Published by **INDIAN TECHNOLOGY CONGRESS** Volume 5 • Issue 1 • August 2017 ₹.100/-

# TIP

## TECHNOLOGY INNOVATION PRODUCTIZATION

WFEO-CIC

# INDUSTRY 4.0

## Engineering the Interface with Real World

# Bühler PulShine®.

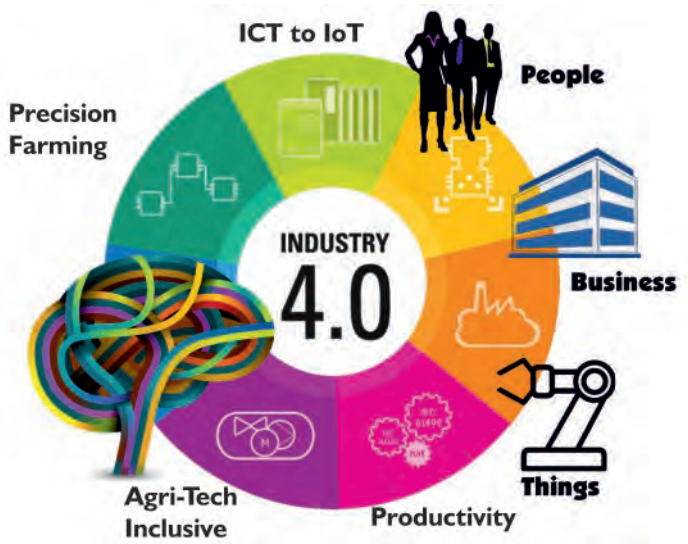
World's first
hygienic & food safe
Pulse Polisher.

**Got a question? Let's talk about it.**
buhler.bangalore@buhlergroup.com
www.buhlergroup.com

Innovations for a **better world.**

BÜHLER

# TECHNOLOGY INNOVATION PRODUCTIZATION




The world is at the cusp of the fourth Industrial Revolution—fondly called Industry 4.0—which envisages smart factories in which cyber-physical systems will monitor the physical processes of the factory and make decentralized decisions. The physical systems will become the Internet of Things, communicating and cooperating both with each other and with humans in real time via the wireless Web. Fact-based decision-making, peak productivity and clear understanding of commercial impacts are just a few of the central factors that will underline the concept.

TIP
TECHNOLOGY INNOVATION PRODUCTIZATION
Volume 5 • Issue 1 • August 2017

## Mission

Enable lively debate,
inspire and enrich the technology community of India



**Address**
#3, First Main, BDA layout,
Kodihalli, HAL 2nd Stage ,
Bengaluru - 560008.
Ph : +91-8065592501
Fax : +91 80 48508380
www.techcongress.net

**Design**
Hornbill Publications
www.hornbillgroup.in

**Printed at**
Pentaplus Printers Pvt Ltd.
Bangalore



WFEO-CIC
This publication is a WFEO-CIC initative, in colabration with Indian Technology Congress

Content













**L.V. Muralikrishna Reddy**
Past President
The Institution of Engineers
(India)

# INDUSTRY 4.0 MISSION...

The World is continuously shaped by science, engineering, and technology. Adoption of technological advances has been the primary reason for significant enhancements in industrial productivity since the time of the Industrial Revolution.

Today at a global level, with the advent of contemporary digital industrial revolution trademarked as **Industry 4.0**, based on some key ten pathbreaking technological advances, sighted the integration of enterprises to realize a single value chain by connecting sensors, machines, workpieces, and IT systems.

### India as a Global Manufacturing Hub

From a national perspective, the Government of India has embarked on an ambitious mission to position India as a global manufacturing destination through its "Make in India", "Digital India", and "Startup India" initiatives that will foster developing best-in-class manufacturing infrastructure in the country.

### Industry 4.0, the way forward...

To effectively adopt the Industry 4.0 technology stack, it is essential to building a wide repertoire of skills that span both the online and offline worlds. Future engineers will need to build specialized system skills for productivity enhancement including increasing efficiency, reducing waste; production-line skills including monitoring, coordination, quality control, knowledge of raw materials, production processes and techniques; soft skills including analytical thinking, problem-solving, and working with digital interfaces, amongst others.

### Factories of the Future

Factories of the future will be more digital, virtual and resource-efficient. It will be an environment that is more connected, both regarding information availability and flow, with machines speaking to, directing, and collaborating with each other.

Tangible value is being created through the adoption of the **'Future Factories'** paradigm. Industry analysts report that global manufacturers have reported increased efficiency and reduced costs by as much as 30% across the entire value chain, powered by improvements in overall operating efficiency, lower inventory levels, reduced energy and water costs, and a significant reduction in incidents involving safety.

### ICT to IoT

Industry 4.0 and Industrial Internet of Things (IIoT) rely on robust information technology systems to securely process industrial device data to automate and optimize business processes, creating a more efficient supply chain and facilitating predictive maintenance. The Cloud platform can be scaled resulting in flexible service provisioning, providing predictable performance in the context of varying magnitude of interconnected devices.

Industry 4.0 implies that more devices, including unfinished products, will feature embedded computing and intelligence. This will allow devices in the field to communicate with one another, exchange information, and possibly direct each other; and communicate with centralized controllers.

### IoT and Smart Agriculture

Critical societal concerns including increasing demand for food, climate change, water scarcity, variations in eatery conditions and rainfall are some of the challenges that impact agricultural production. To address these challenegs, the agriculture industry is embracing digital solutions. IoT sensors are being used to report weather conditions, monitor soil moisture, acidity, while IIoT applications are being used to track agricultural facilities including silos, stables, and dairies. IoT can usher in an era of efficiency in the agricultural sector, creating a positive virtuous cycle focused on making food products readily available to consumers, minimizing the impact on the environment resulting in 'sustainable farming practice.'

### Creating Networks, Collaboration and Partnerships

The two-day conference brought out by ITC with WFEO-CIC with technology-intensive and application-centric sessions will deliberate and suggest a seamless roadmap for adoption of digitally executed manufacturing processes. The Conference has dedicated tracks on **Agri-Tech** and **Productization through Patents** that are critical for India's emergence as an economic superpower.

The annual thought-provoking and intellectually stimulating sessions at ITC-2017 during 10-11 August 2017, is to create an inclusive platform for technologically mature and confident practitioners and end-users of technology. The compilation of perspectives and articles on Industry 4.0 will trigger thought processes in each of you on how technological advances can be leveraged to build a better world for the coming generations.

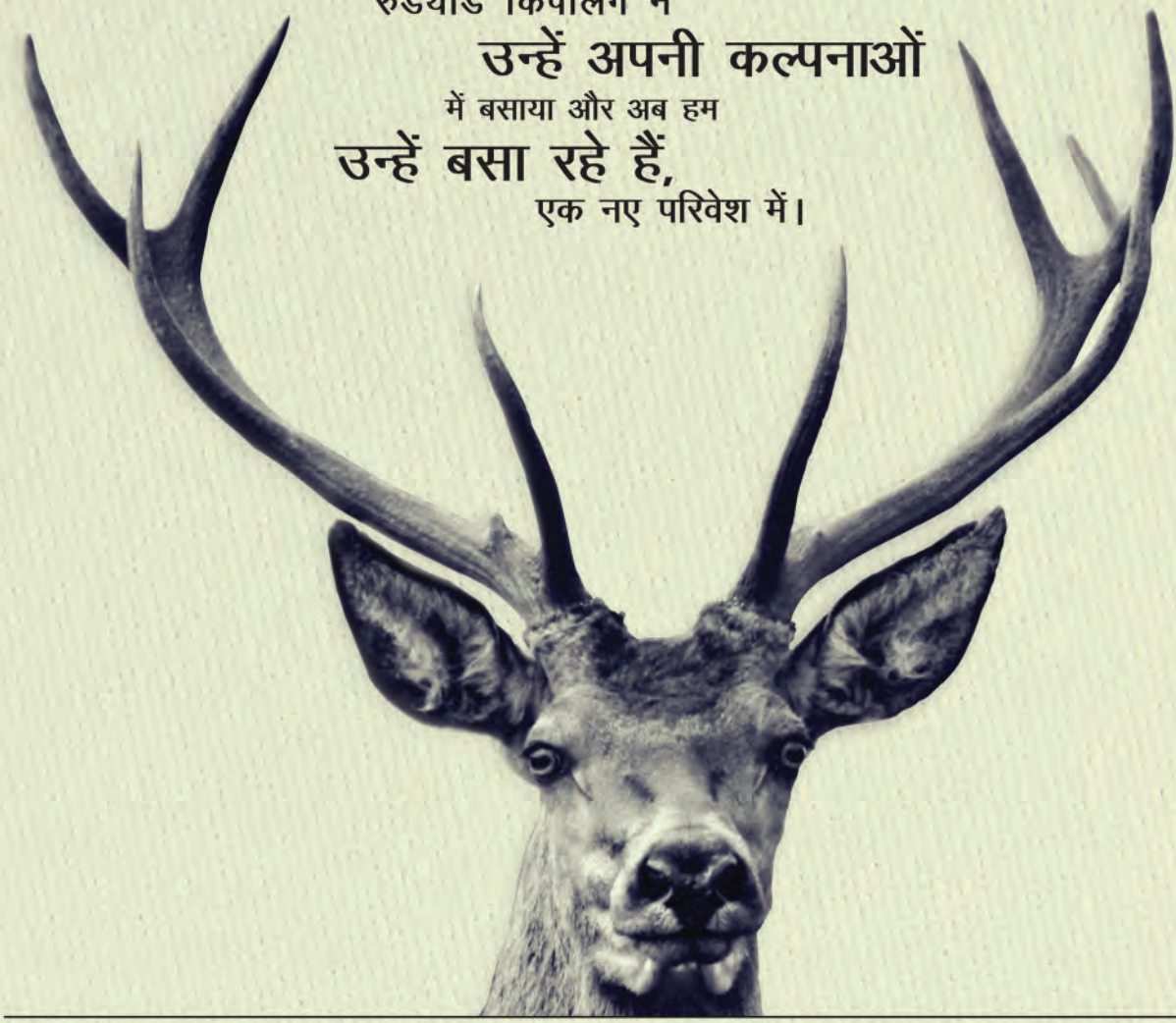
रुडयार्ड किपलिंग ने

# उन्हें अपनी कल्पनाओं

में बसाया और अब हम

# उन्हें बसा रहे हैं,

एक नए परिवेश में।



## "ओएनजीसी बारासिंघा (ईस्टर्न स्वैम्प डीअर) संरक्षण परियोजना"

### एक दुर्लभ प्रजाति को विलुप्त होने से बचाने के लिये ओएनजीसी की सीएसआर पहल।

असम में पाये जाने वाले बारासिंघा या ईस्टर्न स्वैम्प डीअर *(Rucervus duvaucelii ranjitsinhi)* आज विलुप्त होने की कगार पर है। प्रसिद्ध लेखक रुडयार्ड किपलिंग ने जिस से मंत्रमुग्ध हो कर उसकी सुन्दरता को अपनी दूसरी किताब 'द सेकंड जंगल बुक' में कैद किया हो, उस जीव के लिये यह काफी दुखद स्थिति है।

ओएनजीसी ने इस प्रजाति को विलुप्त होने से बचाने के लिये अपने कदम बढ़ाये, और वो भी बिल्कुल सही समय पर।

इसके पहले चरण के अन्तर्गत इनकी अनुमानित आबादी, अनुकूल पर्यावरण, पशु–चिकित्सा अंतःक्षेप एवं सामान्य अध्ययन और जागरूकता अभियान किया गया। इनके स्थानांतरण के लिये मानस राष्ट्रीय उद्यान को चुना गया, जो इनके रहने के लिये बिल्कुल उपयुक्त स्थान था।

काज़ीरंगा राष्ट्रीय उद्यान से 19 बारासिंघो को मानस में स्थानांतरित करना बहुत ही कठिन काम था। योजना के इस अत्यंत कठिन दूसरे चरण को दक्षिण अफ्रीका से बुलाये गये वन्यजीव विशेषज्ञों ने बहुत खास तरीके से अंजाम दिया। 19 बारासिंघो का स्थानांतरण खास तंबुओ में किया गया, जिनको अन्दर से उनके प्राकृतिक आवास जैसा ही बनाया गया था। कुछ ही महीनों में 6 नवजात बारासिंघो ने झुण्ड में जुड़कर, स्थानांतरण की खुशी को दुगना कर दिया।

