



WHY THE **MANUFACTURING INDUSTRY** NEEDS DIGITALIZATION WITH **INDUSTRY 4.0** AND ITS IMPACT

As the manufacturing sector stands at the threshold of **Industry 4.0**, what it needs the most is **digitalization**; especially when **75%** of manufacturers now consider improving internal cross-departmental systems, process collaboration, and integration among their top strategic priorities.

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01 Industry 4.0 - An Overview

Industry 4.0 is a productivity oriented push in manufacturing, propounded by the German government, and powered by the post-information revolution technologies, and the impact of Big Data and the Internet of Things (IoT). It is being touted as the fourth industrial revolution, after the first industrial revolution was powered by water or steam power, the second industrial revolution by electricity, and the third by nascent computing power.

Industry 4.0 involves the integration of machines, mobiles, sensors, work pieces, and IT systems all through the value chain, going beyond the enterprise, to create one integrated cyber physical system, with each part capable of interacting with another part using standard Internet-based protocols.

The main characteristics of Industry 4.0 are:

- *Vertical networking of smart production systems, including factories, logistics, marketing and services, to deliver needs-oriented, individualized and customer-specific production operation.*
- *Horizontal integration of the value chain, beyond the enterprise level, and including business partners and customers, using a new generation of global value-creation networks, to create new business models.*
- *Exhaustive engineering throughout the entire value chain, taking in the production process as well as the end product.*
- *Acceleration of the production lifecycle through the use of exponential technologies that hitherto catered only to mass-market applications.*

02 Industry 4.0 Technologies

Boston Consulting Group (BCG) identifies nine technology areas that constitute the core requirements for Industry 4.0:

1. **Horizontal and vertical system integration:** Industry 4.0 requires an enterprise view of data and networking of systems to ensure collaboration across partners and value chains, leave alone in-house departments.
2. **The Internet of Things:** IoT through embedded computing sensors and other tools will communicate and deliver real-time responses. This is the core essence on which Industry 4.0 is based.
3. **Cybersecurity:** Billions of devices and communication channels crisscrossing one another require state-of-the-art cybersecurity, to not just maintain integrity of the whole ecosystem, but also to instill confidence.
4. **The cloud:** The cloud becomes the de-facto norm in Industry 4.0. Only cloud servers can realistically support the multitude of devices and sensors, and the loads of data it generates. The ability to respond in real time and the scalability the cloud offers become essential ingredients in Industry 4.0. Most industrial monitoring and control systems, including ERP systems, are migrating to the cloud.
5. **Big data analytics:** IoT means an exponential increase in data, in all aspects of product development, production and testing. This offers a new dimension to manufacturing, making possible innovation, marketing, and decision making on a more targeted scale.
6. **Simulation:** Big data and cloud based enhanced computing capabilities brings virtual modeling of product scenarios, and rapid testing to center stage.
7. **Additive manufacturing (3D printing):** Industry 4.0 is poised to bring a paradigm change in manufacturing models. Additive manufacturing methods that produce small batches of customized products, will become commonplace. Such high-performance, decentralized additive manufacturing systems would overthrow existing business models based on transportation and stock on hand.
8. **Augmented reality:** Augmented reality is a technology that superimposes a computer-generated image on a user's view of the real world, thereby offering a composite view. For instance, augmented reality technology will provide workers with repair instructions as they look at the actual system needing repair. This improves decision making and productivity greatly. Google Oculus Rift and Microsoft HoloLens are two products already using augmented reality to deliver cutting edge solutions.
9. **Robots:** Robots are set to play a big role in manufacturing 4.0. While today's robots assume the form of mechanical arms on assembly lines, the new paradigm would co-opt smarter robots to assume sophisticated roles beyond rote assembly.



03 The history of the manufacturing industry's tryst with digitalization

Manufacturing companies historically had an on-off relation with technology. They have embraced some technologies such as Enterprise Resource Planning (ERP) in a big way, and also made significant efforts towards production automation ever since the 1970s. They have also embraced the latest that IT powered communications had to offer from time to time.

However, the manufacturing industry, on the whole, are laggards in several key areas of technology, especially in adopting some of the emergent technologies such as big data analytics, and real-time order confirmation. The level of technology adoption has not been uniform or across-the-board either, creating a connectivity gap in their operations.

The difficulty and challenges associated with change mean that most technological innovations have been pushed through rather than accepted as natural course of evolution, as in the case with most service industries.

The latest technologies, such as Internet of Things, are poised to make a radical overhaul of existing paradigms in manufacturing, and would be a big positive disrupter.

04 The current status of the industry's digital maturity

Manufacturing companies have generally been quite slow to adopt the more recent digital technologies, and may be considered as a 'beginner' in digital maturity. The MIT Center for Digital Business estimates that **only 12% of manufacturing companies fully leverage the power of available digital technologies**, as of now.

