

# INDUSTRY 4.0 e-NEWSLETTER

September 2020



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## Foreword

Saurabh Gaur, IAS  
Joint Secretary



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16<sup>th</sup> September 2020  
दिनांक / Dated.....

### Foreword

Our Vision is to drive self-sufficiency and create capabilities to take leadership position in new and emerging technology areas such as Industry 4.0, Artificial Intelligence, Additive Manufacturing, IoT, Blockchain and AR / VR. Most industries would have to use emerging technologies in some way or other in order to remain relevant and competitive in the market and this will in turn open great opportunities for the Indian Electronics Industry.

Industry 4.0 is no more a technology of the future, it's undoubtedly in front of us. We would very soon see a paradigm shift in the field of manufacturing due to these emerging technologies. And this will not be restricted to the manufacturing sector only, its impact will percolate and will have a tremendous effect in making our daily lives better.

Indian Government aims to improve its manufacturing output from the current level of 16% to 25% of GDP. This will also create a great demand of skilled manpower which will be a boon for a young nation like India.

I am happy to see that FICCI has taken an initiative to spread the knowledge and awareness about these emerging technologies through this newsletter. I wish FICCI a great success.



(Saurabh Gaur)

New Delhi



# Message



**Mr. Bhaskar Mandal**  
Chairman  
FICCI Industry 4.0 Committee and  
Head-Digital Industries, Siemens Ltd, India.

## Industry 4.0 and Atma-nirbharta

**A**s the world continues its fight against C-19, we are all realizing the magnitude and scale of change that is required for us in finding the new normal.

Till now, India Inc has faced the adversities with fortitude. What will take us ahead will be our collective zeal to collaborate and overcome this unprecedented situation.

On May 12, 2020, the Hon. Prime Minister of India, Mr. Narendra Modi, announced the “Atma Nirbhar Bharat Abhiyaan” with the aim of making the country independent against the tough competition in the global supply chain. Emerging from the shadows of the “Make in India” initiative, “Atma Nirbhar” (or self-reliance) caught the imagination of Indian Enterprises and has given the much-needed fillip for Indian enterprises to converge on a renewed narrative for change.

India Inc’s initiative of self-reliance is based on five levers of Economy, Infrastructure, Technology, Vibrant Demography & Demand. Considering manufacturing’s influence on all the five and its role as the backbone of any economy, self-reliance here will result in improved contribution to the nation’s GDP, improved employment opportunities and sustainable long-term growth. Coming on the back of India’s 74th year of Independence, the struggle for being “Atma Nirbhar” or “self-reliance” is not new to the average Indian. The real difference this time is that we have the means and the access to achieve it.

It is here that Industry 4.0 and its constituent digital technologies will play a role as catalysts for an Atmanirbhar India. After what industry is experiencing in the corona crisis, flexibility will obviously be more important than ever in the future. And flexibility requires intelligence in everything from product design to

production. Adoption of IIoT to connect the legacy manufacturing assets and cloud-based data analytics applications to acquire shop-floor insights, are increasingly providing the basis for fast and accurate day-to-day decision making. Increased use of simulation tools is giving entrepreneurs the power of

experimenting with alternatives and select what is most beneficial, both, for product design as well as for manufacturing processes. Integrated manufacturing setups are increasingly more efficient and productive, helping India's manufacturing sector especially SMEs to be globally competitive. Robotics and additive manufacturing are encouraging industry to question the status quo and be responsive to the dynamic market demands, especially during these challenging times. Digitalization reshapes everything and that includes casting our journey towards self-reliance. This in turn would mean improving the key parameters of flexibility, efficiency, productivity and quality while establishing the critical need of safety & security in the digital era.

Time has come for India's manufacturing sector to break the barriers of reluctance – paucity of funds, lack of access to technology or scarcity of expertise. It is time to take the leap of self-belief and adopt Industry 4.0 and its constituent digital technologies to transform our industries. While it is useful to envision the end-to-end digital landscape, perhaps we can start with baby steps, mitigating the manageable risks yet targeting exponential value. It will be our contribution to atmanirbharta - a transformed, competitive and globally respected innovation driven Indian economy. Let us make this our voice to join the growing chorus of 'vocal for local' and help India achieve the \$1 trillion GVA from manufacturing in next 5 years contributing to at least 20 percent of national GDP.

## Message



**Mr. Rajeev Singh**

Co-chairman  
FICCI Industry 4.0 Committee and  
Partner Management Consulting  
Deloitte Touche Tohmatsu India LLP.

**A**fter a long period of minimal economic activity, the Indian economy has potentially started showing signs of recovery, with sectors such as e-commerce and consumer products leading the way. What we are seeing across the board is a slow build-up to reach the pre-COVID levels of economic activity over the next few quarters. It is interesting to note that through these difficult times a number of industry sectors have demonstrated a strong resonance with adoption of technology and digital transformation across their value chain. These transformations, I believe are in perfect alignment with the onset of the 'Atmanirbhar' India journey.

The Manufacturing industry will play a pivotal role in making India Atmanirbhar. Manufacturers are working on Developing new products, improving operational efficiencies and product quality to ensure reliability, which will result in building agile, responsive and reliable supply networks.

Industry 4.0 solutions are going to be a driving force behind the vision of an Atmanirbhar Bharat and the manufacturing industry is seeing a scalable deployment of Industry 4.0 use cases across Production operations, Asset Maintenance, Manpower & Quality domains. Technologies such as Advanced Analytics, Machine learning, Robotics and Automation, Artificial intelligence, Virtual reality amongst others are at the forefront of these use-cases and organizations have put to use these technologies to expedite the product development lead times & optimize capacity utilization, these steps taken by the Indian manufacturers will accelerate the journey towards making India Atmanirbhar.

The Industry 4.0 ecosystem in India though a work in progress, will also evolve faster with a renewed push towards an Atmanirbhar India. On a broad level the Industry 4.0 value chain is divided into the hardware aspect, the platforms that bind it all together and most importantly the data gathering & processing that makes it all tick. Today most of the technologies and platforms that we see being deployed across industries are homegrown. At the onset, I4.0 ecosystem in India was lagging in comparison to their global peers in terms of matching up to security, infrastructure, and efficiency and reliability standards. But having closely seen the progression, I can confidently say that we will soon be at a point where we don't need to look beyond our borders for these solutions, thus providing peace of mind for organization from information security & Cyber risk stand point as well.

Fundamentally, I believe Industry 4.0 will play the role of a fulcrum in the path towards making India Atmanirbhar, and the journey has already began with hundreds of home grown Startups offering cost effective I4.0 solution and Organizations experiencing substantial business benefits by adopting them. Exciting times ahead, indeed!