इस योजना के विस्तार के तीसरे चरण के अन्तर्गत 20 अतिरिक्त बारासिंघो का स्थानांतरण किया जा रहा है।

यह परियोजना संतुलित पर्यावरण की ओर ओएनजीसी की एक शुरुआत है। लुप्तप्राय प्रजातियों का संरक्षण करने के लिये प्रेरित, हमारा संगठन प्रकृति की असली सुंदरता को बनाये रखने के लिये प्रतिबद्ध है।

ओएनजीसी
ONGC

**ऑयल एण्ड नेचुरल गैस कॉरपोरेशन लिमिटेड**

पंजीकृत कार्यालयः– पंडित दीनदयाल उपाध्याय ऊर्जा भवन, 5, नैलसन मंण्डेला मार्ग, वंसत कुँज, नई दिल्ली-110070
दूरभाषः 011-26752021, 26122148, फैक्सः 011-26129091 www.ongcindia.com /ONGC Limited @ONGC_

Chairman
National Advisory
Committee
ITC 2017

**Prof. R.M. Vasagam**
Chairman
Aerospace Engineering
Division Board,
The Institution of Engineers
(India)

# MAKING INDIAN TECHNOLOGY WORLD CLASS

India is poised to become a $10 trillion economy taking advantage of younger age group population in excess of 60%,increasingly modernised infrastructure and production of high quality cost competitive products for domestic and world markets. Engineering and technology plays critical role in such transformation of India from the present scenario of $ 2 trillion economy. Achievements in few areas such as space, atomic energy and defence are often highlighted in the media. But our achievement in food production through green revolution and India becoming the number one milk producer in the world through white revolution successfully by networking grass root level people with elite educated scientific and technical manpower can be the starting point. The economic transformation can be achieved through rapid industrialisation, favoured destination for FDI, ambience for high technology and innovation and abundant human resource.It is a question of improving the quality of Indian education system, infrastructure and opportunities for millions of talented Indian youth.

The effort of Indian Technology Congress is to present the home grown technologies, technology upgradation and adaptation and originating innovative new products to conquer the world market in the 21st century. Few of the areas need improvement to attain the goals set for this ambitious transformation..Knowledge is the currency of this century and is derived by harnessing the outcome of research in science and technology field. It is an area requiring constant efforts. In patents field India ranks poor and the education system has to aggressively promote innovative creative thinking and originating new ideas and products. In addition mere knowledge does not create wealth and employment. Application of knowledge to the current and perceived needs for the society is of great importance. Revamping the technical education to meet these goals is of utmost importance. The emerging industrial scene Industry 4.0 demands training of human resource to handle new design tools manufacturing processes and managing distributed work places to build complete products in a highly coordinated manner.

Similarly the penetration of internet world over has to be harnessed for workplace efficiency and productivity improvement. The IoT wave is omnipresent in farming, food production and preservation, transportation distribution and marketing. It is going to play dominant role in efficient health care of billions of people in this planet. Information gathering by smart sensors coupled with powerful analytical tools is most challenging for Technology development. Efficient water use, crop yield and damage assessment through remote sensing using satellites, aircrafts and drones. These applications are still in initial stages and more and more success have to be attained.. The engineering aspects of agriculture in developing farm machinery, farm power, move towards drip irrigation, use of non-conventional energy sources and effective using bio mass are all needed to improve the agricultural economy. Post harvest technologies have to be put in practice to ensure preservation of products, ensuring remunerative price year around and make farming sustainable.

Knowledge creation and protection of intellectual property are of great importance for improving our standing and market share in world economy. We are to go a long way in reaching to the required levels of success in this area. Educational institutions and industries have a major role in promoting patent and product design culture. While government can support to a limited extent the major thrust should come from educational institutions and industrial R & D houses. The ITC - 2017 focuses on patenting, start ups and venture capital support aspects and showcases the success being achieved.

On the whole the efforts of ITC – 2017 may succeed in its objectives if the outcome of the exercise makes India to gain an edge in tackling these challenges and come up with short and long term action plans. The moto is Make In India products conquer the world markets in the immediate future in a cost competitive manner with world class quality. We have to make 21 st century as India's century and usher in a prosperous India through harnessing the power of ever advancing science, technology and engineering. Let the deliberations of ITC -2017 play a significant role in this effort.

# Navy Looks to Partner with Private Sector for Warship Production

The government is looking at making the country a defence manufacturing hub by involving domestic companies so that dependence on overseas players could be reduced, a top naval officer said today. "At the end of the day, what we are looking at is India becoming a major defence manufacturing hub. Rather than we going out (of the country), others should come in and get their assets built here in India. That is the plan," Controller of Warship Production and Acquisition Vice-Admiral DM Deshpande said.

He was talking to reporters after the launch of indigenously-built Floating Doc (FDN-2) for the Indian Navy at Larsen and Toubro Shipbuilding yard at Kattupalli near Chennai.

The idea of Make in India was to get foreign dependence to a minimum and a strategic partnership programme had been launched in this regard, he said. The navy was examining whether Indian companies have the capacity to build submarines, non-combat aircraft, fighter jets, helicopters and armoured vehicles.

"We are looking at Indian partners. We will identify the Indian partners as they have to pass through technical and financial gates. So, we are looking at top of the line people," he said.

Admitting that the domestic shipbuilding industry had been in the dump for a while, he said defence shipbuilding in the country presented a huge market as well as huge challenge,

adding the navy wanted private shipyards to ease the load of public sector units.

The navy had chalked out a maritime perspective plan. "We have earmarked which are the ships that need to be built by defence PSUs (public sector undertakings). What we are looking at is private shipyards playing a role and they can ease the load of defence PSUs. So that we can have a load share between defence PSUs and private shipyards," he said.

On the status of the P75(I) submarine project, he said, "It was going on under the strategic partnership plan. First we should be able to get an RFI (request for information). We are in the process of activating the methodologies so that we have the tenders out soon."

# Bosch to introduce 'SMART MANUFACTURING' at India plants by 2018

Bosch, the flagship company of the Bosch Group in India, is implementing smart manufacturing systems across its 14 manufacturing plants in India. The company, an exponent of "connected industry" or "Industry 4.0", offers a range of solutions such as drives, automation, sensors, software, and predictive maintenance, a top company official said. Bosch also made a presentation on "Industry 4.0" to PM Narendra Modi and German chancellor Angela Merkel during a visit to Bosch Vocational Centre on Tuesday.

"By 2018, we aim to implement connected production in all 14 manufacturing locations across the country," said Steffen Berns, MD. Later, speaking to reporters, Berns said: "Industry 4.0" is already a reality at several Bosch plants in India. In Bengaluru, where the company is headquartered, Bosch uses real-time data to shorten throughput times for the calibration of pumps for tractors. The location also provides associates with smart watches that promptly notify them of a machine malfunction."

Thanks to real-time monitoring, manufacturing downtime can be prevented and productivity improved, Berns said. In September, production started at the new automotive component plant in Bidadi, about 35 km from Bengaluru, where Bosch applies connected industry principles to optimise manufacturing processes.

# NEW POLICY TO BOOST PRIVATE SECTOR DEFENCE MANUFACTURING

NEW DELHI: The approval to the strategic partnership policy comes as a major boost to the private defence manufacturing sector, where a race has already begun among top Indian companies to get onto a select list of six that would be eligible for deals worth more than $20 billion on offer over the next year.

The policy, which had been stuck for over 18 months due to differences within the bureaucracy, has been cleared after the intervention of defence minister Arun Jaitley and several rounds of meetings with stakeholders.

The private sector had been upset with a lack of orders by the defence ministry for the past three years, with several top companies complaining to the government about all big projects going to the public sector, as has been the norm for decades.

Jaitley, who holds charge of both finance and defence ministries, said the Union Cabinet was made aware of the strategic partnership policy in a meeting on Wednesday. Four sectors – helicopters, submarines, armoured vehicles and fighter jet – have been identified under the policy for now, as ET reported on May 11. It is, however, unclear whether the policy would require a formal approval from the Cabinet Committee on Security or would now be rolled out by the defence ministry as a new chapter in its procurement policy.

As reported by ET, a pool of six Indian companies will be created to accord a special status for defence manufacturing. The companies, selected on the basis of financial strength and technical expertise, would be given the opportunity to bid for mega defence production orders, expected to be worth over $20 billion.

The ministry will also initiate work to identify foreign partners for the four identified projects. An ambitious target of nine months has been set to select the Indian companies. This will be done based on technical evaluation and field trials

Once the foreign vendors are shortlisted, the Indian pool would be invited to plan collaborations and present joint proposals that would be the basis of a final selection.

As per the policy, one Indian company would be allowed to participate in only one strategic partnership project, to avoid a monopolistic situation. With this model, the ministry is hoping to avoid questions on competitiveness and price discovery, given that a pool of both Indian and foreign vendors would be competing for collaborative projects.

*Read more at: http://economictimes.indiatimes.com/articleshow/58826129.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst*

# Hi Tech Garment Factories

Tianyuan Garments Company of Suzhou signed an agreement with Soft Wear Automation of Atlanta to develop a fully automated T-shirt production line at Tianyuan's newly acquired plant in Little Rock, Arkansas, on July 19.

The technology was developed by and is patented by Georgia Tech's Advanced Technology Development Center. Using cameras to map the fabric and robots to steer it through the sewing needles, the system will handle soft fabrics and make T-shirts for Adidas.

The system is scheduled to be fully operational by the end of next year.

"From fabric cutting and sewing to finished product, it takes roughly four minutes," said Tang Xinhong, chairman of Tianyuan Garments. "We will install 21 production lines. When fully operational, the system will make one T-shirt every 22 seconds. We will produce 800,000 T-shirts a day for Adidas* .

Tang said that with complete automation, the personnel cost for each T-shirt is roughly 33 cents.

"Around the world, even the cheapest labor market can't compete with us. I am really excited about this," he said.

Tianyuan announced last October it would invest $20 million in the 100,000-square-foot defunct Little Rock plant it had acquired. In time, it will bring 400 new jobs to Arkansas.

Xu said that establishing a clothing factory in Arkansas enables Tianyuan to satisfy instant order demands from its clients.

He praised Tianyuan's working with American partners in automation as a smart move at a crucial junction in the technology revolution.

"The idea of Industry 4.0 and Intelligent Manufacturing is gradually becoming the reality," Xu said. "It is revolutionizing labor-intensive clothing manufacturing .

# ICT to Industry 4.0

## The Journey thus far, and the Road Ahead...

**Eng. S S Rathore**
Vice President, and Chair, Committee on Information and Communication
World Federation of Engineering Organizations and
CMD, Sardar Sarovar Narmada Nigam Limited

Internet information technologies has catalysed innovation across multiple industrial sectors, and ushered in a new, technology-driven global industrial revolution.

Mechanization and electricity were the catalysts for the earlier industrial revolutions, and have been recognized as General Purpose Technologies (GPTs). Over the last two decades, Information and Communications Technology (ICT) has emerged as the single-most pervasive GPT. From its humble beginnings in facilitating tabulation and record keeping, ICT has grown over the years to applications for myriad needs including automating mundane, repetitive processes; inventory control and Just-in-Time inventory management; organization-wide Enterprise Resource Planning (ERP); Customer Relationship Management; Supply Chain Management; amongst several others.

Over the years, ICT has transformed the way things are made by integrating contemporary technologies with new or optimized processes and methods of doing things.