The key stumbling block for manufacturing companies to leverage the benefits of emergent digital technologies is their failure to effect a complete integration of information flow along the operations process. While manufacturing companies have invested in technologies, such investments have largely taken place in silos. Research by Capgemini indicates that **only 38% of manufacturing industries coordinate their digital initiatives across functions or regions**, and failure to do so leads to connectivity gaps that hinder smooth flow of information across departments and units.

The gaps are especially visible in Supply Chain Management (SCM), where companies tend to implement, over the years, disparate tools that distort end-to-end visibility and create silos. Capgemini's global survey reveals over 40% of supply chain executives believed that improving supply chain visibility could improve their organization's competitive advantage.

Lack of information leads to delays, which in turn leads to:

- Loss of sales opportunities as lack of right information at the right time prevents executives from confirming customer orders in time. Empirical research estimates that the larger the delay, the greater the magnitude of lost sales.
- Increased costs and customer dissatisfaction owing to production downtime resultant from lack of visibility on stock levels and lack of information on inbound supply chain.
- Low productivity, as employees struggle to integrate and sync several service and maintenance tasks such as planning activities, checking, availability of required spare parts and consumables, physical transportation, and ensuring efficient remote services.

Of late, manufacturing companies have started to recognize this gap. Capgemini estimates **75% of manufacturers now consider improving internal cross-departmental systems, process collaboration, and integration among their top strategic priorities**.

Why the manufacturing industry needs digitalization

There are several reasons why manufacturing industries would do well to embrace the latest digital technologies in a big way.

The obvious benefit is cost advantages. Capgemini estimates *adopting the latest digital tools help manufacturing companies cut costs by as much as 30%*. The savings would be mostly in capital costs, and labor field force. The indirect benefits are much larger.

- **Improved productivity:** The application of digitalization tools offers visibility throughout the operational chain, enabling enterprises to integrate all related information, which in turn helps in managing end-to-end processes efficiently. LG Display uses disparate Manufacturing Execution Systems (MES) and integrates it to their ERP, to overcome the challenges of data standardization and make business systems real-time.
- **Improved efficiencies:** An advanced ERP system with a machine control system facilitates direct transfer of production orders to the machine, eliminating human intervention. Digital devices display incoming production orders to the shop floor control team, and factoring in material availability side-by-side. All this eliminates manual tasks and infuses the whole process with transparency. The benefits are improved accuracy and accelerated time to market.
- **Accelerated time to market:** The emergent digital technologies such as EDI-enabled Advanced Shipping Notification (ASN) enable effective management of information flow throughout the chain, from suppliers to the manufacturing facilities and further down the value chain right to the customer. Companies may use the positioning and navigational systems the same way to connect inventory management tools across transport modes to lend further information to this flow. All these improve efficiencies considerably, resulting in not just considerable savings across the board, but also accelerated time to market, facilitating just-in-time production schedules, improved customer satisfaction, and more.
- **Better control of Outsourced Service Partners:** Outsourcing parts of the process has become the norm of most manufacturing systems; but the increasing number of such outsourced service partners make it challenging for manufacturers to control the activities in the service and maintenance functions. The end-to-end control and visibility across the value chain that digital technologies provide make this easy and allow companies to deliver optimal after-sales performance.
- **Accurate predictions:** Service and support functions related to manufacturing, such as scheduling delivering, pricing, and other functions invariably suffer from the lack of right information at the right place at the right time. For example, gaps in information on an installed base may result in wrong estimation of the resources required, when calculating for servicing. IoT sensors offer comprehensive and real time information on the base, and help overcome critical gaps that impede making correct estimates. The emergent digital tools consolidate all relevant information in one place and make it easy to access them, allowing for timely and more accurate estimates, and eliminating guesswork from the equation.

The different areas in manufacturing that digitalization can help with

Digitalizing gives a fillip to both the actual manufacturing process and the support services connected with it.

At the heart of Industry 4.0 is leveraging technological advances to manufacture things in a new way. Additive manufacturing, or the process of making three-dimensional object of virtually any shape from a digital model is expected to herald customized manufacturing at the expense of the classic production-line model. Machines that facilitate this are already capable of using everything from wood pulp to cobalt to create products from sneakers to fuel nozzles for airplanes and even human organs. Furthermore, additive manufacturing makes it possible to create designs or structures not possible using traditional ways such as milling or casting. In its extreme form, additive manufacturing would even extend the “work from home” concept to manufacturing.