## ARTICLES ON INDUSTRY 4.0

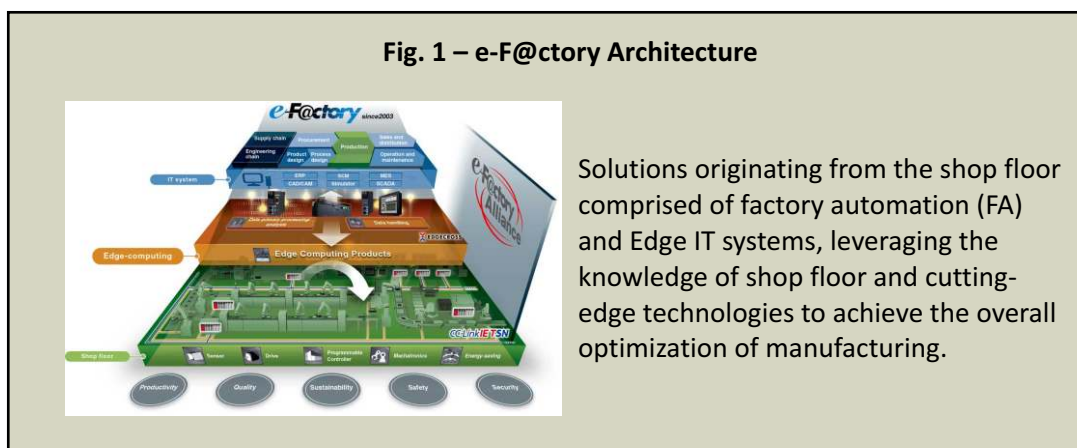
### e-f@ctory Solutions



**Mr. Sunil Mehta**  
General Manager  
Automotive Business Development  
Department, Mitsubishi Electric India.

In these modern days and age, it is apparent that digital transformation is changing the way business is done in every sector of the economy. Businesses will need to transform themselves into digital enterprises to thrive, and this transformation will need to be far more profound, not only by investing in the latest technology but also with a strategy that is carried through redesigning talent models, transforming processes and retooling technology. The solutions should be standardized in a way that appeals to the demand of rising challenges faced by the customers.

To address these challenges, Mitsubishi Electric introduced a concept called e-F@ctory. It's a Japanese concept that refers to intelligent / smart manufacturing. The e-F@ctory concept is a comprehensive solution that leverages latest digital technologies such as IoT, Big Data, AI, Advanced Robotics etc. which help customer to achieve digital transformation in manufacturing environment. Fig. 1 represents e-F@ctory Architecture



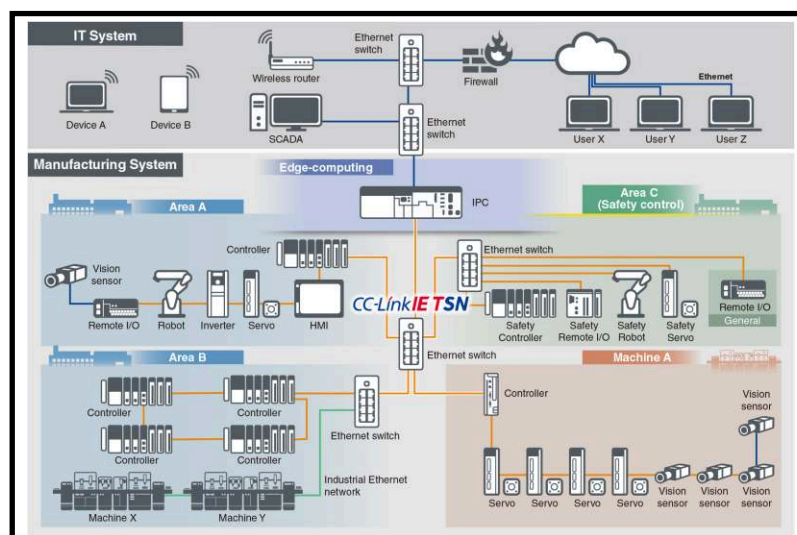
e-F@ctory concept was announced way back in 2003 in Japan by Mitsubishi Electric and is continuously evolving as technologies are emerging year by year. The company has implemented e-F@ctory Solutions to its various manufacturing factories in Japan, India and other countries in the world.

➤ **Channelizing Atmanirbhar (Self-Reliant) India for Advance Automation**

Addressing the on-going pandemic conditions, the government is emphasizing to make a Self-Reliant India and channelizing domestic resources at best use. Self-reliant India can only be realized by addressing the issues of Economy, Infrastructure, Demography, and rising demand. The major beneficiary of this movement is Micro, Small and Medium Enterprises (MSMEs) and other small-scale industries. Mitsubishi Electric also wishes to contribute to growing demand for automation through smart manufacturing. Mitsubishi Electric’s Graphic Operation Controller (GOC), designed, developed and manufactured in India, can be effectively used for low cost automation for variety of applications.

➤ **Creating an innovative platform through “Standardization”**

The need of hour is to simplify processes starting from the factory floors by eliminating unnecessary activity and assuring consistency in inputs. To realize smart factories, productivity improvement through higher equipment performance by gathering real-time information from production processes, processing it via edge computing, and then transmitting it seamlessly to Enterprise systems is essential. Mitsubishi Electric has recently introduced CC-Link IE TSN in (Time Sensitive Networking) that enables seamless, smooth connection from upper level IT systems to OT systems at production sites. Demand for TSN support will increase, as this technology makes it possible to mix different networks on same trunk line and provide real-time communication through time synchronization. The key to digitalization is integration of IT & OT systems. Fig. 2 represents complete plant architecture based upon CC-LINK IE TSN.



**Fig. 2 represents complete plant architecture using CC-LINK IE TSN.**



➤ **Enhancing Connectivity through End-to-End Journey**

Mitsubishi Electric delivers its e-F@ctory solution by using its core products at various layer of manufacturing. At shop-floor, Mitsubishi Electric uses its PLCs, Inverters, AC Servo Systems, NC Controllers, Industrial Robots; at network layer – CC-Link IE TSN and at FA-IT layer – its MES Interface Module for data exchange with ODBC complaint databases, OPC UA Module for Enterprise connectivity. Mitsubishi Electric offers Edge Analytics through its Edge computing product MELIPC (Industrial PC) and Edgex Open Software Platform. This open software platform offers flexibility to build edge applications and deploy AI/ML model on MEL-IPC. Edge computing brings computation and data storage closer to where data is generated, enabling better data control, reduced costs, faster insights and actions, and continuous operations. Thus, improved productivity, while reducing Total Cost of Ownership (TCO). e-F@ctory Alliances Partners offers Smart Manufacturing Solutions and support in customer’s digital transformation journey in close coordination with Mitsubishi Electric.

➤ **Ensuring Safety & Cybersecurity**

Mitsubishi Electric’s prime endeavour is to develop products that are safe, reliable and to only deliver products that fully satisfy our customer’s needs. Mitsubishi Electric’s leading-edge development is highly regarded internationally for its efforts to improve quality in every process, whether product development, design, or production, as well as in aftermarket service following delivery.

Mitsubishi Electric’s with its CC-Link IE Network technology ensures devices securely join network, ensuring proper authentication and authorization as securing data at device level. At network level, it has mechanism to ensure availability of communication networks, security across heterogeneous network connections and prevent unauthorized users’ access to data and controls. Edge security streamlines the flow of traffic between the edge and IoT devices, making it possible to conduct real-time security analysis, filtering, and processing of security data.

With the growing demand for smart manufacturing, we are providing solutions that can cater to greater automation, safety and efficiency for various industries like Automotive, Pharmaceutical, F&B, Printing, and Plastic among many others.

## Applicability and Developing of Standards for deployment of Industry 4.0



**Mr. V. Venkata Ramana**  
Founder Director and Consultant I4-VG  
(Industry 4.0 - Virtual Guild)



**Mr. Manoj Belgaonkar**  
General Manager-Quality  
Siemens India Ltd.

A manufacturer's sustainable competitiveness depends on its capabilities with respect to cost, delivery, flexibility, and quality. Deployment of Industry 4.0 maximizes those capabilities by using advanced technologies that promote rapid flow and widespread use of digital information within and between manufacturing systems.