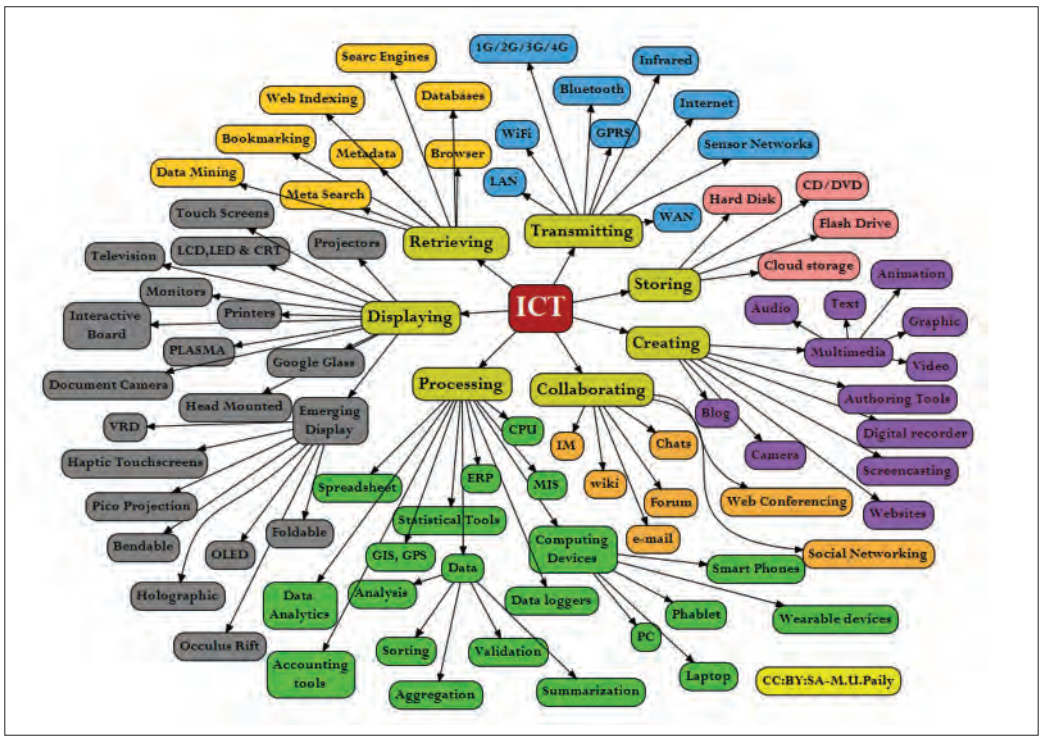
ICT has a plethora of new technologies including Cloud Computing, Big Data and Internet of Things (IoT) that are enhancing automation, and driving increased digitalization, networking and connectivity; resulting in increased levels of industrial intelligence. These technologies have become the foci of innovation primarily because traditional industrial technologies have reached their full potential, and are not able to address present-day business challenges of compressing production time, slashing cost of production, increasing production flexibility resulting in an overall increase in business agility.

Internet technologies have scaled with accurate sensing

and high-performance computing capabilities that facilitate efficient response to production requirements, making industrial production more visible and programmatically controllable. Cloud computing and Big Data along with rapid advances in data storage and data analytics are facilitating collaborative processing of large volumes of industrial data including supply chain, production, and marketing data. Smart sensors and IoT are enabling high-frequency, real-time data collection during the production process, and this functionality is extremely helpful in monitoring physical systems and machinery; and controlling complex production processes in real time. High bandwidth broadband networks are helping efficient transmission of large volumes of industrial data between production locations for remote processing.

The integration of Internet with the manufacturing systems has led to the tectonic shift of Internet becoming a **'core influencer and enabler'** and transitioning from the erstwhile status as an **'external factor'**. Manufacturing enterprises are deploying Internet technologies across the entire value chain into manufacturing, R&D, services and marketing thereby streamlining the entire production process and operating model of the enterprise.

In India, many enterprises are adopters of ICT innovations, and are using new production technologies including robotics and 3D printing to build **customized** or **personalized** products. They are using the ubiquitous broadband to transfer large volumes of data to control the production environment and facilitate closer engagement between suppliers, manufacturers and customers. The proliferation of sensors and the ability to acquire accurate data is driving **'zero defect'** production.




## Digital Revolution: Industry 4.0 and Future Factories

Cutting-edge technologies are being developed that will change the way things are produced, resulting in Industry 4.0, or the fourth industrial revolution. Industry 4.0 is a paradigm that will see machines collaborating seamlessly and performing increasingly complex tasks; accurately predicting downtimes and failures, and triggering maintenance processes; and perhaps even 'self-organizing' themselves to respond to unscheduled disruptions in the production line.

Present-day manufacturing automation systems are oriented towards high-volume/low-mix production with centralized control. Future factories will have a plethora of sensors that would be acquiring measurements continuously, and robotic systems that have significantly higher levels of intelligence and decision-making capabilities. The production setup will metamorphose from a **high-volume/low-mix** (large numbers of standardized products) to a **high-mix/low-volume** (many customized products) paradigm as products will be more closely tailored to a customer's requirements.

Tomorrow's businesses will need to collaborate with partners and suppliers to collaboratively design new products, or optimize supply chains by sharing production lines and facilities. This will require a 'plug and play' infrastructure that is flexible and secure for sharing data. Data infrastructure will increasingly be powered by cloud technologies; and **distributed ledgers** or **blockchains** will be shared and accessed by users without the need for centralized data infrastructure. Data will be available to trusted parties, and other classes of users will be able to perform certain algorithms on the encrypted data and view results using homomorphic encryption technologies.

Analytics technologies including Big Data will be used to 'mine' and 'discover' patterns and linkages in data that can be used to provide insights from the shop floor to the top-floor. Machine learning and artificial intelligence technologies will be deployed to identify patterns for predictive and prescriptive analytics (presenting options to the users).


## Way Forward...

While the proliferation of these technologies has resulted in enhancing affordability, the Micro, Small and Medium Enterprises (MSME) face the challenge of 'leap-frogging' the technology ladder, and quickly moving through the stages of electrification, automation, and digitisation to achieve the status of 'smart factories'. To seamlessly make the transition, MSME units will need to focus on upgrading the existing equipment to deploy sensors and enable networking and connectivity.

A critical piece for the MSME in the adoption of contemporary technologies and expanding their operations is the skills gap. Manufacturers and related organizations, academia, research organizations, engineering professional organizations, and the Government will need to work together in a cohesive manner to develop innovative solutions to bridge the skills gap and create a pipeline of employable future-proof manufacturing professionals.

Many nations have embarked on an ambitious mission to strengthen their national manufacturing sectors to ensure economic advantage in the global comity of nations, and are aspiring to develop best-in-class manufacturing infrastructure in their countries.

Professional societies including the World Federation of Engineering Organizations (WFEO) as custodians of the cumulative experience and expertise of interdisciplinary practicing engineers will need to work with the technology providers, Government, and the MSME units to minimize disruption; protect the investments made; adopt a conservative approach to identify and implement long duration investment cycles, enhance the quality of engineering education and develop industry-specific advanced personalized learning courses that will support the Government initiatives to make nations self-sufficient and strengthen the manufacturing sector.

**World Federation of Engineering Organizations**
**Committee for information and communications**

**The WFEO-CIC holds as a duty to help lead forward the Information and Communication Technology (ICT) in order for it to be applied globally, and focuses on developing countries where narrowing the gap has become essential.**

ICT for Sustainable Development

ICT Innovation in Emerging Economies

Information Technologies for Smart Cities

ICT in Quality of Engineering Education

Big Data Analytics

WFEO-CIC

# WORLD ACADEMY OF ENGINEERS (WAE)

Secretary General, World Academy of Engineers
4th Floor, # 3, First Main, BDA Layout, Kodihalli, HAL2nd Stage, BANGALORE-560008, INDIA
Phone: +91 80 6559 2501, Fax: +91 80 48508380
Email: contact@waengineers.org, Website: www.waengineers.org

*Majority of the likeminded professional bodies have agreed for establishing "World Academy of Engineers (WAE)" for better leverage and networking among professional engineers across the globe. A meeting on the sidelines of Indian Technology Congress-2015 held at Bangalore on 29 July 2015 with* ***WFEO President-elect, Mr. Jeorge Spitalnik*** *who was there to launch the Website of IEI Alumni Association has cemented the unity among the likeminded Professionals in India who have come forward to register the WAE*

## VISION

Promote and provide services for the Professional bodies of engineering & Technology/Students of Engineering and Technology from various Institutions/ Universities from various Countries

## MISSION

Integrate all Engineering and Scientific Disciplines, network Engineering Organizations across the globe, associated with engineering and technology, which will help in forecasting, planning & executing near-term and long-term activities, aimed at various mutual benefits of various nations and generate ample employment opportunities for all stake holders.

**Primary Objectives of WAE**

Encourage and promote the pursuit of excellence in the field of 'Engineering';

Offer the views of engineers in co-operation with other professional bodies in regard to all matters pertaining to 'Engineering' to various Government Agencies of various countries;

Promote the Accord for Integrated Accreditation Mechanism among various countries; also bring out the Robust and Realistic Accreditation System conducive to the social progress to be evolved and implemented among various countries.

Present at all academic forums, the research and development activities on engineering on mutual interactive and cooperative basis among various countries;

Encourage inventions, investigations and research and promote their applications for development of both organized and unorganized sectors of global economy;

# INTEGRATED FARMING and PRECISION FARMING with the help of ICT: Need for hour

## NABARD

NABARD is an apex development financial Institution, formed by an Act of Parliament in 1982 and is owned by GOI and RBI. NABARD mandate is bringing rural prosperity through credit and noncredit initiatives in the field of agriculture, cottage and village industries, handicrafts and small scale industries

From being a pure refinance provider in 1982 to India's apex level development financial institution in 2017, NABARD today directly and indirectly touch lives of millions in rural India. NABARD have traversed a long journey and we are today engaged with various facets of nation building.

NABARD initiatives are aimed at building an empowered and financially inclusive rural India through specific goal oriented departments which can be categorized broadly into 3 heads: Financial, Developmental and Supervision, touching almost every aspect of rural economy. From Providing refinance support to building rural infrastructure, from preparing district level credit plans to guiding and motivating the banking industry in achieving these targets, from supervising Cooperative Banks and Regional Rural Banks to help them develop sound banking practices and onboarding them to the CBS platform, from designing new development schemes to the implementation of GOI's development schemes, from training handicraft artisans to providing them a market platform for selling these articles, NABARD touch millions of rural lives across the country.

## How will precision farming help Indian farmers and its draw backs

Precision farming is a farming management concept based on modern information technologies such as GPS, remote sensing and GIS. In Indian context, precision farming may be defined as an accurate application of agri inputs for crop growth considering relevant factors such as soil, weather and crop management practices. It is actually information and technology based farming system where inputs are managed and distributed on a site specific basis for long term benefit.

### Advantages:

- GPS allows fields to be surveyed with ease
- Yield and soil characteristics can be mapped
- Provides opportunities for better resource management and so could reduce wastage
- Minimizes risk
- Suitable for larger farms/consolidation of land holdings/contract farming/Cooperative farming

### Drawbacks

- It may not suitable to small farm holdings in India due to its high cost and in the small holdings farmer will have control on the micro climate of the cropped area.
- Techniques are still under development and so it is important to take specialist advice before making expensive decisions
- Initial costs may be high and so it should be seen as a long term investment
- It may take several years before you have sufficient data to fully

**M.I. Ganagi**

M. I. Ganagi serves as Chief General Manager of Karnataka at National Bank for Agriculture and Rural Development. Mr. Ganagi served as Chief General Manager of Corporate Planning Department at National Bank for Agriculture and Rural Development. Mr. Ganagi served as Chief General Manager of Production Credit Department at National Bank for Agriculture and Rural Development. He served as Director of AFC India Limited until June 26, 2015.

implement the system

- Extremely demanding work particularly collecting and then analyzing the data

## Integrated Farming System

The operational farm holding in India is declining and over 85 million out of 105 million are below the size of 1 ha. Due to ever increasing population and decline in per capita availability of land in the country, practically there is no scope for horizontal expansion of land for agriculture. Only vertical expansion is possible by integrating farming components requiring lesser space and time and ensuring reasonable returns to farm families.

The Integrated Farming Systems (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity and reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. In order to sustain a positive growth rate in agriculture, a holistic approach is the need of the hour. Farming system is a mix of farm enterprises in which farm families allocate resources for efficient utilization of the existing enterprises for enhancing productivity and profitability of the farm. These farm enterprises are crop, livestock, aquaculture, agro-forestry, agri-horticulture and sericulture.

In such diversified farming, though crop and other enterprises coexist, the thrust is mainly to minimize the risk, while in IFS a

judicious mix of one or more enterprises along with cropping there exist a complimentary effect through effective recycling of wastes and crop residues which encompasses additional source of income to farmer. IFS activity is focused around a few selected interdependent, inter-related and interlinking production system based on crops, animals and related subsidiary professions.

