

DIGITAL INDUSTRIES SOFTWARE

Integrated MES is key to pandemic recovery for MedTech manufacturers

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“Digital technology is considered the vaccine for manufacturing industries during COVID-19.” An independent team of researchers from the Kalinga Institute of Industrial Technology (KIIT) in Bhubaneswar, Odisha, India reached this conclusion after a study of the Coronavirus disease of 2019 (COVID-19) pandemic and its impact on manufacturing across the globe. The researchers believe digital technologies are the gateway to manufacturing enterprise recovery and success. What does this mean for medical technology (MedTech) manufacturers as they navigate the ongoing effects of COVID-19 on their businesses? The study’s findings appear to be good news, as the researchers outline a promising path to successful operations in the post-pandemic marketplace.

The study points to three pillars of digital technology that have significantly influenced manufacturing under COVID-19 constraints – artificial intelligence (AI),

internet of things (IoT) and big data analytics. The integrated manufacturing execution system (MES) is positioned at the heart of the digital enterprise and it can be used to leverage these pillars to achieve strong manufacturing progress. An MES may prove to be the most important technology enabler, accelerating the MedTech industry’s pandemic recovery.

The study’s findings

By employing extensive literature reviews, the KIIT research team identified 12 key factors influencing the status of global manufacturing during the pandemic. They characterized each factor as a solution or a challenge. Then, they applied analytical techniques to recognize interrelationships among the challenges and solutions and determine their driving and dependence power. That is, they analyzed how the factors influenced or were influenced by changes in other factors.

Factors affecting global manufacturing under COVID-19 constraints

Challenges	Solutions
COVID-19	Centralized decision making
Lack of resources	Efficient supply chains
Transportation constraints	Product diversification and just-in-time (JIT)
Unavailability of buyer	IoT
Lack of operational performance	Big data analytics
	AI
	Revenue generation

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The researchers uncovered the critical role of digital technologies by classifying the factors based on driving and dependence on power. Like an efficient supply chain, some factors are highly dependent on other factors and have low driving power. Factors like COVID-19 are strong drivers of factors with little dependence on them. The three digital technology factors (IoT, big data analytics and AI) fall in a third category. These factors are strong drivers and highly dependent, which makes them the linkage between challenges and solutions. The researchers view these linking factors as elements that provide a platform essential to solving manufacturing issues due to COVID-19.

This means MedTech manufacturers can employ IoT, big data analytics and AI to facilitate improvements in other factors – more centralized decision-making, more efficient supply chains and greater product diversification and JIT implementation. These improvements will help mitigate the adverse effects of COVID-19 and associated constraints – the challenge factors. Ultimately, these efforts work together to revitalize revenue generation, which is a foundational objective of MedTech and all manufacturing companies.

The role of MES in pandemic recovery

A MedTech company's current digital enterprise may be comprised of numerous digital tools, including software used for product design or shipping logistics. To fully benefit from these digital tools, forward-thinking manufacturers are progressing toward a holistic approach known as smart manufacturing. This approach leverages digital design and engineering capabilities that are interconnected with the production environment.

Smart manufacturing generates and relies on the digital twin, which is an accurate virtual representation of products and their manufacturing processes. This is where the role of an integrated MES is critical. To make a product, design and production information must be communicated to the manufacturing floor. While the product is being made, significant amounts of data are generated that can inform the digital twin and continuously optimize production performance. The MES delivers design and engineering information to production, then collects the data generated during production and contextualizes and communicates it to systems across the enterprise. The purpose is to serve the enterprise's functional needs in real time and for long-term strategic activities.

Another way to describe the role of an integrated MES is it orchestrates and optimizes the production of a finished product based on design, engineering and process data. In the medical device and diagnostics (MD&D) industry, an MES enables error-proofing processes, paperless manufacturing, electronic device history records (eDHR) and electronic batch records (eBR). Using an integrated MES ensures that information from the virtual realm can be verified, validated and commissioned for real production. In performing these functions, an integrated MES interacts pervasively with IoT, big data analytics and AI. If these three technologies are critical to the MedTech industry's pandemic recovery, then so is an MES.