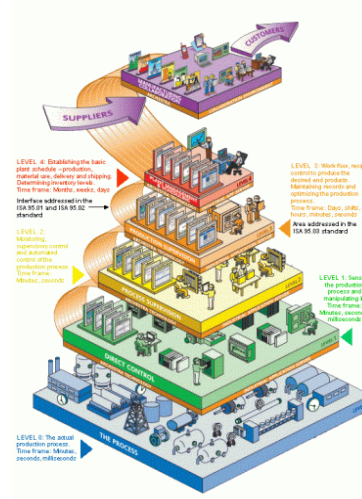
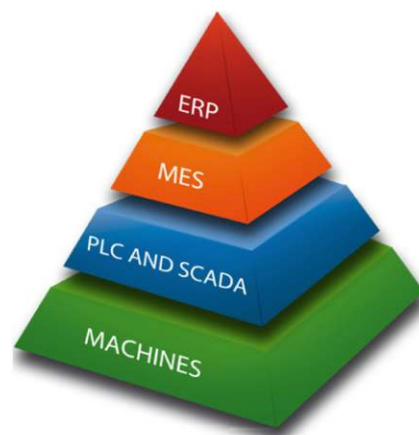
The top transformative manufacturing technologies that bring about Industry 4.0 are: Advanced Sensing, Control, and Platforms for Manufacturing, Visualization, Informatics and Digital Manufacturing Technologies, and Advanced Materials Manufacturing.

The key characteristics of Industry 4.0 implementations are:

1. Digitalization of every part of manufacturing enterprise with its interoperability and enhanced productivity.
2. Enable Mass customization of product manufacturing through connected devices and distributed intelligence for real time control.
3. Collaborative supply chains which respond rapidly to market changes and supply chain disruptions
4. Use of Sensors to acquire data and big data analytics.
5. Faster innovations through effective product lifecycle management

A wholistic view of various dimensions that comes into play in the vertical integration of machines, plants, and enterprise systems is called the Manufacturing Pyramid, (as defined in ISA-95 standard) which is shown below.

## ISA-95 Framework



### Importance of ISA-95, Manufacturing Pyramid:

Historically, these dimensions have been dealt with as silos of concern. Indeed, integration along even one of these dimensions is a non-trivial challenge and is being actively worked on. Tighter integration within and across these dimensions will result in faster product-innovation cycles, more efficient supply chains, and more flexibility in production systems. The combination of these allows for optimal control of the automation and decision-making needed to make high quality, highly customized goods in tight synchronization with the demand for these goods. The seamless integrations within and across the manufacturing pyramid leads to Industry 4.0 capabilities.

### Importance of Standards

Accordingly, each of the layers in ISA-95 manufacturing pyramid contribute to one or more of the Industry 4.0 capabilities. For example, on the product dimension, PLM standards contribute to both agility (by streamlining processes) and quality (by enabling the integration of different activities along the product and production system lifecycles). Standards are fundamental and valuable tools that can enable the adoption of technologies and innovations by enterprises. In the production system area, continuous commissioning standards can improve machine performance and systems reliability to improve productivity, quality, and sustainability. Standards for electronic commerce help streamline business processes between partners in the supply chain.

Typically, there are standards development organizations like ISO, BIS, IEEE and IEC which not only work for developing standards but also facilitate consensus building and open availability for organizations to use them. Typically, ownership of these standards remains a public trust of various sorts and they are open to interested participants

### Brown field implementations of Industry 4.0

In a brown field implementation of Industry 4.0, it is important to capture and assimilate various levels of manufacturing pyramid, irrespective of their level of maturity of implementation. This ensures

information flow from Shop-floor to Top-floor seamlessly and from Top-floor to Shop-floor as actionable instructions. There are existing standards for each level as well as for inter level information flow. Where such information flow channels don't exist please refer the Green field implementation topic in the later section.

**Enterprise Level:**

ISO15704 Enterprise Architecture Requirements

ISO19439 Enterprise Integration

ISO 19440 Enterprise Integration

ISO 20140 Automation systems and Integration

ISO 9000, ISO 14000

ISO 10303 (STEP)

PLMXML for PLM data exchange

STL (for 3D Printing)

IGES and DXF (Drawings)

ISO TC213 (for GDT)

ISO TC10 (for Tech documentation)

IPC-D-235: For documentation of PCB, assemblies etc

ISO14306 (also known as JT standard for visualization exchange)

ISO 13584 For product catalogues data standards

EDIFACT (EDI by UN), e-Class for part codification and classification (for global supply chain)

**MES Level:**

IEC 62541, IEC62837

IEC 62264 (ISA95)

IEC 62443 (ISA 99)

IEC 62832 Digital Factory

ISO 22400

ISO 6983 G-code standard for CNC machines

Automation ML

**SCADA Level:**

IEC 62541 (OPC-UA)

IEC 61512 (ISA 88)

PLC Open XML

Modbus

**Device / Machines Level:**

IEC 61158 (Profinet, EtherCAT)

IEC 61784

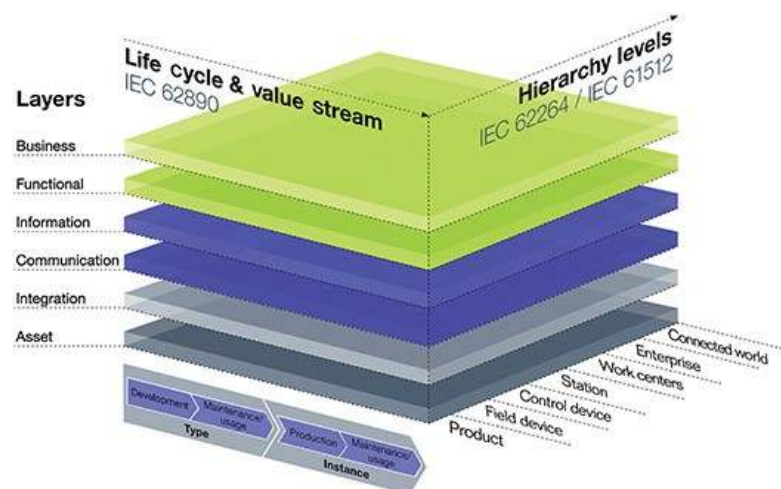
MT Connect

Modbus, Profibus

IEC 62591 (HART)

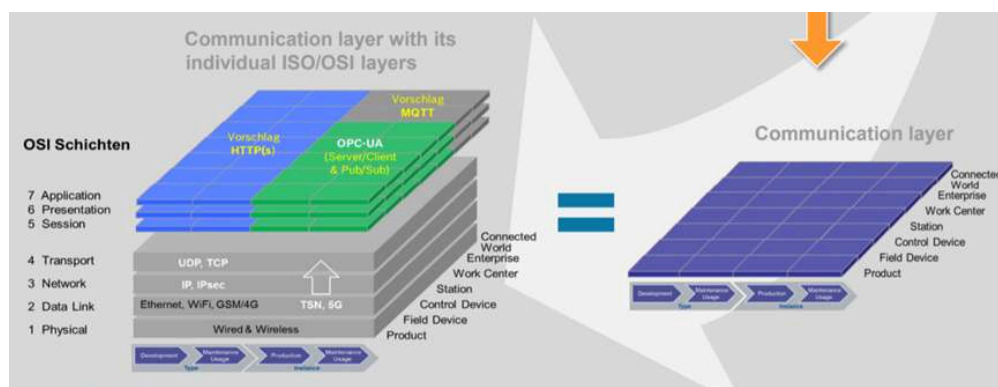
**Green field Implementations of Industry 4.0**

Green field implementation of Industry 4.0 is best represented by RAMI 4.0 model shown below which is developed by German Industry.