Integrated farming system approach is not only a reliable way of obtaining fairly high productivity with considerable scope for resource recycling, but also concept of ecological soundness leading to sustainable agriculture. With increasing energy crisis due to shrinking of non-renewable fossil-fuel based sources, the fertilizer nutrient cost have increased steeply and with gradual withdrawal of fertilizer subsidy.

It is expected to have further hike in the cost of fertilizers. This will leave the farmers with no option but to fully explore the potential alternate sources of plant nutrients at least for the partial substitution of the fertilizer nutrients for individual crops and in the cropping systems.

## ICT application in Agriculture:

### Advent of the Information Communication Technology in farming

- ICT creates conditions that enable farmers to acquire and use knowledge for decision making
- Precision Agriculture designed to maximize agricultural production
- Combination of GPS and Mobile mapping supports for implementation of Precision Agriculture.
- Crucial Information on price factors — prices of inputs and output
- Non-price factors like information about availability of inputs, quality of seeds, modern techniques, etc. would play primary role in improving farm productivity
- ICT services deliver a wide range of information to the farmers

### Challenges for ICT

- Huge digital divide between the urban and rural population
- Most of the ICT models are based on internet and computers
- Low income levels and high levels of illiteracy
- Insufficient power availability in rural areas
- Poor ICT infrastructure and ICT illiteracy
- Non-availability of timely relevant content
- Non-integration of services and poor advisory services
- Lack of localization
- Quality, timeliness and trustworthiness of information important

### How to make use of ICTs for better information delivery

- Digital Agriculture- ICT & data ecosystems

to support the development & delivery of timely, targeted information and services to make farming more profitable and sustainable

- Linking farmers to markets, consumers, and investors through new ICTs and new media
- Agriculture Technology – based services will need content in local languages as well as interfaces that are appropriate for farmers with less formal education and limited experience with computers
- Strong market links between players along the value chain, financing mechanism to reduce risk & appropriate scales of supply and demand
- Integrated crop based market driven information delivery system
- Skilling of rural youth for value addition at source – to reverse the trend of on farm to off- farm.

## What are the new challenges and possible opportunity of Indian Agriculture

### New challenges in agriculture

- Low Agricultural productivity- Yield Gaps - stagnating/marginally improving
- Lack of Remunerative prices for farmers
- Land policy related issues
- Agrarian distress

### Stagnation/low agricultural productivity

- Over exploitation of Natural Resources & land and soil degradation
- Inefficient use of water – Improper technology and methods, poor water management, water use efficiency & productivity,
- No specific policy to promote – Reduce, Reuse and Recycle of water & Missing Integrated Water Resource Management
- Depleting soil health, deficiency of micro nutrients, fertilizer imbalance
- Non-availability of adequate quality inputs - seeds, fertilizers & pesticides, Low Seed Replacement Rate

### Remunerative prices for farmers

- Critical gaps in Pre & Post Harvest Infrastructure- Supply Chains, including cold storages for more efficient distribution of farm produce
- Post-Harvest Losses- range from 90000 – Rs.1.50 lac crores annually due to inadequate storage structure
- MSP related issues

### Agricultural Land Policy-Leasing and Titling

- Land holdings - Small, tiny & fragmented holdings
- Prevalence of sharecroppers & tenants farmers – No ownership to the cultivator
- Absence of transparent Land leasing laws in agriculture & conclusive titles - Banning land leasing with exceptions
- Non Digitization of land records

### Farmer Distress and Immediate Relief

- Natural disasters such as droughts, floods, cyclones, storms
- Vagaries of monsoon & climate change issues
- Low Coverage under insurance schemes

### Possible Opportunities & way forward:

- Integrated Farming System approach – synergic blending of crops with Horticulture, Dairy, Goat Rearing, Sericulture, Bee-keeping, Poultry
- Focus on skill and capacity building of farmers
- Livestock sector - vital for SF/MF – higher returns per unit of land
- Focused initiatives for Dairy, fisheries & poultry
- Focus to be shifted to Off farm activities- Primary & secondary processing, Agro-processing & agri. value chain
- Better quality seeds & increase seed replacement rate, issue of more Soil health cards
- Optimum use of fertilizers according to soil type, crop, water usage- Increase Fertilizer Use Efficiency through fertigation
- Needs technology breakthrough in pulses & oilseeds
- Enhancement of productivity level - Modern technologies & low cost Green Technologies- SRI, SSI, micro irrigation
- Adopting climate smart technologies for enhancing adoptive capacities of the farmers
- Revision in APMC Act in some states & reforms to permit pan-India trades & **e-NAM** - a pre-cursor to nation-wide unified market connectivity- easing of norms of licensing
- Strengthening storage & processing facilities & value chain
- Integrated approach to managing risk – **Adaptation & Mitigation especially in rainfed areas**
- Increased coverage under crop Insurance schemes
- Structural reforms in land leasing and market restrictions needs to be addressed – Transparent land leasing law, model land leasing act

### Strategies may include:

- Judicious use of scarce natural resources
- Focus on rainfed areas, small holders
- Timely and adequate credit
- Promotion of Integrated Farming system models – location specific
- Increased Capital formation in agriculture
- Strengthening of Extension services & ICT Technologies
- Infrastructure, Research & Development
- Integrated marketing arrangements
- Agro-processing / Value Chain
- Collectives of farmers- like Formation of farmers' producer organizations (FPOs), Farmer Interest Groups, Joint Liability Groups etc.

# INDUSTRY 4.0

## Learnings from Hannover, Germany Applicable on SME's of India in line with Make in India

**Dr. Enti Ranga Reddy**
Managing Director.
Legend Technologies (I) Pvt Ltd

### Intelligent, efficient, Industrie 4.0

Industry 4.0 offers endless opportunities for Indian companies. Small businesses in particular have new challenges to overcome. The road to the smart factory is not lined with intelligent machines alone.

Manufacturing facilities that share information with work pieces and call a technician for help if needed? This vision becomes reality with Industry 4.0. Machine production is networked into a self-learning system using cutting-edge communication technology – resulting in a smart factory. The foundation for this modern industrial revolution is the Internet of Things (IoT), which enables continuous data exchange between all participating units – from the production robot to inventory management to the microchip. This connects all production and logistics processes together, making our industry more intelligent, efficient and sustainable.

### Small steps to the smart factory

To move closer to this vision, more and more companies are integrating smart machines into their production process. Trumpf, one of the world's largest providers of machine tools, uses laser cutting machines with intelligent lenses, for example. If a lens become dirty, it automatically sends an alert to the maintenance team. This saves the company unnecessary servicing and cleaning costs.

Software manufacturer SAP has gone a step further in digitization: In the Open Integrated Factory, an autonomous process chain, work pieces inform the various manufacturing systems about how they should be processed. The machine can register the work piece's information, manufacture different versions of a given product and even

learn new production processes while doing so.

## Security gaps

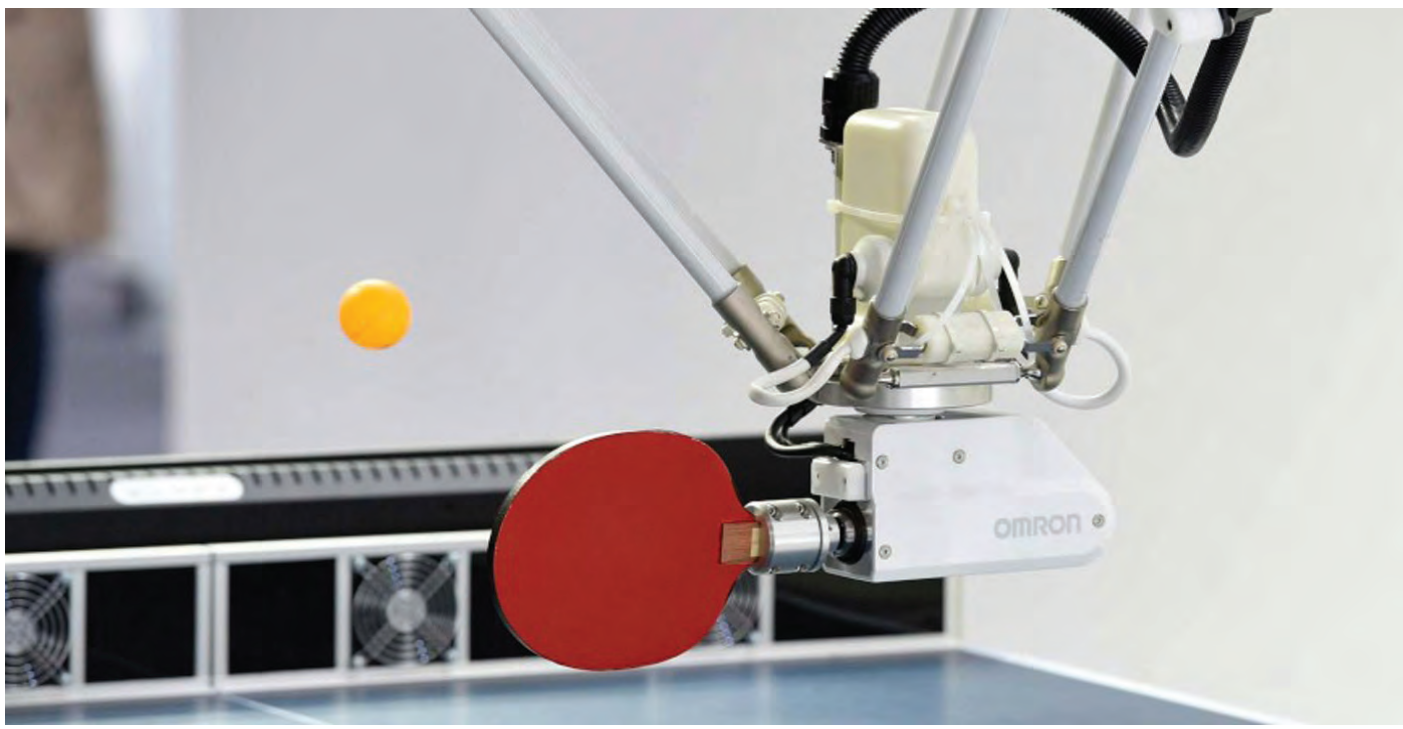
Smart machines are not uncommon even in small businesses these days. But small companies in particular still view Industry 4.0 with skepticism. Their main reason: the lack of data security. To counter these risks, several research institutes are working on new approaches to industry security. Complex attack scenarios are modeled in virtual test laboratories, in order to optimize existing security systems and develop targeted prevention strategies.

## Smart training

Along with security gaps, many companies also complain of the lack of qualified workers. Because standardized, simple tasks are increasingly performed by robots in


Industry 4.0, workers' need for meaningful IT expertise is growing. In Germany, there is a lack of this IT expertise, but India being forefront in IT industry can take this challenge quite easily. Specialized further education measures that already exists in Germany and are being used in daily business to integrate insufficiently qualified workers into Industry 4.0. For example, smart data glasses guide employees step by step through the repair of a complex system, while smart gloves can immediately notify the worker if a component is incorrectly mounted.

India being in the forefront of IT Industry can augment the manufacturing industry and bring us to Industry 4.0 with ease.



Vivek Wadhwa H.S.

# Should Artificial Intelligence Replace Soldiers?

The United States has on its Aegis-class cruisers a defense system that can track and destroy anti-ship missiles and aircraft. Israel has developed a drone, the Harpy, that can detect and automatically destroy radar emitters. South Korea has security-guard robots on its border with North Korea that can kill humans.

All of these can function autonomously -- without any human intention.

Indeed, the early versions of the Terminator are already here. And there are no global conventions limiting their use. They deploy artificial intelligence to identify targets and make split-second decisions on whether to attack.

The technology is still imperfect, but it is becoming increasingly accurate -- and lethal. Deep learning has revolutionized image classification and recognition and will soon allow these systems to exceed the capabilities of an average human soldier.

But are we ready for this?

Do we want Robocops policing our cities? The consequences, after all, could be very much like we've seen in dystopian science fiction. The answer surely is no.

For now, the U.S. military says that it wants to keep a human in the loop on all life-or-death decisions. All of the drones currently deployed overseas fall into this category: They are remotely piloted by a human (or usually multiple humans). But what happens when China, Russia and rogue nations develop their autonomous robots and acquire with them an advantage over our troops? There will surely be a strong incentive for the military to adopt autonomous killing technologies.

