in manufacturing lies the concept of smart factories.

Intelligent production facilities leverage real-time data, automation, and AI to streamline processes and improve decision-making.

Smart factories not only boost operational efficiency but also pave the way for predictive maintenance - reducing downtime and enhancing overall equipment effectiveness.

Manufacturing facilities struggle to successfully expand their capabilities to adopt new technologies due to the harshness of their environment.

Deployed smart devices are also difficult to access quickly and need constant maintenance which hinders the effectiveness of their usage.

To ease the issues it faces, facilities need to work with solution providers to solve location challenges, protection challenges, and ease of access problems they will face.

At the top of the list of proposed solutions was the utilization of protective enclosures with waterproof and shockproof capabilities to adequately protect devices.

Implementing a custom mounting system also enhances accessibility in hard-to-reach locations that are located throughout manufacturing environments.

Those who followed the solutions mentioned and implemented digital technologies saw a 15% increase in production efficiency and a 17% reduction in operating costs.

**“15%
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2. Introduction & Background

“81%
of manufacturing enterprises plan to increase budgets dedicated to utilizing digital technologies”

In an era dominated by rapid technological advancements, the manufacturing industry finds itself at the forefront of a profound digital transformation.

The integration of cutting-edge technologies is not just a luxury but a necessity for companies aiming to stay competitive, agile, and resilient in today's fast-paced business environment.

This is why approximately 81% of manufacturing enterprises plan to create and increase budgets dedicated to utilizing digital technologies.

The increased investment in digital technologies considers the hardware that powers digital transformation initiatives by facilitating data collection.

Here, the Industrial Internet of Things (IIoT), smart electronic devices, and wearables all have crucial roles to play.

These roles span data collection and facilitating collaboration within the modern shop floor.

To successfully capture data and aid collaboration, devices must be protected from the effects of the harsh industrial manufacturing environment they function in to ensure the safety of the entire operation.

2.1 Examples of Digitalization in Manufacturing

Digitalization in manufacturing takes on a unique form for each organization.

Even though digital transformation isn't a one-size-fits-all solution, every instance of digitalization empowers employees, increases connections with customers, streamlines operations, and enhances products and services.

Examples of these solutions include:

A photograph of a large industrial machine, possibly a turbine or engine, with a glowing yellow target symbol overlaid on its center. Two workers in white protective suits are standing in the foreground, looking at the machine.

Predictive Maintenance

A photograph of a robotic arm in a smart manufacturing setting. The arm is dark and sleek, with a glowing blue light at its joint. It is positioned over a complex assembly of components, including a circuit board and various mechanical parts.

Smart Manufacturing

A photograph of a smart city at night, with a large, illuminated building in the center. The city is surrounded by water, and the buildings are lit up with warm lights. The overall scene is a mix of modern architecture and natural elements.

Industrial IoT Sensors

A vertical red bar on the left side of the page contains a semi-transparent image of an industrial facility with large pipes and machinery. Two workers in white protective suits are visible in the lower portion of the image, standing near a large circular component.

Predictive Maintenance

Predictive maintenance continuously analyzes the condition of assets and equipment to reduce the chances of experiencing unplanned downtime or machine failure.

It's a transformative application of IoT sensors with advantages, such as:

- **Decreased Downtime**
Address issues before they become full-blown problems.
- **Greater Worker Productivity**
Reduce workflow disruptions by having predictive maintenance plans work around your workers' schedules.
- **Reduced Field Service Costs**
Saving on service costs helps increase ROI by anticipating machine maintenance.
- **Improved Product Design**
Design smarter with IoT data from your machines which allows you to make informed decisions.
- **Enhanced Worker Safety**
Predictive maintenance ensures your machines get fixed before they become hazards.

Smart Manufacturing

Smart manufacturing solutions can unlock new levels of innovation, productivity, and growth through various continuous improvement strategies.

These solutions help companies keep pace and remain competitive by:

- **Reducing Operational Costs**
Connected monitoring and analytics can trim down labor, materials, and overhead costs by up to 12%.
- **Maximizing Revenue Growth**
Boost factory output by up to 30% with quicker lead times, smaller lot sizes, and faster time to market.
- **Increasing Asset Efficiency**
Cut down on changeover times, unplanned downtime, and work-in-progress (WIP) inventory.





Industrial IoT Sensors

Factory settings could generate around [\\$3.3 trillion by 2030](#) with just Internet of Things (IoT) devices.

These smart sensors and actuators, working hand in hand with the IoT, are connecting people, products, and processes for added benefits:

- **Maximize Revenue**
IoT data points can also help you expand into new markets, improve throughput, and unlock new business models.
- **Get to Market Faster**
With rapid application development on IoT platforms, you can improve your legacy assets with new functionality and hit the market quicker.
- **Decrease Operational Costs**
Unlocking industrial data can help facilities remove bottlenecks and boost efficiency to help lower operational costs.
- **Improve Quality**
Scale up your product, service, and factory operations with IoT data points.