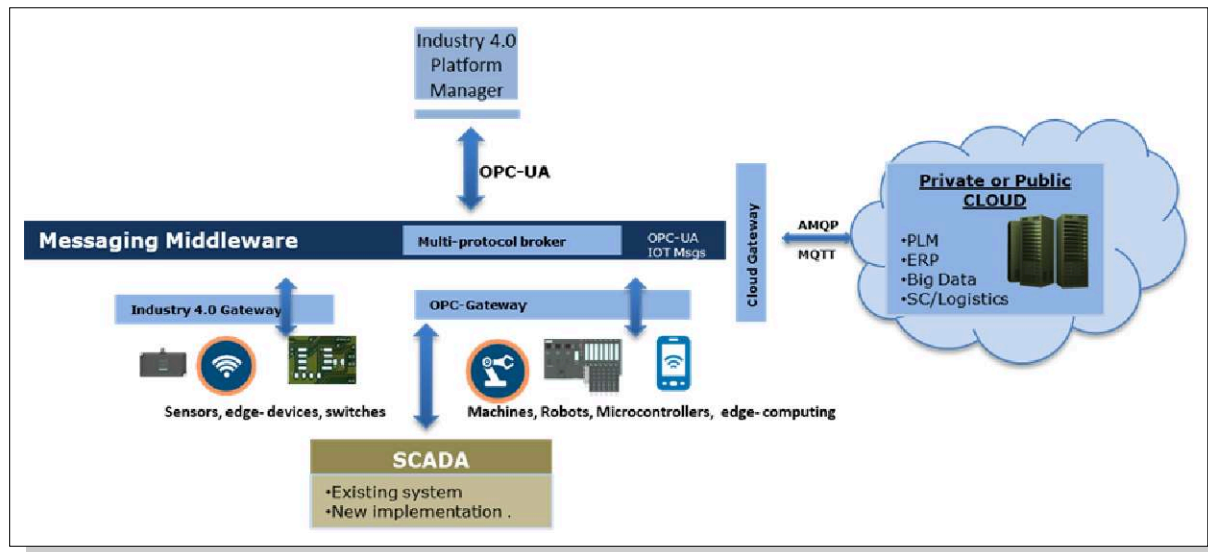


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Based on the manufacturing context and information processing need, equipment and devices can communicate amongst themselves or to an edge computing device or to enterprise solution or to cloud, depending on the context. A communication node and an integration platform is typically used. Given below is the RAMI communication layer which is basis for standard communication across and between administrative layers shown above.



A simplified Implementation with physical components and communication protocols is shown below. The details of used in the diagram are explained below.



- Industry 4.0 Platform Manager: Takes care of a) Control of devices and gateways, b) Security management, c) Configuration of Cloud connection, d) OPC-UA information model.
- Protocols: a) OPC UA –platform independent open source industrial protocol , b) MQTT-Lightweight publish –subscribe messaging protocol, c) CoAP- web transfer protocol for resource controlled devices, d) LwM2M-protocol for IOT device management, e) AMQP-binary internet protocol for business messaging
- Industry 4.0 Platform: a) IIOT Messaging infrastructure, (which can be OPC UA for high-level messaging , or MQTT/CoAP/LwM2M for low level messaging), b) IOT and OPC UA Gateways, for legacy device integration, which runs on dedicated micro-controller, c) Industry 4.0 Platform Manager, d) Cloud gateway which is typically MQTT/OPCUA data to cloud, d) Private cloud for Big-data and enterprise applications
- Industry 4.0 Gateway which is typically provided by a Microcomputer, Audrino, Raspberry PI. It has Embedded OS /RTOS and -MQTT, CoAP, LwM2M Stack. Provides for Legacy Device to Messaging middleware communication
- OPC-UA Gateway which is typically provided by a Microcomputer, Audrino, Raspberry PI. It works on Linux-OS and has -OPC-UA Stack. Provides for Legacy equipment with OPC to Messaging middleware communication

The Industry 4.0 Platform manager, Messaging Middleware and other Gateway requirements are typically met by emerging standard platforms like Mindsphere of Siemens, Picominer (for IOT edge) from Vidcentum, etc. Data flow from sensors and switches will be routed through gateway applications, which may provide edge computing needs also. OPC-UA is accepted in most situation as neutral solution from

equipment and from gateway to middleware. Data flow to and from enterprise application which may also be on cloud, is done with MQTT or AMQP protocols.

Sensors and field devices which are typically sourced from various vendors become most important elements of new Industry 4.0 implementations. These devices will be sending communication using various communication protocols. IEEE is therefore developing standards for quick adoption of such current and new devices and sensor, under IEEE1451-99 Harmonization standards. The key objective of this standard is to provide plug and play for such field level devices and sensors. This functionality is expected to be provided by incorporating the technical feature functionalities of devices (electronic data sheet) into an embedded information or as easily accessible resource in a system. This will ensure that newly plugged in device or sensor identifies itself to the Industry 4.0 system and adapt to the functionality demanded by that system including reconfigurability of Industry 4.0 systems.

**Summary:**

Standard and well accepted manufacturing pyramid ISA-95 is a good model to understand the integration and data flow across application layers from shop floor to top floor. Compliance to existing standards that exist across these layers will enable long-term sustenance and safeguard existing investments in of a robust Industry 4.0 implementation. However, wherever the missing layers or its elements in manufacturing pyramid are not yet implemented, the RAMI model should prevail as it ensures compliance to Industry 4.0 implementations of the future. The RAMI model and its implementations will also reduce the typical burden of implementing all hierarchical layers. In that case data can flow across the layers without necessarily passing through all hierarchical layers. A typical example is production monitoring data can directly flow from individual machine to ERP to monitor critical machines without passing though SCADA or MES layers. The emerging standards especially at the device and sensor level communication are very important for plug and play and future proofing of the systems.



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## Journey for SMEs in Post-COVID Era



**Dr. Lovneesh Chanana**  
Vice President (Digital Government)  
SAP India Pvt Ltd.

The Small and Medium Enterprises are a vital part of the Indian economy. The contribution by the sector to the economic and social development including employment generation is widely recognized.

MSMEs play a catalytic role in the development of our nation and constitute to be a key element for India to become the second largest economy by 2030. When the economy touches the 5 trillion-dollar mark, the vision is for the sector to contribute 50% to India's GDP, 45% of India's employment and 75% of Indian exports. Retail, manufacturing, logistics, travel and hospitality continue to hold the top share among SMEs. With around 65 million units, canvas of the potential landscape in Indian economy is large enough to have a significant impact. To achieve the set marks, MSMEs need to produce high quality goods and market them at competitive process to leverage economies of scale and technology driven by innovation. As per the reports<sup>1</sup> 70% of SMEs are digitally influenced and over 600 aggregators are enabling the rise of digital SMEs.

From a technology solution and enablement standpoint, COVID has accelerated the reality of digital consumers and companies are focusing their strategies to being more digitally intelligent. Digital optimization is no longer the sole recipe for business transformation and the consumers' experience management i.e. value creation through experience may assume an important role in shaping competitiveness. From an industry stand point, we are moving to a model of intelligent enterprises, with repetitive tasks being taken over by machines and high value tasks are becoming the focus areas for organizational growth and competitiveness. A summary of changes is presented below:

<b>From</b>	<b>To</b>
Value creation through products and services	Value creation through experience management
Evolving digital society	Maturing digital society
Innovative business models	Innovative new organizations
Collaborative teamwork	Machines as co-workers
What and How	Why
Capacity, skilling and reskilling	Culture of innovation
Digital optimization	Intelligent enterprises
Processes	Data
Profit and then social	Social becoming a priority

In short, this phase of technology evolution is a two sided one with machines helping in perception, prediction, prescription and also participation. The other shift that we envisage is from “Processes consuming data”, to “Data defining processes”.