The rationale then will

be that if we can send a robot instead of a human into war, we are morally obliged to do so, because it will save lives -- at least, our soldiers' lives, and in the short term. And it is likely that robots will be better at applying the most straightforward laws of war than humans have proven to be. You wouldn't have the My Lai massacre of the Vietnam War if robots could enforce basic rules, such as "don't shoot women and children."

And then there will be questions of chain of command. Who is accountable in the event that something goes wrong? If a weapons system has a design or manufacturing issue, the manufacturer can be held accountable. If a system was deployed when it should not have been deployed, all commanders going up the chain are responsible. Ascribing responsibility will still be a challenging task, as it is with conventional weapons, but the more important question is: Should the decision to take a human life be made by a machine?

Lethal autonomous weapons systems would violate human dignity. The decision to take a human life is a moral one, and a machine can only mimic moral decisions, not actually consider the implications of its actions. We can program it, or show it examples, to derive a formula to approximate these decisions, but that is different from making them for itself. This decision goes beyond enforcing the written laws of war, but even that requires using judgment and considering innumerable subtleties.

And the steady seepage of military technologies into civilian life will see these military systems being deployed in our cities.

Artificial systems have the benefit of not experiencing destructive emotions, such as rage. But they also lack critical positive emotions, such as sympathy and compassion. As Maj. Daniel Davis of the U.S. Army points out: "In virtually every war involving the U.S. ... the enemy discovered that although GIs could be as ruthless and vicious as any opponent, the same soldier could extend mercy when appropriate." The point of war is to attain peace on our terms; the human connection is an important part of facilitating it.

The only way to avoid untenable situations is to create and enforce an international ban on lethal autonomous weapons systems. Unilateral disarmament is not viable. As soon as an enemy demonstrates this technology, we will quickly work to catch up: a robotic cold war.

The precedent for this sort of ban is well established. Barbed spears, chemical weapons and blinding lasers are all weapons that society has agreed should never be used. (Unfortunately, nuclear weapons are not specifically banned, though their use may violate other international laws limiting civilian casualties and long-lasting effects; the main factor curtailing their use is the fear of massive retaliation.)

There is hope for such a ban. Efforts are underway by the U.N. Convention on Certain Conventional Weapons (CCW), leading scientists and the Campaign to Stop Killer Robotsto have the world's governments consider a multilateral treaty that would remove the temptation to build a bigger, better swarm of autonomous killer robots and deploy them sooner than the next potential enemy can. But we are collectively responsible for considering these moral questions and deciding whether we want this technology to be used in war.

Robotics and artificial intelligence both offer great potential for helping society -- from searching collapsed buildings for survivors, to sifting massive data for new treatments for cancer. It is up to us whether we harness their potential to build peace and enrich our lives or to ensure endless war and cheapen human life.

*Source: https://www.inc.com/linkedin/vivek-wadhwa/robots-could-eventually-replace-soldiers-warfare-good-vivek-wadhwa.html*

Ashish Pramod Soni

# SMART FACTORY

## Cyber Physical Systems, Fusion of Technical Process and Business Processes

Industry 4.0 is a name for the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing. Industry 4.0 creates what has been called a "smart factory". The deployment of cyber-physical systems in production systems gives birth to the "smart factory."

Smart Factory is a system that is proven to help manufacturers sustain continuous flow, optimize efficiency and reduce errors in manual assembly processes. The system enables users to instantly recognise opportunities for improvement, to quickly and easily move ID points without reconfiguring hardware infrastructure, and to instantly identify critical issues and the real-time status of operations. It also enables automatic, product sensitive device control and poke-yoke, anywhere in the plant, reducing manual errors, cycle time and line stoppages. By accurately identifying and locating process critical assets, Smart Factory provides real-time operational awareness, adaptive control and data-driven insights.

Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time, and via the Internet of Services, both internal and cross-organizational services are offered and used by participants of the value chain.

Flexible production systems which are able to respond in almost real-time conditions allow in-house production processes to be radically optimized. Production advantages are not limited solely to one-off production conditions, but can also be optimized according to a global network of adaptive and self-organizing production units belonging to more than one operator.

This represents a production revolution in terms of both innovation and cost and time savings and the creation of a "bottom-up" production value creation model whose networking capacity creates new and more market opportunities. Smart factory production brings with it numerous advantages over conventional manufacture and production. These include:

CPS-optimized production processes: smart factory "units" are able to determine and identify their field(s) of activity, configuration options and production conditions as well as communicate independently and wirelessly with other units;

Optimized individual customer product manufacturing via intelligent compilation of ideal production system which factors account product properties, costs, logistics, security, reliability, time, and sustainability considerations;

**Resource efficient production;**

Tailored adjustments to the human workforce so that the machine adapts to the human work cycle. Smart factories, with their interfaces to smart mobility, smart logistics, and smart grids concepts, are an integral component of tomorrow's intelligent infrastructures.

### HOW IT WORKS

Smart Factory gathers location data, and data from existing plant systems and devices. The system combines this information, correlating the real-time process interactions with operational details, to deliver a virtual interpretation of exactly what's going on in the factory. By leveraging this knowledge, Smart Factory empowers automation and drives widespread

improvements to users' manufacturing processes.

## WHAT YOU GET:

1. Measurable cost reduction, with lean, optimized procedures throughout the assembly process.
2. Guaranteed productivity gains, as errors and wasted time are reduced or eliminated.
3. Reduced cost of quality, by maximizing right-first-time and reducing the cost of re-work.
4. The ability to manage product customization, through error-proofing and guiding increasingly variable manual processes

By combining the Smart Factory Information Engine with the relevant apps, manufacturers can gain significant value from a single starting point, and seamlessly expand the value across a wide range of operations.

## PROCESS IMPROVEMENT

Factory Process Improvement are uniquely engineered to support operational enhancements, delivering a suite of advanced performance monitoring capabilities. These powerful applications deliver critical alerts, reports and rules to empower fast, information driven decision making. Production teams are able to better manage day-to-day operations, while quality and lean management teams can rapidly highlight process and stability issues affecting optimal quality, throughput and cost.

## VIRTUAL STATION

Smart Factory Virtual Station eliminates the cost and burden associated with relocating and rebalancing process identification points. Highly accurate Smart Factory location technology removes the need for bar code scan, and other legacy identification mechanisms, transforming fixed assembly lines to be completely and easily malleable.

## SMART DEVICE

Smart Factory Smart Device is an incredibly powerful tool-control application, which automates traditionally manual identification tasks, frees tools and operators from both the tether and the workstation. The process changes enabled by Smart Device drive significant reductions in errors and re-work, leading to better throughput at reduced operational effort. Modern information and communication technologies like cyber-physical system, big data analytics and cloud computing, will help early detection of defects and production failures, thus enabling their prevention and increasing productivity, quality, and agility benefits that have significant competitive value.

The broad definition of smart factory covers many different technologies. Some of the key technologies in the smart factory movement include big data processing capabilities, industrial connectivity devices and services, and advanced robotics.

### Advanced robotics

Advanced robots, also known as smart machines operate autonomously and can communicate directly with manufacturing systems. By evaluating sensory input and distinguishing between different product configurations, these machines are able to solve problems and make decisions independent of people. These robots are able to complete work beyond what they were initially programmed to do and have artificial intelligence that allows them to learn from experience. These machines have the flexibility to be reconfigured and re-purposed. This gives them the ability to respond rapidly to design changes and innovation, which is a competitive advantage over more traditional manufacturing processes. An area of concern surrounding advanced robotics is the safety and well-being of the human workers who interact with robotic systems.


Advanced robotics used in automotive production

Traditionally, measures have been taken to segregate robots from the human workforce, but advances in robotic cognitive ability have opened up opportunities, such as cobots, for robots to work collaboratively with people.

### Industrial connectivity devices and services

Leveraging the capabilities of the internet, manufacturers are able to increase integration and data storage. Employing cloud software allows companies access to highly configurable computing resources. This allows for servers, networks and other storage applications to be created and released at a rapid pace. Enterprise integration platforms allow the manufacturer to collect data broadcast from its machines, which can track metrics such as work flow and machine history. Open communication between manufacturing devices and networks can also be achieved through internet connectivity. This encompasses everything from tablets to machine automation sensors and allows for machines to adjust their processes based on input from external devices.

The merging of the virtual and the physical worlds through cyber-physical systems and the resulting fusion of technical processes and business processes are leading the way to a new industrial age best defined by the "smart factory" concept.

Smart factory products, resources and processes are characterized by cyber-physical systems; providing significant real-time quality, time, resource, and cost advantages in comparison with classic production systems.

The smart factory is designed according to sustainable and service-oriented business practices. These insist upon adaptability, flexibility, self-adaptability and learning characteristics, fault tolerance, and risk management.

## Case: ABB LV Installation Materials Co., Ltd., Beijing

In the smart factories of the future, processes take place in real time, production is flexible, and the entire value chain is automated from order to delivery. Production can be monitored remotely and customer orders and manufacturing handled automatically. Traceability is integrated into all stages of production, processing and distribution. This future has already arrived at ABB's plant for low-voltage products in Beijing. The plant benefits from improved competitiveness, more reliable deliveries, better quality and higher customer satisfaction.

There are 27 robots working alongside humans at ABB LV Installation Materials Co., Ltd., Beijing. The plant is largely automated and automation is used throughout the order-delivery process chain. The plant has applied automation to functions from parts manufacturing to assembly and logistics. Automation has increased the reliability of deliveries, product quality, competitiveness and profitability, leading to continuous improvement in productivity.

### Smart manufacturing based on MES

The highly automated Beijing plant has entered the era of smart manufacturing with the help of manufacturing execution systems (MES).

MES can respond to customer orders in real time, enabling manufacturing system configuration to be set automatically according to customer needs. Automated assembly lines then assemble and test products via human-machine collaboration. This seamlessly connects customer demand and manufacturing, resulting in shortened lead time and improved services.

MES can also automatically generate production planning and scheduling based on real-time inventory levels. New orders are generated as stock runs low or big order is received. Automatic scheduling reduces the need to stock finished products and enhances operational efficiency.

With MES, the status of the Beijing plant can be monitored remotely. The production monitoring system works in real time and indicates equipment malfunctions, analyzes the status of each process, reports test results with root causes for rejected products, and generates statistics and reports from production data. "Talking" equipment can communicate with each other and operational status can be sent to engineers in real time for faster response.

Robots can assemble and test products without error. They work exactly as programmed.

### Wireless & mobile terminals eliminate bottlenecks

The Beijing plant uses wireless & mobile terminal solutions to register every shipment both in inbounding and out bounding logistics. As components arrive, they are unloaded and sorted for reception before being picked up by automated guided vehicles and put in storage or a production cell. This technology prevents bottlenecks and human logging errors and enhances the accuracy of the inventory and overall efficiency.
Assembly workers can use touch screens to request more parts, and order is immediately placed in work queue. Automated dispensing system will bring the necessary components to the assembly line and inform logistics staff to transport assembled products away for delivery.

In a smart factory, automated monitoring and management is taking place in all stages ranging from production, testing to packaging and distribution because every product is uniquely marked with a QR code. This means products can be traced throughout the order-delivery process chain.

While humans and robots are working together in the plant and while increasing automation has reduced demand for assembly line workers, it doesn't necessarily mean that people will become obsolete. Humans are and will be needed to control and monitor the automation systems and to make decisions. Small-quantity assembly lines with complex products will also require human-machine collaboration.

### Plant benefits from automation:

- The reliability of deliveries is now 99.94 percent, up from 96.73 percent.
- Productivity has improved more than 6 percent on average.
- The average lead time has improved from eight days to two.
- Manufacturing stability and quality has improved.
- Production can be adjusted according to demand.

# Industry 4.0: International Industrial Trade Fair INNOPROM at Russia with Japan as Partner Country

## Indo-Russian Technovation Delegation Participated during 10-13 July 2017 at Ekaterinburg, Russia

In 2017, International Industrial Trade Fair INNOPROM confirmed its status of the main site for industrial leaders: 50,000 square meters of exhibition space was packed with stands representing over 600 companies from 20 countries; 95 governments sent their trade and industry delegations to INNOPROM-2017. This year event focused primarily Industry 4.0 and Smart Manufacturing.