MES and IoT

The appeal of remote manufacturing operations surged as COVID-19 took hold globally and IoT is the engine that powers these remote capabilities. With sensors and software embedded in production machines and equipment, IoT supports communication and data exchange directly from one machine to another and from the machine to remote monitoring and control

stations. MedTech companies that have implemented IoT have benefited from the reduced operating costs and minimized safety risks the technology presents. COVID-19 has magnified these benefits, permitting some manufacturing operations to continue even during lockdowns, reducing human interaction and human transmission of the virus.

An integrated MES uses IoT connections to bridge the gap from the systems used to plan the manufacturing of a product to the devices, sensors and controllers on the production floor and back again. The MES and IoT work in concert with each other. In remote manufacturing operations, the MES orchestrates manufacturing with product design and production plans by sending actionable data to IoT devices. These devices employ their sensors and software to execute the manufacturing operation. The IoT devices communicate production data back to the MES, which aggregates and contextualizes it to create meaningful information used throughout the digital enterprise.

MES and big data analytics

Before COVID-19, MedTech companies were experiencing increased complexity in products, global supply chains and regulatory landscapes. This burgeoning complexity was generating tremendous growth in digital sources of various types, input rates, communication channels and accuracy. COVID-19 compounded an already challenging situation. It accelerated some new product introductions, created chaos in the supply chain and multiplied the regulations MedTech companies must contend with. Leveraging real-time and big data analytics enables manufacturers to corral the complexity and improve their decision-making processes, which is critical as COVID-19 continues to shake the MD&D ecosystem.

An integrated MES enables MedTech manufacturers to aggregate, analyze and transform big data into actionable information. An MES offers the manufacturing team real-time visibility into what is happening on the production floor, enabling them to understand key performance indicators (KPIs) and make intelligent decisions about production operations. The meaningful information generated by the MES can also be reported back to product development and production planning. This results in a closed-loop decision-making environment for continuous optimization.

MES and AI

Different forms of AI have been applied to all types of pandemic-related efforts, from understanding how the virus spreads to improving diagnostics and developing effective treatments. Two primary forms of AI are used regularly in manufacturing industries. Machine learning (ML) helps speed application development. It uses data to modify or improve the performance of a particular task without being explicitly programmed to do so. For example, ML has been used to create inspection algorithms in one to two days, which would require several weeks if hand-engineered. As it relates to COVID-19, ML accelerates new product introduction and helps implement product and process improvements.

Deep learning (DL) analyzes production and other data to generate manufacturing insights that can be communicated upstream to product development and production engineering systems. DL is the power behind closed-loop continuous improvement efforts.

All forms of AI need significant amounts of data. In manufacturing efforts, applying AI must be preceded by building a large database of meaningful information. In other words, it relies on big data analytics, which is dependent on effective data collection and delivery, orchestrated and performed by an integrated MES.

Conclusion

Some economists have characterized the Coronavirus pandemic as potentially the biggest macroeconomic shock the world has experienced in a century. Amid these challenging times and trends, investing in digital technologies, like an integrated MES, was a good idea for MedTech companies. Now it is clear this technology has become an indispensable key to medical manufacturing business success.

The value of best-in-class MES for MD&D

HOW?

- Eliminate paperwork and related errors
- Eliminate nonvalue-added activities
- Shift from compliance to quality via manufacturing enforcements
- Provide real-time visibility into manufacturing performances and quality metrics

Opcenter™ Execution for Medical Device and Diagnostics (Opcenter EX MDD) is a best-in-class MES for MD&D that provides out-of-the-box (OOTB), manufacturing execution functionalities. It helps MedTech companies control cost and quality in production environments to make sure the product is operated as intended and leads to a positive patient outcome. This is part of the Xcelerator portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software. Opcenter EX MDD also provides the flexibility manufacturers need to orchestrate a global manufacturing enterprise while supporting local needs, price points and preferences. These are the benefits of the MES system – it can audit itself; it knows what resources are on local production lines and can optimize production based on manufacturing orders without paper.



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