The technologies shaping the industry 4.0 journey include robotics, industrial internet, cyber security, cloud computing, artificial intelligence, 3D printing, augmented reality and big data and analytics.

Industry 4.0, for many countries including India, has been focused on enhancing broadband infrastructure, standardization and inter-operability, work organization and redesign, training and skill building and modelling of complex systems. Samarth Udyog Bharat is an example of such an initiative promoted by the Indian government to transform the manufacturing industry in the country.

However, the challenge for small and medium businesses lies in the task of understanding the Industry 4.0 journey into specific development stages that show tangible benefits which are quantifiable.

The pandemic has impacted the following aspects of business:

- a. Finance: management of cashflows, funding and reworking of margins and goals
- b. Supply chain: Regionalization of supply chains, agility of supply chains
- c. Employee: Employee health, learning, productivity improvements

The supply chain has seen a greater impact since there is a significant drop in customer demand. This has further impacted the revenue outlook and inventory stock up, product safety assurance to customers, logistics and movement challenges, raw material, parts and labour shortage, finding alternate suppliers, surge pricing, retrenching existing workforce and cash flow challenges. Repurposing of factories is also being seen.

That brings us to a more important question, how does the digital transformation journey map out for SMEs post COVID-19?

Going forward, the SME journey to Industry 4.0 may be differently aligned and be characterized by the following:



We are likely to see the emergence of global buyer supplier networks and hence the need for Indian SMEs to have a global discoverability and visibility. The innovations on 'technology platforms' is likely to reshape the solution landscape leading to a differentiated measure of competitiveness. Skilled workforce and talent pool in artificial intelligence, cloud, big data, cyber security through a collaborated government industry initiative would be the key ask.

'Digital' may assume a higher pedestal on Government schemes and programs. Exploring new financing models which are pure technology based will further push the digital adoption.

If anything, the pandemic has shown us the significance of technology and for the SME industry in particular- need for adoption. Let's together empower our back bone of the economy and emerge stronger to make a new and resilient Indian SMEs community.

## Smart Factory Operations empowering customers through Camozzi Digital



**Mr. Sudhir Mehani**  
COO/CDO, Marzoli India



### Camozzi Digital enabling Customers for Smart Factory Operations

Manufacturing Industry, which has continuously upgraded itself with the passage of time and challenges. Not only has the innovation taken place in product development, but also it has covered development with specialized properties, environment friendly processes, machineries etc. Now a days, the major challenge of this Industry is its readiness to Industry 4.0 revolution. Industry 4.0 is emerging globally as a powerful force and is being flaunted as the next industrial revolution. It is characterized by increasing the digitization and interconnection of products, value chains and business models. Industry 4.0 can be defined as the link between the physical and the digital worlds to turn conventional industry into a smart industry. Industry 4.0 facilitates, connects / merges production with information and communication technology, merges customer data with machine data, machine communicates with machine, components and Machines automatically manage production in a flexible, efficient and resource saving manner.

The profitability of a Manufacturing Industry relies on the performance of machines: only if they run smoothly, continuously, efficiently and produce great volumes of high-quality product, the industry thrives. Hence one of the major risks in a Manufacturing Industry is the rise of technical malfunctions which harm the profitability of a mill before and after an eventual machine failure. Before a machine failure, there is a sharp increase in energy consumption, temperature, and vibrations with a reduction of product quality and several problems related to the machine. After the machine failures, the problems are even worse: the customer must bear high repair costs and long downtimes, especially if technicians and repair materials are not promptly available.

Therefore, in order to maximize overall equipment effectiveness (OEE) and minimize the total cost of ownership (TCO), Camozzi Digital has stepped into Industry 4.0 platform and is ready with solution through **Cyber-MES (Manufacturing Execution System) and DRM – Digital Remote Maintenance Tools** towards “A whole new operations philosophy for the Manufacturing Sector”.

These tools have been designed to provide end-to-end solutions integrating overall maintenance monitoring, production monitoring and control needs for all Machinery into one single platform, managing multiple plants and multiple units across the Manufacturing value chain.

**CyberMES**, the production management software, is the platform that allows to register and elaborate all production data, operating conditions and technological parameters of the machines in real time in one simple, intuitive and well-structured interface and allows the user to interact directly with each and every machine of the plant by downloading, editing and uploading any production recipe. The centralisation of all the information about production, efficiency levels, energy consumption, alarms, etc., enables the client to have everything under control in any moment and to manage and optimise production from his office.

**DRM**, the innovative software platform for predictive maintenance, allows to continuously analyse the symptomatic data gathered by processors and sensors installed in critical parts of the machines to constantly monitor their efficiency. The data about temperatures, power consumption, pressures, speeds,

MODULES:	
1. DATA COLLECTION & WORK ORDERS	10. TOOLS MODULE
2. MONITORING & PROACTIVITY	11. MOLDS AND EQUIPMENT MODULE
3. SCHEDULING	12. OVEN MANAGEMENT MODULE
4. TRACEABILITY	13. COMPRESSOR MODULE
5. MACHINERY INTEGRATION & MDI SUPERVISION	14. DOCUMENTATION MODULE
6. QUALITY CONTROL TQM	15. ERP INTEGRATION MODULE
7. MAINTENANCE TPM (total Productive Maintenance)	16. IIR MODULE
8. PMS (Power Monitoring System)	17. COST ANALYSIS MODULE
9. TICKETING	18. RECIPIES MODULE

and vibrations are gathered and, through a gateway, sent to the Azure Cloud provided by Microsoft. The data are then analysed through special algorithms developed by Camozzi Digital, which continuously verify the monitored parameters in relation to the machine working conditions. If any one of them is outside the tolerance range, an automatic email alert is sent to the client’s addresses registered in the system. The client can always access the dedicated SW platform where it is possible to see the information for predictive maintenance of the machines and overall, the efficiency of the Plant.

Furthermore, Camozzi Digital customer service can access, if necessary, the customer’s machine to diagnose the problem and communicate the necessary steps to solve it. DRM discloses the following benefits:

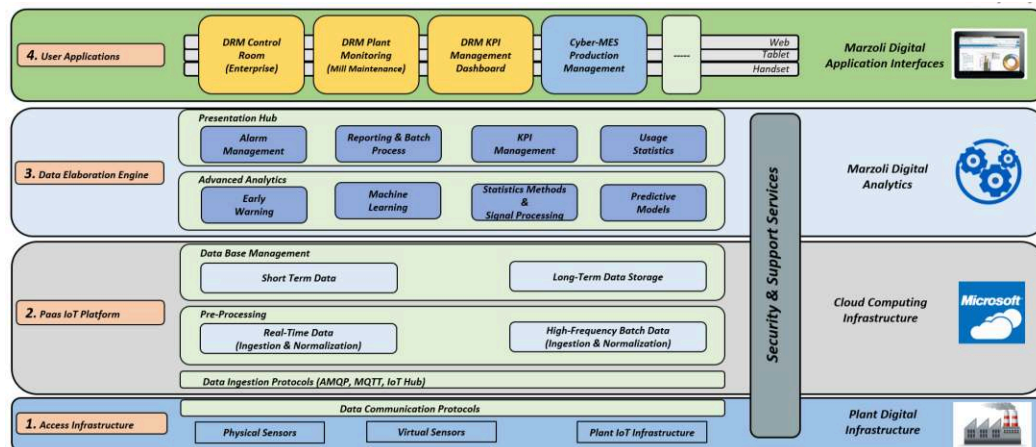
- prevention of machine failures,
- longer running life of the machine components and
- more effective maintenance of the mill.