On July 9, 2017, **Vladimir Putin** the President of the Russian Federation took part in the Opening Ceremony, Vladimir Putin pointed out that INNOPROM featured Russian companies that were actively implementing advanced technologies. "It is very important to see the actual efficiency of these technologies and their practical results, such as better labor conditions, increased productivity, reduced costs, contemporary levels of management, and, finally,

6000
Companies
from
20 Countries

48000
unique visitors

95 Business
and
Political
delegates
from
95 Countries

increased competitiveness of Russian products, goods, and services", Putin said.

The first day of the International Industrial Trade Fair INNOPROM-2017 was marked by the main strategic session *Smart Production: Competition of Models vs. Competition of Technologies*. "Today we are actually right in the midst of the most extensive technological revolution. Digital production, services, and smart environments have already claimed 5% share in the world's largest economies, and experts predict further development of this segment," **Denis Manturov**, Minister of Industry and Trade of the Russian Federation, said at the main strategic session.

### Exhibition

Major international and Russian manufacturers, such as FANUC Robotics, State Corporation Rostec, Yamazaki Mazak, Volvo Trucks, SAP, Siemens, Shvabe Holding, Russian Export Center, Air and Space Defense (VKO) Concern Almaz-Antey, RCC, STAN, and Kaspersky Labs took part in the exhibition in 2017. The exhibition is organized by the Ministry of Industry and Trade of the Russian Federation.

INNOPROM-2017 was also attended by 15 Ambassadors and diplomatic workers representing their respective countries' Embassies in the Russian Federation.

### International Forms

This year, INNOPROM held several international forums: Russia-Korea Industrial Forum, Russia-Japan Industrial Forum *Optimizing Cooperation in Trade and Industry*, Russia-Africa Industrial Forum, Russia-Germany Industrial Forum, International Logistics Forum, and International Industrial Export Development Forum.

### 7th International Global Industrial Design Forum

INNOPROM-2017 hosted the Seventh Global Industrial Design Forum. Expert session *Transportation Solutions for a Large Country* featured a series of presentations delivered by representatives of design studios working for major global automobile companies Renault and Nissan. Director of the Department for the Development of Economic Sectors of the Ministry of Economic Development of the Russian Federation **Alexander Maslennikov** presented a draft strategy on the development of the Russian automobile industry until 2025 written in cooperation with the Ministry of Industry and Trade of the Russian Federation.

One of the main industry trends is the development of e-cars. Representatives of Renault and Nissan pointed out the importance of mass production of e-cars and identified the main setback: preproduction takes 3-4 years for Renault and 2 years for Nissan. **Anthony Grade,** Renault's Vice-President of Design Programs and Head of Design for Russia, stated, "We care not only about the interior and exterior, but also the color scheme, and we have specialists who are working on that. And as we move towards an autonomous environment, materials will become particularly important for the interior because we will develop a completely different "relationship" with our vehicles. That requires new technologies and materials that can provide the desired level of comfort."

Forum and Exhibition "Global Industrial Design" is an integral part of the industrial exhibition INNOPROM. It unites world stars, professional designers and heads of industrial enterprises on one platform, promoting the special role of design in the contemporary industrial development, forming relevant agenda and setting global trends.

The forum "Global Industrial Design" will enable representatives of industrial companies to learn about the current state of industrial design, global trends and additional possibilities to improve efficiency and competitiveness of the company through the improvement of industrial design, as well as to meet successful Russian and foreign designers.

Global Industrial Design includes the exhibition of the latest achievements in the field of industrial design and the business program devoted to the most relevant issues of industrial design.

**Ms. Maria Tvardovskaya,** Project manager of **Global Industrial Design Forum (GID)** has networked eminent keynote speakers across the world. From India, **Dr. K. Gopalakrishnan,** Chairman, R&D Committee, Institution of Engineers (India) and **Dr. W. Amarnath**, Inventor and Scientist has been invited and delivered their keynote address. Ten members of Indo-Russian Technovation Delegation comprising the representatives of Indian Technology Congress and New Horizon College of Engineering have visited Russia during 8-16 July 2017. **Dr. Saurabh Kwatra,** Head, International Innovations, New Delhi has coordinated the visit of delegation to Russia.

http://www.innoprom.com/en/about/special/GID/

# Organic Milk & Milk Products

A product of organically managed sustainable rural dairy enterprises promoted by Akshayakalpa

## Wholesome food for the ENTIRE FAMILY

Modern cattle shed designed for cow comfort with mattresses for cows

Adlibidum feeding of greens to ensure health of cows and quality of milk

Abundant cultivation of legumes organically provide the nutrition required for cow

Azolla, the water plant grown in every farm provide good protein supplements

Tree fodders like Subabul, Sesbania & Moringa provide fodder security throughout the year

Healthy calves grow up to be healthy and happy cows

Modern milking systems to reduce the drudgery of women

It is a great team work and we need your support

It is a great team work and we need your support

**Your Distributor Name :**..... **Phone :** .....

**+91 95353 88122 (Customer Care)**

support@akshayakalpa.org

**Akshayakalpa Farms & Foods Pvt Limited**

382/2, Sharadanagara, Tiptur - 572201, Karnataka facebook.com/Akshayakalpa.Farms

# BRICS FEDERATION OF ENGINEERING ORGANISATIONS (BRICS FEO)

## Introduction:

"BRICS Federation of Engineering Organizations" and the same has been deliberated. BRICS is the acronym for an association of five major emerging national economies i.e., Brazil, Russia, India, China and South Africa. The BRICS members are all developing or newly industrialized countries, but they are distinguished by their large, fast-growing economies and significant influence on regional and global affairs. Out of the above five countries Russia is a G-8 member and other four countries are G-20 members. The BRICS Forum formed in 2011 is an independent international organization encouraging commercial, political and cultural cooperation between the BRIC nations. In June 2012, the BRICS national pledged $75 billion to boost the lending power of the International Monetary Fund. In late March 2013, during the fifth BRICS summit, the members countries agreed to create a global financial institution which


they intended to rival the western-dominated IMF and World Bank and planned to finalise the arrangements for this New Development Bank by 2014. India has appointed Mr K V Kamath as the Head of the New Development Bank of BRICS nations and he would preside over its operations for the first six years.

## Vision

To Promote and provide services for the Professional bodies of engineering & Technology/Students of Engineering and Technology from various Institutions/ Universities from BRICS Countries

## Mission

Integrate all Engineering and Scientific Disciplines, network Engineering Organizations in India and BRICS Countries, associated with engineering and technology, which will help in forecasting, planning & executing near-term and long-term activities, aimed at various mutual benefits of BRICS nations and generate ample employment opportunities for all stake holders.

**BRICS FEO Operations at**

#3, Fourth Floor,
First Main, BDA Layout,
Kodihalli, HAL 2nd Stage,
Bengaluru – 560008,
Karnataka, INDIA
Phone: +91 91 80 6559 2501
TeleFax: +91 80 4850 8380

Ashok Kumar Meda

# The Paradigm Shift – The Indian Agriculture Next

**Agriculture Sector**, globally, is at the threshold of a needful paradigm shift, towards adaptation of the smart solutions, particularly while facing climate change, volatility, shifting nutrition needs, and the increasing scarcity of most of the physical factors of production. The population trajectory means that from now to 2030, the world will need to build the equivalent of a city of one million people in developing countries, every five days !.

**India, an agrarian economy**, essentially has recognised that, going forward, farmers must produce more food per unit of land, water and other inputs, like agro-chemicals & machinery adopted. Need of the day is to invite reasoned interactions, cutting across the thought silos intrinsic to different views and values to identify consensus, particularly the engineering & ICT technocrats with the agriculture domain experts and practitioners. Participation of leading experts is solicited in different dimensions of agriculture, representing the perspectives of the natural and social sciences, policy makers and academia, public and private. National level dialogue should deal with the most significant trends and the important priorities in the next 5 years to ensure application of engineering as well as ICT solutions towards sustainable food and agriculture systems in India.

Farming has enormous impacts on the country's most critical resources. Accordingly, farmer-entrepreneurs will have to produce, but ensure the limitations of the vital ecosystem services. Prevent degrading of the resources, but exhaust the ability to produce enough food. The overall outcome depends mostly on small and medium farmers, occupying major proportion of Indian farming community. The current 'more production' orientation is outdated and unresponsive. The future

focus should particularly be on our environment and natural resources. Pressing need is for the new approaches in policies and structures. Accountability shall be on the formidable environmental impacts and consider the social consequences of evolving new agricultural systems. The disruption shall be from the concept of "more" production towards adopting the concepts of "better" production and 'better' food systems.

The recent orientation towards profound re-thinking of our current models and, to better serve our coming needs, would re-imagine and transform major agricultural systems. The limited key resources will be oriented as the challenges to stimulate creative engineering innovations, adopting a collaborative approach involving the related stake holders viz., - farmers / entrepreneurs, domain and technology experts, financial institutions and policy makers. The event shall trigger technology transformation in the primary sector – agriculture, taking cue from successful radical and world-changing innovations in every other field has experienced, from

healthcare (nanotech-based diagnostics and drugs) and communication (mobile telephony) to politics (social network media).

**Emerging Trends in Focus**

- Agriculture uses our available fresh water and potentially, productive lands are lost annually through soil erosion and degradation. Need is to integrate all vital functions of ecosystem management as central features of its development. Attempts here are to evolve new learning pathways for the producers, communities, firms and policy makers, enhancing their concentration all along the value chain. Firms face new governance challenges with volatility in supplies and markets. Forward looking firms need to recognize the need to create shared value and not just profit to thrive in the long term...

- With the advent of Industry 4.0, machines can predict failures and trigger maintenance processes autonomously or self-organized logistics, react to unexpected changes in production. The world of production has become increasingly networked, until everything is interlinked with everything else, the driving force behind the Internet of Things. Agriculture, with enormous complexities of production, needful linkages with inputs and supplier networks, as also the creation of market demands & reach out, needs these innovative approaches resulting out of Industry 4.0 initiatives. Need is for interconnecting multiple supportive technologies or geographical regions. Focus on adaptation to the trends towards automation and data exchange in farming technologies. The farming future lies in the cyber-physical systems monitoring physical processes, and make decentralized decisions, in situ. Over the Internet of Things, cyber-physical systems shall mutually communicate and also with humans in real time.

  The Internet of Services, both internal and cross-organizational services offered & used by participants across value chain. Such Interoperability & Technical Assistance, supports us on aggregating and visualizing information comprehensibly for making informed decisions and solving problems continuously. Within this decade, the norm of the farming day will be that the cyber physical systems takes decisions & performs their tasks as autonomously as possible. The human interferences will only exceptional, to resolve on conflicting goals, if any as encountered.

- The big data analytics or cloud computing enables early detection of climatic uncertainties, defects and production failures, the precautions exercised enhances productivity, quality, and agility benefits that have significant competitive value for the produced products. This will lead generating contextual contents to derive meaningful correlation. Precision Farming, thereon ensures localized customization, adding value to the products and services rendered. Internet of Thing-devices populate a wide variety of applications for the Precision Farming

- Such technological advents are leveraged for wide ranging applications in - Horticulture, Rain-fed, Green house/ Poly-house with controlled environment, Field Crops & Special Crops etc across the Agri-domains. Connected Agri-Life Science, through Deep Learning and AI / IR / VR based prediction controls against natural calamities, plant diseases as also insect attack.

- Technology innovations and applications to consciously address the small and marginal farmers, constituting over 80% of total land holdings size less than 5 acres. Solutions for rain fed crops /semi-arid are crucial, as only about 45% of the land has irrigational support. This Inclusive approach will support around 55% of total Indian population who depend on farming.

- Farm mechanisation with Smart Gadgets & Applications ensures enhanced farm productivity, adopting excellence in Agri-Tech deployments, engineering innovations & research for mechanization. Need is for designing simpler and effective machinery like robots, drones and other process automation of farming practices.

- Contemplating Connected Farming Systems (CFS), with the end-to-end process automation in mind using the Information and Communications Technology (ICT) is now a reality. Coupled with the Deep Learning Platforms and IoT based Connected Systems of Systems, CFS provides near-accurate information for decision making right from sowing to monetization. With Online Connected Market Place, agriculture adopts to Demand Based Inputs as also harvesting.