3. Challenges of Implementing Digital Strategies

Digital transformation is expected to solve many operational challenges. According to a report by [Finances Online](#), manufacturers intend to leverage digital technologies to:

- Increase productivity
- Optimize decision-making
- Improve customer services
- Reduce risk and improve safety
- Predict and address maintenance issues

To achieve these goals, enterprises must first navigate the challenges of developing a successful digital transformation strategy. The diverse challenges manufacturers face are linked to the specified digital transformation goals they intend to achieve.

Table 3 showcases the links between strategic implementation goals and their specific challenges.

Implementation Goals	Challenges
Increase productivity	Difficulties in choosing the right service providers
Optimize decision-making	Inadequate deployment of digital technologies
Improve custom service	Obscurities with analyzing customer-related data
Reduce risk and improve safety	Limited hardware protection
Predict and address maintenance issues	Challenges with training available personnel

3.1 Hardware Safety Challenges

With over 13 million workers at risk of injury in the manufacturing industry, governmental organizations have risen to this challenge by providing adequate standards and regulations to protect facility personnel. These regulations consider the harsh environment and its impact on the workers managing manufacturing assets and the digital equipment used on the shop floor. Using the consumer packaged goods (CPG) industry as an example, some facilities operate in hazardous locations subject to:



High Temperatures and Moisture

Excessive heat can lead to combustion or the explosion of devices, while any type of moisture can cause electrical faults and fires within manufacturing facilities. ATEX classifications such as the ones listed above provide compliance regulations focused on protecting hardware from excessive sources of heat and explosions.



Gaseous Emissions

The industry uses diverse gases and equipment to create seals, fill up packaging, and improve the shelf-life of the items they produce. In many cases, these gases may be hazardous to the personnel. Hence regulations such as ATEX Zone 1, ATEX Zone 2, and Class 1 Division 1 (C1D1) were developed to protect the safety of personnel and facilities. Many specifics of these regulations are designed to protect against possible ignition.



Fine Powder or Dust

Manufacturing processes that involve cutting or grinding raw materials produce small particles that are harmful to personnel and equipment on the shop floor. These flammable particles cause a hazard as a single spark could cause a catastrophic event. Securing all possible ignition sources within these hazardous locations ensures the safety of personnel and the facility. Regulatory compliance such as ATEX Zone 21, ATEX Zone 22, and Class 2 Division 2 (C2D2) guide utilizing hardware within these environments.

4. Protecting Smart Devices

Without adequate protection, smart devices are unlikely to last for more than a few hours within the harsh environment of the shop floor. A defective tablet will reduce the ability to monitor assets in real time, hindering productivity and leading to safety issues arising. The task of protecting smart devices from the harsh environment on the factory floor can be broken down into two categories:



HAZLOC Environments

In hazardous environments, the dangers to consider are:

- Combustible Dust or Powder
- Ignitable Vapor or Mist
- Flammable Gas

Ensuring the safety of the workers utilizing tablets is the priority of all hazardous safety regulations. Protecting the workers and their smart devices from dangerous by-products of the manufacturing floor requires a HAZLOC-certified case. [Regulatory entities](#) guide requirements for any electrical component to operate safely within a hazardous environment. These regulatory requirements pave the way for safety measures. Industrial enclosures are expected to keep smart tablets safe from combusting, keeping them accessible to workers on the shop floor by using heat resistance, ergonomic design, and a rugged build for durability.



Non-HAZLOC Environments

The dangers smart tablets face within non-hazardous environments include:

- Liquids, Water, and Moisture
- Climate Temperature
- Oil and Grease

Protecting tablets and smart devices used within non-HAZLOC facilities requires using a rugged protective casing with the capability to withstand harsh manufacturing conditions. Rugged enclosures ensure that smart devices are immune to water droplets, moisture, dust, liquid, powders, and grease. Rugged protective enclosures are also expected to simplify access to control features on the device such as touch pads and knobs.

4.1 Advantages of Using Industrial Enclosures

Protecting workers from harsh manufacturing environments is not the only advantage of utilizing HAZLOC-certified protective enclosures on the shop floor. Other important advantages include:

+ Increasing Productivity

Optimizing productivity and operational efficiency is the overarching goal of the digital transformation in manufacturing. Fully functional frameworks of smart devices provide every worker with access to pertinent information allowing them to do more with less. The application of protective enclosures ensures industrial tablets remain functional and accessible throughout the production cycle reducing the costs associated with production downtime.

+ Protecting Production Line Operators

Industrial enclosures ensure operators have access to all the functions of a deployed smart device. This access supports the ability to receive notifications in real-time to make instant decisions that reduce the occurrence of injuries on the shop floor. Industrial enclosures can be customized with secure handles and mounts that enable operators to utilize tablets without slowing down their work or causing safety-related issues.