**Service approach towards DRM & CyberMES for Customers:** Camozzi Digital designs, creates, installs, and maintains, as tailored to the client's requests. DRM & CyberMES fully embraces this business philosophy as its implementation follows a highly tailored engineering process that is articulated in the following steps:

- Analysis of the plant and collection of requirements, specifications, maintenance procedures, maintenance problems, production processes and KPI management.
- DRM & CyberMES customization to the Customer plant and equipment.
- Installation of hardware, software, sensors, communication infrastructure and HMI
- Performance verification and validation: SAT and assessment of the installed platform according to defined KPI.

**System Architecture:** DRM & CyberMES has a base of solid system architecture for a thorough plant analysis. A distributed online system uses a remote data acquisition device to collect physical signals from the machines and transmits them back to a cloud service powered by Microsoft for online monitoring and analysis. The results from data analysis, physical-mathematical models' application, deep dive on incidents and critical cases are returned to maintenance engineers and operators by means of reports, Web Application and Dashboard.

The architecture allows to accumulate large amount of information and data which can be processed to identify and analyze historical trends of the operating parameters and investigate correlation functionalities and prediction algorithms.



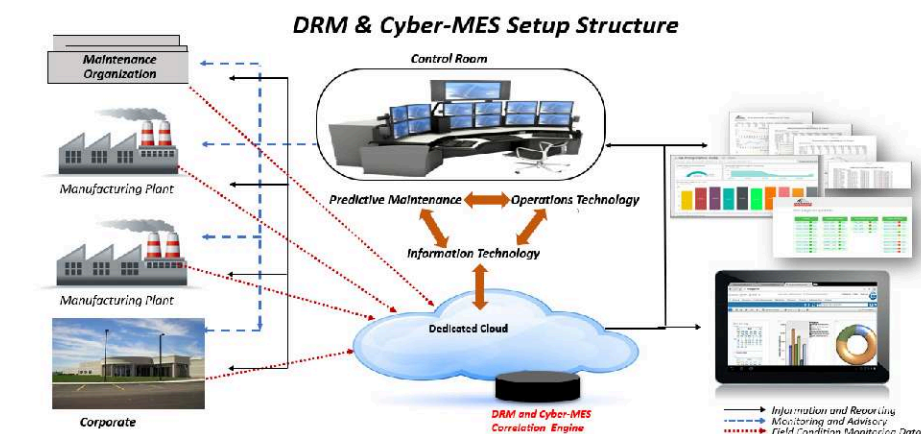
**Dedicated Technical Team:** To secure an outstanding service to customers and to guarantee all the advantages of preventive and predictive maintenance, there is a senior technical team for supervision of the client's machines through DRM and CyberMES. **The control Room operates through a senior technical team, fully trained on Remote Maintenance and Production Management technology**, that has one of the important missions: to continuously monitor the parameters of every machine of the customers around the world so that if there is a technical malfunction, it contacts the client and provides live technical assistance. Moreover, the control room has direct connection with Camozzi Digital R&D and

Customer service and support departments, thus ensuring a fast and reliable technical assistance with prompt delivery of the needed spare parts and immediate technical support.

**Benefits of Smart Factory Operations:**

The client can draw on a great, relevant, and reliable amount of information to effectively undertake maintenance operations and Production Management. Moreover, the advantages of using:

**DRM** increases over time: as the customer learns how long the maintenance cycles of the machines should



be, he can better plan maintenance activities, reduce operations costs and always obtain the highest machinery performances. Predictive maintenance - alert system, based on big data and the constant comparison between data collected by the machine and reference models - allows you to obtain the following advantages:

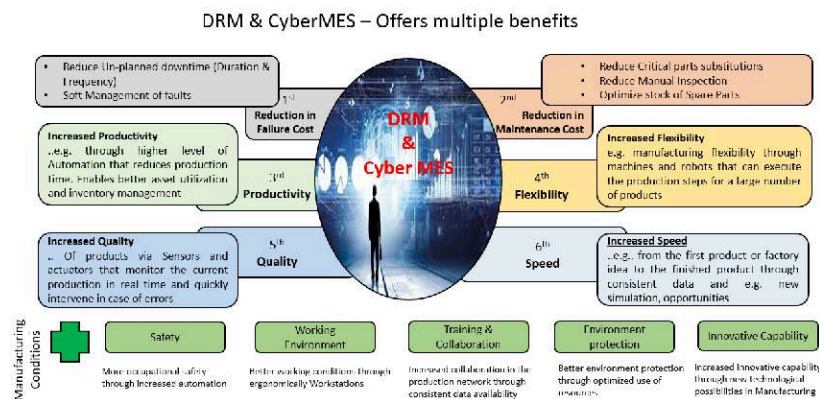
- 20 - 30% reduction in maintenance costs
- 20 - 30% reduction in stops
- 1 - 1.5% increase in productivity and efficiency.

**CyberMES** user can easily control and manage from his/her computer, the entire Plant. As Camozzi Digital is a European supplier of the full line of machines for manufacturing industries, its software platform can control every machine comprising the production process. The centralization and organization of all the messages coming from the entire production process in one intuitive and well-structured interface allows to have everything under control in any moment and to improve the speed of response in production operations. CyberMES has been designed in order to make production control as easy and as immediate as possible: it has no useless or complicated functions, it provides the user with all and only the desired data and makes the information accessible by using tables, colours, charts and diagrams. Moreover, thanks to its modular design, CyberMES can be easily tailored to any Manufacturing Plant, while the software structure allows to easily connect new machines. CyberMES can bring the benefits in:

- Control shop floor operations
- Meaningful manufacturing and engineering data
- Improved product traceability

- Reduce manufacturing costs
- Reduced manufacturing cycle time
- Better understanding of equipment utilization
- An enabler to paperless manufacturing
- Gate way to SMART Manufacturing.

In a nutshell, **Camozzi Digital's Digital Smart Factory Operations** discloses the following advantages:



- **Reduce Failure Cost**
  - Reduce Un-planned downtime (Duration & Frequency)
  - Soft Management of faults
- **Reduce Maintenance Cost**
  - Reduce Critical parts substitutions
  - Reduce Manual Inspection
  - Optimize stock of Spare Parts
- **Increase Production Efficiency**
  - Power Savings
  - Enhanced productivity
  - Reduced Scrap due to Machine failure
- **Increased Productivity:** through the higher level of automations that reduce production time, enable better asset utilization and inventory management.
- **Increased Flexibility:** Manufacturing flexibility through machines that can execute the production steps for large number of products
- **Increased Quality:** the products via sensors and actuators monitor the current production in real time and quickly intervene in case of errors
- **Increased Speed:** from the first product or factory idea to the finished product, through consistent data and new simulation opportunities.