Most manufacturers continue to depend on traditional and outdated models of planning. Embracing digital technology enables migration to advanced planning systems, and in the process gain greater visibility into their systems and processes. A case in point in the supply chain network. Many manufacturers, have, over the years, accumulated multiple disparate digital tools, creating a silo system that distorts end-to-end visibility. Such connectivity gaps can be bridged with digital. A case in point is how Levi Strauss & Co. used Advanced Shipping Notification, which helped cut down manual tracking and tracing of inbound shipments by 98%.

The three major connectivity gaps related to supply chain management processes that digital technologies can overcome include:

- Disparities in point of sales connection and immediate customer order
- Absence of inventory visibility during inbound transit, production, and outbound transfer
- Gaps in integrated supply chain planning and execution

The existence of these gaps leads to process and cost inefficiencies.

07 Anticipated impact of manufacturing digitalization

A survey by Capgemini reveals that a clear majority of companies expect digital transformation to industry 4.0 to increase their competitiveness. Only a tiny fraction fears that the disruption would affect their current business, and even they believe that major change is fait accompli.

Overall, industry 4.0 is set to cause a paradigm change in manufacturing models. Big data analytics would allow companies to integrate customers' needs and preferences into their development and production processes. Technologies such as 3D printing would herald a shift from a model of mass production and maintaining stocks to real time customized production. IoT sensors would enable companies to analyze data on real time, to enhance quality and improve service.

Among specific business functions, Industry 4.0 would give a big fillip to research and development (R&D), while warehousing and logistics would undergo the maximum transformation from present levels.

08 Challenges

The major risk of Industry 4.0 is the high stakes it places on connectivity, and the potential disruption in the entire process if connectivity is interrupted for some reason. Real-time co-ordination and synchronization is the lifeblood of Industry 4.0, and it requires reliable, high-speed internet connection, always, to make it happen. While technology has advanced, and innovations such as Google Balloons promise to make reliable internet available even to the remotest parts of the planet, there is still considerable ground to be covered, before the seamless connectivity that Internet 4.0 assumes for granted becomes a reality.

Another significant challenge of Industry 4.0 is heightened cyber-security risk, with all key processes connected to the internet all the time. Cyber-criminals striking systems at will is already a big menace, and bringing in more systems online would increase the risk. Industry 4.0 understands this risk and makes robust cyber-security an essential ingredient of this new industrial wave. The stakeholders of Industry 4.0 would have to integrate cyber-security into their core operations, and even then, the domain of cyber-security may have to cover some more ground, with better encryption standards, or even some new pathbreaking solution, to strengthen the overall security scenario, before industry can go online with full confidence.

Industry 4.0 assumes all stakeholders in the ecosystem to have a uniform level of cyber-competence. The individual stakeholders of an Industry 4.0 ecosystem would invariably face the challenge of matching the technological competence of other stakeholders in the value chain. In a globalized world, with varying levels of cyber-infrastructure, and varying levels of competency, not everyone would be adept to work at the same high pace that Industry 4.0 demands. Disruptions at one level can derail the entire process.

Finally, many companies face the challenge of making available adequate resources of Industry 4.0. Industry 4.0 is, at the end of the day, a massive overhaul of legacy systems, infrastructure, and processes. Companies embracing this new concept face the twin challenge of budgeting for new resources, and managing disruptions that invariably come in the wake of any major change. There is also the challenge of finding adequate talent to drive the change. The technologies that Industry 4.0 use are cutting-edge and latest off-the-block, and it invariably takes time to develop a sizable pool of talent competent in such technologies.

The ability of companies to take advantage of the possibilities offered by Industry 4.0 depends not just on their grasping and embracing the concept, but also taking on and overcoming the challenges head-on.

09 About Suyati

Suyati provides marketing technology and integration services for companies that wish to combine the best of breed solutions and create a unified approach to customer acquisition. This unified digital marketing approach requires system integration between various CMS and CRM platforms, and a slew of ecommerce, Marketing Automation, Social Media Listening, email and social marketing, and customer service systems. Our specialized knowledge in Salesforce, open source and .Net based systems enables us to build effective custom integrated solutions for our clients.

Suyati's custom technology solutions have been deployed in companies in the US, Western Europe and Australia, and have helped many enterprises leverage the web/cloud/mobile technologies to acquire customers through integrated digital marketing. Suyati is based in Chicago with product engineering capability out of the US and India.

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Resources:

- 1.https://www.bcgperspectives.com/content/articles/engineered_products_project_business_industry_4_0_future_productivity_growth_manufacturing_industries/?chapter=2#chapter2
- 2.https://www.capgemini-consulting.com/resource-file-access/resource/pdf/operational_excellence_goes_digital_29_07_final.pdf
- 3.<http://www2.deloitte.com/content/dam/Deloitte/ch/Documents/manufacturing/ch-en-manufacturing-industry-4-0-24102014.pdf>
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