+ Supporting Device Inter-Connectivity

The interconnectivity of smart devices across the shop floor supports the implementation of digital transformation strategies. Rugged enclosures are expected to protect devices from the elements within the manufacturing environment by ensuring they function properly to support data transfer and decision-making.

+ Reducing Breakage Risks

Smart devices like the iPad are expensive assets that must be protected to avoid re-investing thousands of dollars when defects occur. Industrial tablet enclosures protect these smart devices from breaking when dropped from considerable heights.

+ Increasing Device Lifespan

Industrial tablet enclosures elongate the lifespan of the diverse tablets deployed on the shop floor. These tablets can keep conventional tablets running for years within harsh manufacturing environments where they are unlikely to last for a week without protection.

4.2 Choosing the Right Solution Provider

The right protective enclosure provides adequate protection and access to smart devices deployed within the manufacturing floor – but making the right choice starts with the following considerations:

● **Analyze Your Environmental Requirements**

This process involves analyzing the environment of your facilities and the government regulations associated with your manufacturing processes to determine the certified protective enclosures required. This analysis will inform of the regulations guiding deploying electrical equipment within the hazardous location. Your requirement analysis should also include installation locations and methodologies which will determine the activities required for setting up your tablets, the supporting handle shapes, and if dedicated mount stations are needed. A proper mount station ensures devices are accessible to technicians so they do not have to navigate shop floor traffic to utilize data collection or information points.

●● **Choose a Solutions Provider**

When searching for a solutions provider, you should focus on selecting technology partners with a track record in your industry. For example, tablets mounted on CPG equipment may require some form of customization on the protective case to fit specialized equipment. Choosing a provider with a track record of meeting the certification guidelines and customization requests of your industry will simplify the usage process.

●●● **Evaluate After-Sales Support**

In scenarios where further support is required to develop and use both custom and generic enclosures, a supportive solutions provider will simplify your deployment of protective enclosures. You can evaluate the after-sales support the provider offers by going through reviews of previous customers before deciding to work with a protective case solutions provider.



5. Conclusion

In conclusion, this white paper illuminates the critical intersection of digital transformation and manufacturing, showcasing the integral role of smart factories in shaping the industry's future. It underscores the challenges faced by manufacturing facilities in deploying and maintaining smart devices within their harsh environments.

The proposed solution, involving protective enclosures and custom mounting systems, emerges as a game-changer, significantly reducing maintenance efforts and enhancing productivity.

The hardware safety challenges in manufacturing are thoroughly explored, focusing on the stringent regulations and standards required to protect both personnel and digital equipment.

The protective measures, particularly the use of HAZLOC-certified enclosures, are presented as indispensable for ensuring the longevity and functionality of smart devices in diverse manufacturing environments.

The advantages of utilizing industrial enclosures extend beyond mere protection, encompassing factors such as increased device lifespan, support for device inter-connectivity, and the safeguarding of production line operators. It stresses the importance of choosing the right protective case solution provider, considering environmental requirements and evaluating after-sales support.

6. Taking the Next Step

The right service provider for the protection of your smart devices must be capable of providing turnkey solutions that meet your industry-specific requirements.

The solution must support the easy set-up of static device stations and the ability to access devices safely, without affecting productivity.

With such turnkey solutions, the shop floor will be equipped to handle the exchange of data inside smart factories.

Static device stations ensure seamless interconnectivity from protected devices with centralized storage locations such as the cloud and on-premise data storage facilities.

On the other hand, access to rugged tablet enclosures ensures smart devices can be used across every aspect of the shop floor to receive and send real-time data - enabling remote monitoring and predictive analysis.

Comprehensive turnkey solutions should also come with a feasibility analysis to determine the best locations, accessories, and mounting gear needed to protect your tablets and increase their efficiency and lifespan.

The next step to ensuring your worker's safety and protecting your industrial devices to improve operational efficiency within your shop floor starts today.

Kick-start the protective process by speaking with a TJF representative today!

7. Resources

- <https://www.mckinsey.com/capabilities/operations/our-insights/capturing-the-true-value-of-industry-four-point-zero>
- <https://www.accenture.com/us-en/insights/industry-x-index>
- <https://www.resulting-it.com/erp-insights-blog/16-stats-manufacturers-erp-digital-transformation-sap-consultancy>
- <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/iot-value-set-to-accelerate-through-2030-where-and-how-to-capture-it>
- <https://www.ptc.com/en/blogs/iiot/digitalization-in-manufacturing>
- <https://financesonline.com/digital-transformation-statistics/>
- <https://pro-cise.com/blog/nine-safety-best-practices-to-follow-in-manufacturing/>
- <https://labtestcert.com/hazloc-certification-why-it-matters/>