## Case Study



Production Planning and Scheduling for Tyre Industry

**Ms. Vaidehi Gupta**

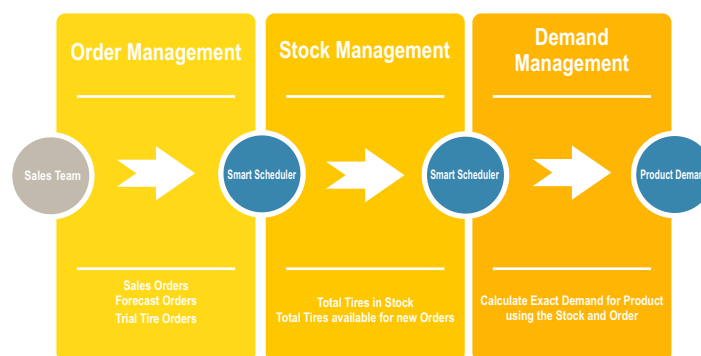
Business Head - Smart Controls

### Objective:

Leading Tyre manufacturing company had a requirement of fully automated planning and scheduling facility, tightly coupled with Manufacturing execution systems and ERP systems. Main goal of this requirement was to forecast demand, automate planning, optimize equipment's, resources and manpower utilization and achieve optimum production.

### Solution Proposed:

Smart Controls developed tailored solution which could cater to the requirements of planning teams of any tyre industry. Coupled with ERP and MES layers this solution would forecast demands by studying the sales patterns and analysing the trends of historic order requirements. System could also schedule the equipment's and resources aiding to maximum optimization.



**Challenges:** Biggest challenge was understanding complex AS IS process and convert to optimal TO BE model. Shop floor complexities had to be handled understanding each machine and process and plant SOP's

**Solution Details:**

Smart Planner & Scheduler was developed to meet the requirements of accurate planning and subsequent scheduling based on final generated demand. Module had an easy “human interface” which made it possible to plan and schedule tyre production.

Modules for Planning was bundled with machine learning which generated demand plan.

This plan served as input to other business processes such as production scheduling and inventory management

The foundation of ML based demand forecasting solution was statistical analysis of data. Big data for the forecast model constituted of historic sales data, OEM production data, macro factors like market sentiments. Success metrics for the model comprised of prediction on product / product categories, time frame and accuracy.

**Planning with Smart Planner**

Once forecast demand data was gathered and converted to order format, planning module collected orders helping the planner take more informed decisions. Smart planner generated final demand of the finished goods by computing inventory, scheduled stock, actual stock, sales order and forecast order. With inbuilt Integration with scheduling and inventory modules, planner had complete visibility to real time status of demands.

- What -> Product
- When -> Date
- How much -> Quantity
- Why -> Order



**Scheduling with Smart Scheduler**

Scheduling module has a tight integration with planning module. Smart Scheduler captures bottlenecks such as curing moulds, building machines and building drums for a tyre plant. It also reduces the complexity of scheduling by validating scheduling rules and quickly providing feedbacks for right schedule. With complete visibility of real time calendars/maintenance schedules of the equipment's, it provides most accurate schedule optimizing production.

Scheduling

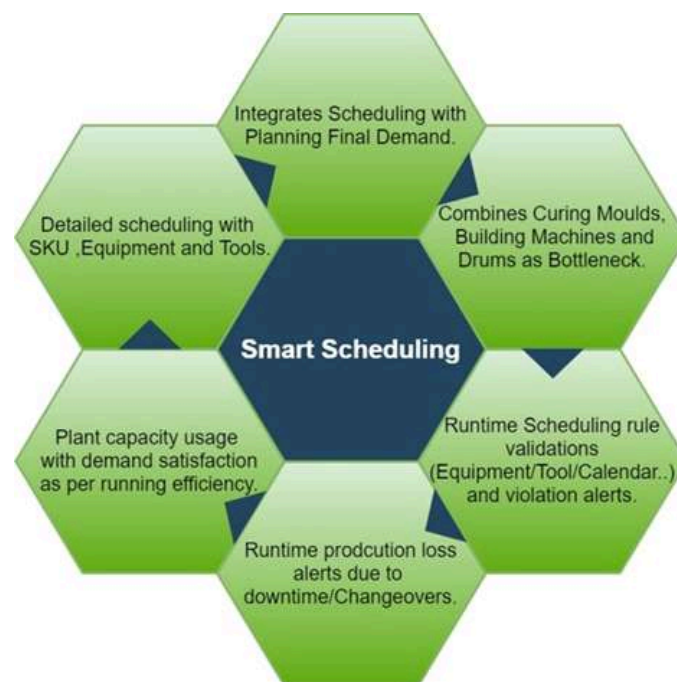
What -> Product

Where -> Machine

With -> Tool

When -> Date/Time

How much -> Quantity



**Benefits:**

- Accuracy of Demand Forecasting improved by 5-15%
- Operational Efficiencies improved by 5-20% Improvements
- Improved OTIFs

## **INDUSTRY 4.0 – Global News**

### **IoT and 5G: a blessing or a curse?**

Already, IoT is by no means a niche market - but with the greater bandwidth that 5G allows these devices will become fully integrated into our daily lives. The smart home IoT devices market is expected to expand revenue generation from \$24.8 billion per annum in 2020 to \$108.3 billion in 2029. In response, the traditional mobile ecosystem is set to expand exponentially. With 43 billion IoT devices connected by 2023, 5G networks will be handling unparalleled levels of communication between devices.

Source: <https://www.techradar.com/in/news/iot-and-5g-a-blessing-or-a-curse>

### **17 ways technology could change the world by 2025**

WEF carried out a survey with Technology Pioneers for their views on how technology will change the world in the next five years. From quantum computers and 5G in action to managing cancer chronically, here are their predictions for our near-term future.

Source: <https://www.weforum.org/agenda/2020/06/17-predictions-for-our-world-in-2025/>

### **Cities of the Future**

The knowledge-sharing consortium to drive smart city initiatives in Oman - Smart City Platform (SCP) – has launched a digital platform for smart city ambassadors to exchange knowledge and experience and work on different projects in smart cities that fall within their interests.

The platform – Professional Initiative for the Ambassadors of Smart City Platform, was launched during the first virtual meeting for the Smart City Ambassadors, with an aim to activate the role of smart city ambassadors in leading smart city projects, embrace and support all the ambassadors in turning their ideas into projects, benefit from the expertise of the existing ambassadors in terms of developing their ideas into projects, utilise the experiences of ambassadors in raising awareness of the technologies of the Fourth Industrial Revolution and the areas of smart cities.

Source: <https://muscatdaily.com/Oman/387635/Cities-of-the-future-->

### **How digitization and innovation can make the post-COVID world a better place**

COVID-19 has presented one of the most formidable challenges in recent history to governments, businesses, and society. Many consider it to be the ultimate tipping point for the 21st-century. The pandemic is a wake-up call for companies to have a plan to deal with disruptions to ensure business continuity. It is also a watershed moment that will signal the fast-track acceleration process for digitization throughout society.

Source: <https://www.weforum.org/agenda/2020/08/how-digitization-and-innovation-can-make-the-post-covid-world-a-better-place/>

### **Here's why human-robot collaboration is the future of manufacturing**

The COVID-19 pandemic has dealt a heavy blow to manufacturers around the world. Lockdowns and travel bans have disrupted production as well as supply chains. New outbreaks in factories and other workspaces have highlighted the need to better protect workers' health and safety. In a March 2020 survey by the



National Association of Manufacturers (NAM), 53% of manufacturers anticipated a change in operations due to COVID-19.

If manufacturers want to compete in a fast-evolving global market, they will need to fundamentally transform the way they produce goods. Now is the time to tackle these long-standing challenges by pairing human skill and creativity with the strength and speed of robots.