INDUSTRIAL 4.0

# Perfectly welded for the future

Extremely flexible man-machine collaborations in times of Industry 4.0: From fully automated production warehouses with Automated Guided Vehicles to automatic loading and unloading with mobile robots to process and machining automation, Grenzebach will be presenting a clear picture of tomorrow's smart factories that are conducted by humans. Process chains, which can be automated, are executed with the help of robots. However, the human being can intervene at any time and directly communicate with the Automated Guided Vehicles (AGV) and mobile robots for processes such as taking over the loading or unloading of parts. The mobile robots ensure ultimate personnel safety for any type of man-machine collaboration.

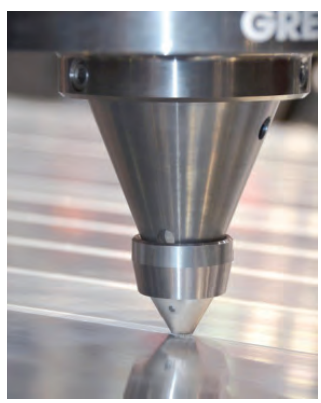
"In order to proactively conduct and control Grenzebach or third party equipment, the Grenzebach Application Server, abbreviation "GAS", is the state-of-the-art and modular central unit. The GAS controls all sequences in production and thus integrates equipment components and devices of all manufacturers. Already, this framework is paving the way to Industry 4.0 and tomorrow's factory for our customers. The simple and most reasonable use of Apps allows to upgrade the system's configuration", says Roland Jenning, head of innovation at Grenzebach.


During the world's leading tradeshow for Industrial Automation, the Grenzebach booth (hall 17, booth B42) will showcase how exactly workpieces are taken off the racks by the AGV "L1200S" with the help of mobile robots to then be transported towards the friction stir welding cell where the gripper of the mobile robot deposits the workpieces. After the welding, the mobile robot picks up the processed workpieces and continues towards the storage - then the cycle in the smart factory starts over.

The brand-new mobile robot MR10S from Grenzebach, which is a combination of the established AGV "L1200S" and a collaborative robot, will be presented at the show for the first time to the public from April 24th through April 28th. The MR10S completes the Grenzebach logistics fleet featuring perfectly safe human-robot collaboration. "Mobile robots are extremely flexible and easily integrate themselves into the operational scheme of tomorrow's smart factory. Today these operations already include friction stir welding, tomorrow there will be a multitude of other tasks", says Jenning. The robot can handle up to 10 kg and is working with a reach of 1300 mm at very high positioning accuracy. The mobile robot supports the employee and avoids exhausting and ergonomically unfavorable work steps. When the MR10S is in man-robot mode, there are no safety concerns for surrounding personnel.

As soon as it operates within the safety zone - i.e. not directly accompanied by personnel - it can easily release its energy for highly precise and quick work. The energy is provided to the mobile robot contact-free with inductive transfer, needs-based and lifetime optimized. The Grenzebach Fleet Manager, one of the multiple apps of the Grenzebach Application Server (GAS), coordinates all transportation tasks - 100% autonomously.

The Automated Guided Vehicle L1200S is already a main component in Industry 4.0: The vehicle can transport up to quadruple its own weight up to 1.2 tons in length- or crosswise direction and can rotate on the spot, all completely safe to personnel. It moves beneath the load carrying devices, which can be individually combined with



superstructures; an ideal solution for the plant-internal "taxi service" and the vehicle for tomorrow's smart factory.

With the friction stir welding (FSW) technology, Grenzebach presents a joining technology for optimum welding seam and surface quality. The innovative Grenzebach FSW technology allows for bonding of different types of metals, robust, with low tendency to distortion, mechanically strong and without filler metals or the use of protective gas. The Grenzebach FSW procedure is especially suited for welding of light metals like aluminum and its alloys. The type of manufacture - rolled, molded, extruded or forged - only plays a subordinate role. The result: Extremely robust, gas and pressure-tight welding seams for simultaneously low process costs and an unbeatably energy balance.

At the Grenzebach booth, mobile robots, AGVs and FSW technology all in collaboration with the human being will demonstrate tomorrow's smart factory.

Aside from the daily program at the booth, Grenzebach will also hold the following presentations: April 25th at 03:30 p.m. at the logistics forum (pavilion 32) and April 26th at 10:20 a.m. at the forum for Industrial Automation (hall 14, booth L19), Roland Jenning will speak on: "Mobile robotics in tomorrow's production environment - mobile multiple-axes systems combined with intelligent Fleet Management".

# SUPER SMART SOCIETY:

## SOCIETY 5.0

A major policy for the economy, society and the general public popularly called "Super Smart Society" (Society 5.0) is being strongly promoted by Council for Science, Technology and Innovation; Cabinet Office, Government of Japan.

Efforts are now being arranged under government-private partnership to lead the change in the so called fourth industrial revolution. In order to get along with other nations and proffer solutions to Japan's ageing societal problems, Japanese companies and all other stakeholders are developing a policy involving the use of robots, IOT and AI.

This policy is anticipated to introduce transformational change in an expansive scope of industrial solutions such as manufacturing, logistics, sales, transportation, medical care, finance and public services. This eventually will have effect on people's work and lives by giving them encouragement to realize high quality of life. Defining the Smart society and as well support systems are being layed out towards realizing the goal for Smart Society development, adding new value in the society.

### The new super smart society

Here are some factors of a super smart society:as per the policy, It is a society in which the different needs of members are distinctly met through the provision of the relevant goods and services in the desired amount to the people who need them, and in which the entire people can be assessable to top notch services and live a convenient, vibrant life that takes into account their differences such as age, gender, religion or language.

To develop and realize an environment in which people and robots and artificial intelligence (AI) exist together and work to enhance personal satisfaction by offering finely separated redid administrations that meet different consumer needs. The general public should likewise be capable of foreseeing potential needs and giving services to bolster human activities, determining crevices in service because of contrasts in religion, age, and so on; and empowering anybody to be a service provider.

Then again, on account of the high level of converging amongst the internet and the genuine world in a super brilliant society, the harm that cyber-attacks can exact on this present reality will likewise turned out to be progressively extreme and may truly influence individuals' lives, including their financial and social exercises. In this way, accomplishing a more elevated amount of security is required. Such endeavors will serve as a wellspring of mechanical quality and universal intensity.

Essential advances are important to build the super shrewd society platform; this means that the innovations associated with distribution, processing, and accumulation of data in the internet are the key advances in framing our world-leading super smart society and making included worth from huge information. Consequently, Japan will accelerate solidification of the accompanying central innovations specifically.

- **Cyber security:** innovation that backs up safe data and communication, considering the qualities of the IoT, for example, the long life cycles from configuration to transfer.
- **IoT system architecture technology:** technology that empowers the displaying of equipment and programming as segments, and the building and working of expansive scale systems.
- **Big data analytics:** innovation associated with getting knowledge and value from a lot of a wide assortment of information, including unstructured information.
- **AI:** technology that backs IoT, enormous information examination, and advanced

communication.

- **Device technology:** innovation that empowers fast, real-time preparation of extensive measures of information with low power utilization.
- **Network innovation:** technology that appropriates large measures of data at high limit and rapid speed.
- **Edge computing:** innovation that empowers expanding speed and enhancement of real-time processing at the real system area, which is fundamental for expanding the usefulness of IoT.

Also, since numerical sciences is an inter-disciplinary exploratory innovation that underpins all these major innovations, we shall advance it together with fortifying cooperation in R&D of every technology, and when cultivating professional advancement.

Crucial innovations that are Japan's qualities, forming the core of new value creation: By installing segments that utilize Japan's innovative qualities in every system component, stakeholders in Japan Inc. are set to establish Japan's dominance and make it workable for the system to make new value that meets the differing needs of the economy and society, both in Japan and abroad. Consolidating the following fundamental technologies in particular, which function as core technologies in the real world will contribute to new value creation in individual systems.

- Robotics, Sensor technology, Actuator technology, Biotechnology, Human interface technology, Material/ nanotechnology, Light/ quantum technology and so on.

Joint effort amongst AI and mechanical technology is required to achieve the improvement of both AI acknowledgment and robot engine capacities, and the integration of differentiated advances. For the key principal advances, the Council for Science, Technology and Innovation is expected to define general procedures considering the point of view of all government ministries and agencies, and lead in advancing compelling and productive R&D. In the meantime, the Council will adaptably advance Research and Development towards envisioning goal of super smart society 5.0

# Boeing buys Liquid Robotics to Boost Autonomous Surveillance at Sea

The Boeing Co. says it has agreed to acquire Liquid Robotics, its teammate in a years-long effort to create surfboard-sized robots that can use wave power to roam the seas.

The acquisition is expected to help Boeing create military communication networks that can transmit information autonomously from the sea to satellites via Sensor Hosting Autonomous Remote Craft, or SHARCs.

Liquid Robotics was founded in 2007 and currently has about 100 employees in California and Hawaii. Once the deal is completed, the company will become a subsidiary of Boeing.

Liquid Robotics' Wave Glider floats on the surface of the ocean, but it's propelled by a wave-powered undersea glider. (Liquid Robotics Photo)

The arrangement is similar to the one that applies to Insitu, a Boeing subsidiary that is headquartered in Bingen, Wash., and manufactures ScanEagle military-grade drones.

Just as the fixed-wing ScanEagle drones can gather and transmit data while they're airborne, SHARCs can monitor maritime operations and send the information back via satellite to their handlers. Boeing also makes a 50-ton underwater robot called Echo Voyager that can explore the deep sea for six months at a time, as well as two smaller unmanned undersea vehicles. The SHARCs can serve as communication relays for those undersea robots.

The deal announced today underscores the fact that Boeing's love affair with oceangoing drones is much more than a fling.

"With Liquid Robotics' innovative technology and Boeing's leading intelligence, surveillance, and reconnaissance solutions, we are helping our customers address maritime challenges in ways that make existing platforms smarter, missions safer and operations more efficient," Leanne Caret, president and CEO of Boeing Defense, Space and Security, said today in a statement.

The SHARCs are versions of Liquid Robotics' Wave Glider robot, which is designed to generate power for itself using solar

arrays as well as an innovative propulsion system that takes advantage of the energy differential between surface waves and the relative calm of deeper water. No fuel is required.

"When you put it at sea, it's good for six months without a human touching it," Egan Greenstein, senior director of autonomous maritime systems at Boeing Military Aircraft, told National Defense magazine in June. "We thought it had promise to solve hard Navy problems."

The Navy tested the SHARC system last year as a sensor-equipped robotic tool for gathering intelligence and doing surveillance. "If it detected a threat, it would call home over satellite communications to tell decision-makers something is going on," Greenstein said.

SHARCs could come into play in situations where the Navy wants to keep a low profile, where long-term surveillance is required, or where potential undersea threats such as submarines have to be monitored.

Terms of the acquisition agreement were not disclosed. The companies said that completion of the transaction "is subject to satisfaction of customary closing conditions."

# Why Everyone Must Get Ready For 4th Industrial Revolution

First came steam and water power; then electricity and assembly lines; then computerization… So what comes next?

Some call it the fourth industrial revolution, or industry 4.0, but whatever you call it, it represents the combination of cyber-physical systems, the Internet of Things, and the Internet of Systems.

In short, it is the idea of smart factories in which machines are augmented with web connectivity and connected to a system that can visualize the entire production chain and make decisions on its own.

And it's well on its way and will change most of our jobs.

Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, has published a book entitled *The Fourth Industrial Revolution* in which he describes how this fourth revolution is fundamentally different from the previous three, which were characterized mainly by advances in technology.

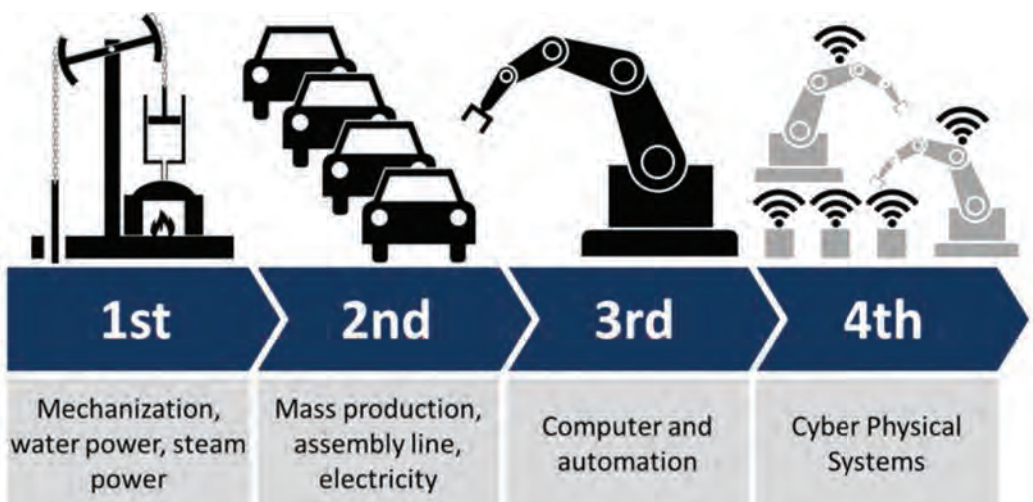
In this fourth revolution, we are facing a range of new technologies that combine the physical, digital and biological worlds. These new technologies will impact all disciplines, economies and industries, and even challenge our ideas about what it means to be human.

