Manufacturing today is no longer simply about making physical products but about finding new ways to create and capture value for the end user

The future of manufacturing

Precautionary measures for Industry 4.0

ABSTRACT

Manufacturing today is no longer simply about making physical products, but about finding new ways to create and capture value for the end user. Changes occurring on multiple fronts – customer demands, the economics of production and the economics of the value chain – have led to major shifts in the way products are designed, produced and sold. This article focuses on precautionary measures to consider for companies implementing or planning to implement Industry 4.0 practices.

KEYWORDS

manufacturing, Industry 4.0, Internet of Things, transformer

1. Introduction

Manufacturing today is no longer simply about making physical products, but about finding new ways to create and capture value for the end user. Changes in customer demands, the nature of products, the economics of production and the economics of the value chain have led to major shifts in the way products are designed, produced and sold. Increasingly, customers who are spoilt for choice are demanding personalization and customization, almost blurring the line between the customer and the creator.

2. Information-based economy

Changes come on multiple fronts, one being advanced manufacturing – in the form of additive manufacturing.

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Advanced materials, smart, automated machines and systems, and other technologies are ushering in a new age of physical production. At the same time, increased connectivity and ever more sophisticated data-gathering and analytics capabilities enabled by the Internet of Things (IoT) have led to a shift toward an information-based economy.

As technology continues to advance exponentially, barriers to entry, commercialisation, and learning are eroding. New market entrants with access to new tools can operate at a much smaller scale, enabling them to create offerings which were once the sole province of major incumbents. While large-scale production will always dominate some segments of the value chain, innovative manufacturing models – distributed small-scale local manufacturing, loosely

coupled manufacturing ecosystems, and agile manufacturing – are arising to take advantage of these new opportunities.

Manufacturers are waking up to possibilities such as these and, in the process, starting to transform the way they do business.

Indeed, in the race to find new ways to create and capture value, their smaller size and agility may give many market entrants an advantage over larger, older organizations, if only because incumbents may find it difficult to change

entrenched business models and practices to accommodate new marketplace realities. Moreover, the new entrants are not necessarily even manufacturing companies in the traditional sense.

3. Implementing Industry 4.0

Manufacturers who want to compete successfully on a global scale should be increasing their investment in IoT infrastructure or they will run the risk of becoming redundant in an increasingly global village. There are precautionary measures to consider for companies

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implementing or planning to implement Industry 4.0 practices. Most of the challenges relate to the management and integration of Information Technology (IT) and Operational Technology (OT).

While some have an organization-level impact, other challenges exist at the broader, ecosystem level. These challenges are heightened as connected technologies evolve at a rapid pace. The challenges include:

• Talent and workforce
• Standards and interoperability
• Data ownership and control
• Security

3.1 Talent and workforce

In the process of trying to integrate IT and OT through the use of Industry 4.0 practices at the organization level, companies often face a shortage of talent to plan, execute, and maintain new systems. The challenge extends to the shop floor as with vast experience in conventional manufacturing, many leaders feel uncomfortable with advanced manufacturing. They simply have less experience with the properties and behavior of materials, as well as the technologies and methodologies that use them.

Another challenge is the fluctuation of the staff on the shop floor and a risk of losing trained operators. It is therefore important to focus on technologies which do not require significant training of the personnel.

3.2 Standards and interoperability

From a broader, ecosystem-wide perspective, many of the systems underpinning Industry 4.0 applications are proprietary and can present integration challenges. A lack of interoperability poses a significant challenge for full adoption of Industry 4.0 technologies.

Ideally, sales tools, design tools, manufacturing machines, test systems, etc. should all be able to communicate to each other.

3.3 Data ownership and control

As more stakeholders across the value chain become connected, questions will arise within the ecosystem regarding who owns the data generated and how to ensure appropriate privacy, control, and security. These questions grow thornier as suppliers and manufacturers become increasingly intertwined. Suppliers and vendors throughout the supply chain – right up to end customers – could potentially stake a claim on the data generated within their particular sphere, and perhaps even beyond.

An obvious example is transformer monitoring data. While this data is usually owned by transformer owners, it would also be very useful to transformer manufacturers, monitoring system manufacturers, manufacturers of different components in the transformer, service companies, etc.
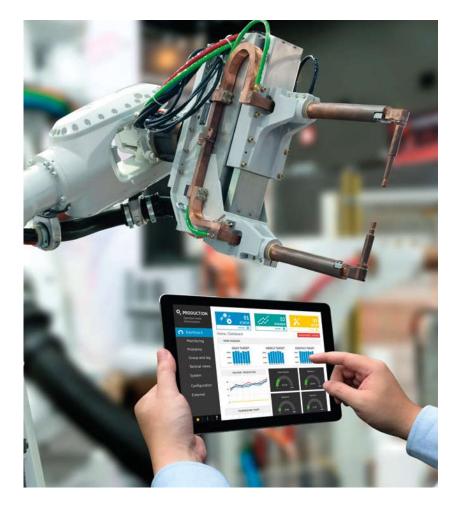
3.4 Security

Security-power tradeoff becomes more important as deployments scale. Retrofitting old systems to new Industry 4.0 applications may also increase security risks, as the old systems were not designed to be connected in this way. In order to manage security risks, companies need to secure their systems, be vigilant to avoid new risks, and be resilient to limit the damage and restore operations.

While this is very important for the manufacturers, it is of particular importance for transformer operators – utilities. Due to security considerations, many utilities work to identify risks, including the risk from terrorism, nuclear threats, etc., and prepare solid plans to increase the grid's resilience.

Effective use of information can in turn impact key business objectives such as business growth and business operations, and transformation can be possible across the value chain and its various stakeholders. The path to realisation of Industry 4.0 involves a clear understanding of the ways in which the physical can inform the digital, and vice versa.

Conclusion

Advanced materials, smart, automated machines and systems, and other technologies are ushering in a new age of physical production. Manufacturers looking to compete successfully on a global scale should be increasing their

investment in IoT infrastructure. When it comes to implementing Industry 4.0 practices, there are precautionary measures to consider, with most challenges arising from the issues in the management and integration of IT and OT. These include talent and workforce, standards and interoperability, data ownership and control, and security.

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Manufacturers who want to compete successfully on a global scale should be increasing their investment in IoT infrastructure, i.e. Industry 4.0

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