Source: <https://www.weforum.org/agenda/2020/08/here-s-how-robots-can-help-us-confront-covid/>

### **Global Smart Manufacturing Technology Market 2020-2025: High Demands To Exhibit Growth with Top Vendors GE, Cisco, ABB, SAP, Schneider, Siemens etc.**

The Global Smart Manufacturing Technology Market Research Report by Orbis Research focuses on some of the vital aspects of the market such as Revenue Rate, Market Share, Key Regions and Production as well as Key Players. This Smart Manufacturing Technology report also provides the readers with detailed figures at which the Smart Manufacturing Technology market was valued in the historical year and its expected growth in upcoming years. Besides, analysis also forecasts the CAGR at which the Smart Manufacturing Technology is expected to mount and major factors driving market's growth.

Source: <https://scienteck.com/uncategorized/86536/global-smart-manufacturing-technology-market-2020-2025-high-demands-to-exhibit-growth-with-top-vendors-ge-cisco-abb-sap-schneider-siemens-etc/>

### **2020 Insights into Adoption Index for Industry 4.0 - What's Shaping the Industry?**

Research and markets team envisions a futuristic scenario of the next big thing - Industry 5.0, which will bring back empowered humans to the shop floor. Industry 5.0 will take the execution of Industry 4.0 a step further, along with business model innovation and customer experience management. However, it is to be noted that the advent of Industry 5.0 will not put a stop to Industry 4.0; instead, the 2 revolutions will transpire concurrently.

While several manufacturing enterprises are still struggling to understand what Industry 4.0 implementation really means to them, the benefits that Industry 4.0 promises to deliver are too hard to ignore. Globally, several strategic initiatives that can guide manufacturers to successfully manage their digital transformation journey are underway. Several early proofs-of-concept and pilot implementations are trying to establish the case for industry 4.0.

Source: <https://www.globenewswire.com/news-release/2020/03/09/1996942/0/en/2020-Insights-into-Adoption-Index-for-Industry-4-0-What-s-Shaping-the-Industry.html>

### **Global Industry 4.0 Market Size, Shares, Growth, Segments, Industry Analysis & Outlook 2018-2024**

A new report published by Infinium Global Research on "Industry 4.0 Market (Component - Hardware, and Software; Technology - Industrial Robotics, Internet of Things (IoT), 3D Printing, and Machine Learning; End User - Industrial Equipment, Automotive, and Others): Global Industry Analysis, Trends, Size, Share and Forecasts to 2024." Industry 4.0 is the trend in automation and data exchange in the manufacturing technologies and processes that include cyber physical systems (CPS), Internet of Things (IoT), Industrial Internet of Things (IIOT), cloud computing, cognitive computing, and artificial intelligence. Technology has played a vital role in progressing most areas in our day to day life. The global industry 4.0 market is projected to grow at a CAGR of 15.3% over the forecast period of 2018-2024.

Source: <https://www.infiniumglobalresearch.com/press-release/global-industry-4-0-market>

## INDUSTRY 4.0 - India News

### CIIT, a joint venture of RCOEM and TTL inaugurated

Nitin Gadkari, Union Minister for MSME on Sunday inaugurated Centre of Invention, Innovation, Incubation and Training (CIIT), a joint venture of Shri Ramdeobaba College of Engineering and Management (RCOEM) and Tata Technologies Limited (TTL) at a function held here. “Innovation, technology and research will pave the way for Aatmanirbhar Bharat,” said Gadkari who was the chief guest at the inauguration function. “The present scenario has opened up new set of opportunities for the nation and the world is looking favourably towards India”. He said that India’s growth story will depend upon innovation, technology and research. He opined that educational institutions such as RCOEM will play a major role in research and joint ventures such as this will bring practical experience inside the class. He emphasised that practical experience is essential and should be used to complement theory.

Source: <https://www.thehitavada.com/Encyc/2020/8/17/CIIT-a-joint-venture-of-RCOEM-and-TTL-inaugurated.html>

### These Advanced Technologies Protect Your Employees In The Time Of Covid-19

In order to ensure minimum touch and curb the spread of COVID-19 infections, proper planning is being done to introduce high-end Internet of Things (IoT) features. The purpose of technology is to make society more resilient in the face of a pandemic as well as other threats.

Source: <http://bwdisrupt.businessworld.in/article/These-Advanced-Technologies-Protect-Your-Employees-In-The-Time-Of-Covid-19-/14-08-2020-308582/>

### COVID-19 has accelerated India’s digital reset

Since the beginning of its COVID-19 lockdown in late March, India has distributed around \$5 billion in cash benefits to its citizens who need assistance the most, entirely through payments made via digital platforms. This has led to 3 key developments

- Coronavirus propelled the use of contactless digital technology across India.
- The digital-first reset has set the foundations for improving governance.
- Indian states have increased the use of robots and drones.

Source: <https://www.weforum.org/agenda/2020/08/covid-19-has-accelerated-india-s-digital-reset/>

### Sona Comstar – IIT Delhi Innovation program for Safe, Clean and Ec0-friendly mobility

IIT Delhi is inviting applications from startups for the unique incubation / acceleration program in the domain of Safe, clean and eco-friendly mobility. This is a joint initiative of Sona Comstar an Indian origin, global automotive systems and components manufacturer and worlds largest for precision forged gears for differentials and the Foundation for Innovation and Technology Transfer (FIIT). The innovation program is open to young Indian start up companies working in EV technologies, vehicle safety solutions, other

efficient mobility and connectivity solutions. The call for applications is from August 15th to September 15th 2020.

Source: <https://www.businesswireindia.com/sona-comstar-iit-delhi-innovation-program-for-safe-clean-and-eco-friendly-mobility-69129.html>

### **IIT Kharagpur Looks to Form Collaborations with MSMEs to Give Industry 4.0 a Push**

The Indian Institute of Technology Kharagpur (IIT Kharagpur) has signed a Memorandum of Understanding with a Kolkata-based startup Hemraj Infocom to promote industrial consultancy and industrial research internship for students,

Source: <https://www.dqindia.com/iit-kharagpur-looks-form-collaborations-msmes-give-industry-4-0-push/>

### **Industry 4.0 Requires Smarter and More Adaptive Networks**

The Indian manufacturing industry is on the cusp of transformational change, impacting the type of networking service offered by operators. India is expected to be among the top five manufacturing countries in the world, according to Deloitte. To become a manufacturing hub, India is adopting Industry 4.0 – the digitization of the manufacturing industry – which will automate processes, enhance production and improve operations. Industry 4.0 impacts all aspects of manufacturing including production, operations, workforces, partners, suppliers, and most importantly, customer relations.

Source: <https://www.voicendata.com/industry-4-0-requires-smarter-adaptive-networks/>

### **Bosch opens Internet of Things garage in Bengaluru**

Robert Bosch Engineering and Business Solutions (RBEI) launched Internet of Things (IoT) garage in Electronic City, Bengaluru, to offer enterprises a full stack IoT implementation capability.

The lab will focus on building technology demonstrators and validating them before they take shape into scalable solutions for smart connected products.

Source: <https://cio.economictimes.indiatimes.com/news/internet-of-things/bosch-opens-internet-of-things-garage-in-bengaluru/72138489>

### **Leveraging IoT in Post Covid World**

There hasn't been any global phenomenon over the past few decades which has taken a toll of this size and magnitude. The world beyond COVID-19 will really look different and it's not a surprise to any one of us any longer.

From a broader perspective, businesses are starting to focus more on automation of processes and operations, instead of relying on cheap labour, so as to limit human dependence. Our reliance of technology is increasing, as is visible in certain cases already. It is only radical to look at every sector with the technology lens, because the meaning of "business as usual" has changed. India could well become an alternate manufacturing hub for companies moving their base from China.

Source: <https://www.voicendata.com/leveraging-iot-in-the-post-covid-19-world/>