These technologies have great potential to continue to connect billions more people to the web, drastically improve the efficiency of business and organizations and help regenerate the natural environment through better asset management, potentially even undoing all the damage previous industrial revolutions have caused.

But there are also grave potential risks. Schwab outlines his concerns that organizations could be unable or unwilling to adapt to these new technologies and that governments could fail to employ or regulate these technologies properly. In the book he postulates that shifting power will create important new security concerns, and that inequalities could grow rather than shrink if things are not managed properly.

For example, as automation increases, computers and machines will replace workers across a vast spectrum of industries, from drivers to accountants and estate agents to insurance agents. By one estimate, as many as 47 percent of U.S. jobs are at risk from automation.

Bernard Marr is a best-selling author & keynote speaker on business, technology and big data. His new book is Data Strategy. To read his future posts simply join his network here.




The 4 Industrial Revolutions (by Christoph Roser at AllAboutLean.com)

# Why Smart Manufacturing is Guaranteed to Need Industrial Robotics

Robots are taking the manufacturing industry by storm. This might read like the beginning of the next hugely successful sci-fi novel, but this is the reality within the United States and across the globe. Although many companies have been hesitant to embrace the robotic production line, recent advancements in smart manufacturing are quickly making industrial robotics a necessity in the industry.

### Advanced Collaboration

Smart manufacturing takes advantage of the Industrial Internet of Things (IIoT) to achieve greater collaboration between partners, factories, individual production lines and consumers. RFID tags are able to track the movement of materials and goods from their first point of origin all the way to store shelves and, in some cases, right into the household.

Industrial robotics can monitor these smart tags in order to shorten production and shipping times. They can also solicit feedback directly from the consumer regarding product quality and their overall satisfaction. Such information is useful when making future improvements to your manufacturing operations.

You'll also see increased collaboration across the factory floor. Self-diagnosing machines that power down for regular maintenance can save time and money and even prevent injury. A machine in one part of your factory can maintain a real-time connection to a device on the other side of the shop, thereby sharing production metrics or transmitting last-minute production changes. Today's smart equipment can even learn how to increase efficiency over the course of time.

### Increased Efficiency

Many human employees are worried industrial robotics will replace them entirely, but the majority of early adopters see the opposite. Instead of replacing your valuable staff members, use this opportunity to give them additional training. Preparing your employees to work alongside industrial robotics is critical when introducing them to the production line.

Automation within the manufacturing industry also leads to greater productivity across the board. Robots are becoming less expensive to implement and manufacturing leaders can use them to improve efficiency in a variety of ways. Not only can they minimize lead times, but automated production robots can be a huge factor in whether or not you meet any tight production deadlines.

### Greater Customization

The 21st century has brought about an increased demand for customized projects. Budding entrepreneurs, up-and-coming millennials and even established companies seem to be full of new ideas and innovations as of late. With so many opportunities to get involved and so much potential to tap into, manufacturers would be doing themselves — as well as their customers — a disservice by ignoring smart manufacturing and industrial robotics.

Frank Piller, co-founder of the MIT Smart Customization Group, explained how manufacturing leaders can use this next-gen technology to better meet the needs of individual customers. He cites the IIoT and its capacity for real-time data collection as well as the lower costs and increased availability of raw materials as the driving factors behind manufacturers' increased focus on the consumer.

Despite growing popularity, only 10% of potential manufacturers are currently utilizing industrial robotics in their own operations. This is due to several reasons, including the lack of any standardized performance or usability benchmarks. Such information will likely become available as more manufacturers embrace the new technology.

### Reaching Beyond the Limits of Traditional Manufacturing

There are a plethora of brand-new horizons waiting for those who are willing to take a chance on the emergence of the IIoT and smart manufacturing. By connecting manufacturing leaders with end-users, implementing machines that are able to maintain themselves and teaching current employees how to work with the new line of industrial robotics, proactive and tech-savvy manufacturers are in a position to revolutionize the way they do business from this point forward.

# Industry 4.0 as a service for Digital Manufacturing


**Industry 4.0** is the fourth industrial revolution after the earlier waves which were mechanization with steam, mass production with electricity and automation through computers. It is also referred to as '**smart manufacturing'** and **'connected factory'**. Industry 4.0 has received a lot of attention recently beyond the CIO's office. CXOs, political and business leaders are aware of it, due to the business benefits it promises to deliver.

The four broad tenets of Industry 4.0 are:

**1. Interoperability** of connected equipment. People, products and processes to talk to each other, enabled by Internet of Things

**2. Informed decision making** with the data gathered, and leveraging analytics

**3. Autonomous decision making** at the edge, with preset rules and sensors

**4.** A **digital twin** or a virtual copy of the physical world. The 'digital twin' for the entire manufacturing facility can be modelled and its day-to-day operations simulated to provide what we call **Industry 4.0-as-a-service**.

The above concepts by themselves are not entirely new but each system has its own siloed communication protocol and language for operation and communication. Emerging technology waves such as the Industrial Internet of Things and Industry 4.0 are promoting the element of **interoperability with global standards** and enabling individual components to seamlessly talk to each other.

Consortiums have been formed among industry players and solution providers to promote such standards. These technologies are becoming affordable with the availability of skilled resources and receding prices of computing elements such as hardware and software, especially with XaaS type of deployment models.

The flow of information becomes the common thread, providing cross-functional visibility across the enterprise from the shop floor to the top management. This enables real-time rational fact based decision-making.

If the life cycle of a product can be split into three broad elements as shown below, industry 4.0-as-a-service covers the "**product realization**" phase where physical products are manufactured on the shop floor and assembled. The list of activities shown is not exhaustive and can vary from industry to industry. It depends on a specific firm's internal processes. Commercially available software is used for these activities, resulting in minimal coding – with some configuration and customization based on the need.

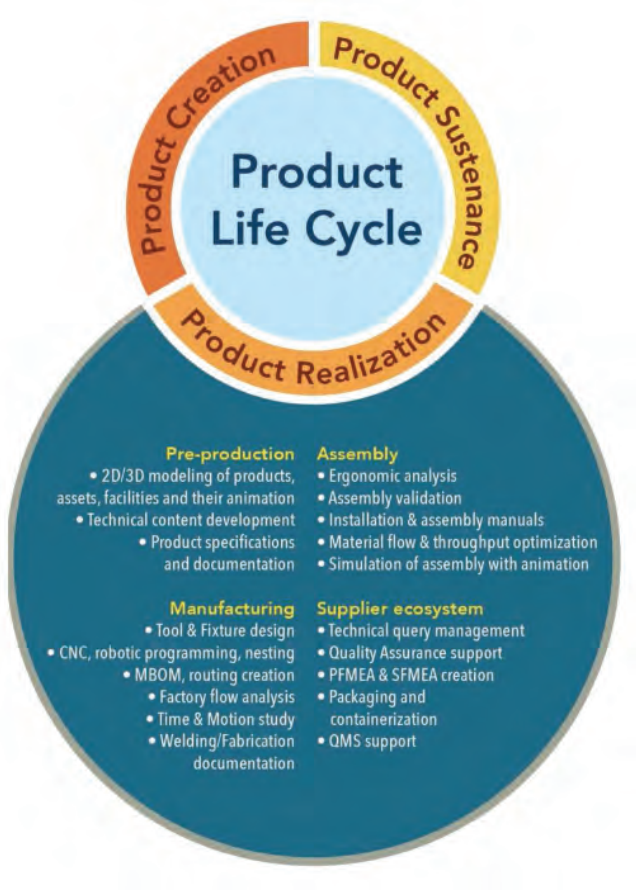
**Product creation** is usually handled by the engineering department for new product introduction and enhancements to existing products. **Product sustenance** covers the aftermarket phase from shipment to performance, maintenance, warranty management and end-of-life.

We have been offering Industry 4.0-as-a-service for a key client. Multiple factories are supported by a central team for

pre-production, planning and digitized execution of machining, assembly, tool design, fabrication and welding operations. The scope of work covers 30 niche sub-competencies. It is driven by metric based execution, achieving economies of scale for cost efficiencies, performing standardized, repeatable work packages and achieving 15% year-over-year productivity.

There are many benefits that can come out Industry 4.0 and its implementation. Developing countries, especially the SME sector, can leapfrog earlier waves of technology that were missed - such as robots and automation, which developed countries went through. The following are the highlights of Industry 4.0-as-a-service.

- **Optimized factories** - The layout of green field projects can be optimized for space utilization and material flow by depicting them virtually even before a brick is laid. Costly mistakes in long-term investment decisions can be avoided.
- **Productivity** – The flow of materials, personnel, tools and other material handling equipment can be virtually modelled for minimal movement. Routings of sub-assemblies and the finished products can be planned in advance. A what-if type of scenario analysis can be conducted to ensure a smooth operation. Bottlenecks in operations can be identified and improved for better material flow. Time and motion studies can be conducted for efficiency and cycle time reduction. Industry 4.0-as-a-service implementation can lead to a 15 to 25% improvement in productivity depending on the implementation.
- **Cost savings** – Usage of valuable resources from human effort to raw materials, energy, tools and consumables can be monitored and minimized for cost savings. A 15 to 25% in reduction in conversion cost can be achieved depending on the industry.
- **Quality assurance** – First-time-right metrics can be improved for new setups, tooling and operations by conducting a virtual dry-run before the actual operation.
- **Transparency and informed decision making** – Analytics based insights with visualization and real time status updates will lead to fact-based timely decisions. Audit-readiness and traceability will improve with historical operations information.
- **Employee health and safety** – Ergonomics or the human-machine interaction can be simulated removing hazardous situations. This can lead to a reduction of 90% in the number of near-misses and mishaps. Faster response times can be achieved during emergencies.




There are multiple challenges faced by organizations in implementing Industry 4.0. It is not one single technology. It consists of multiple areas such as automation, control systems, system simulation, analytics etc. There are subject matter experts available in these individual areas but what is vital is the expertise to look at the big picture, stitch the individual components together and implement a comprehensive solution that achieves the business objective. While some organizations have implemented pilots, scaling up across their network of factories is a challenge.

Given the complexity of implementation, especially with multiple diverse hardware and software components involved, finding the right partner(s) for design and implementation is also a challenge. A system integrator can play the role of an overall coordinator for Industry 4.0 design, roadmaps, blueprints, implementation and its ongoing management.

*- By S Ramachandran, Principal Consultant - Manufacturing, Infosys BPO*

*Source : http://www.forbesindia.com*

# Industry 4.0 is more than just a flashy catchphrase. A confluence of trends and technologies promises to reshape the way things are made.

**Mention "Industry 4.0"** to most manufacturing executives and you will raise eyebrows. If they've heard of it, they are likely confused about what it is. If they haven't heard of it, they're likely to be skeptical of what they see as yet another piece of marketing hype, an empty catchphrase. And yet a closer look at what's behind Industry 4.0 reveals some powerful emerging currents with strong potential to change the way factories work. It may be too much to say that it is another industrial revolution. But call it whatever you like; the fact is, Industry 4.0 is gathering force, and executives should carefully monitor the coming changes and develop strategies to take advantage of the new opportunities.

## Coming to terms

Start with some definitions. We define Industry 4.0 as the next phase in the digitization of the manufacturing sector, driven by four disruptions: the astonishing rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human-machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world, such as advanced robotics and 3-D printing. (The four trends are not the reason for the "4.0," however. Rather, this is the fourth major upheaval in modern manufacturing, following the lean revolution of the 1970s, the outsourcing phenomenon of the 1990s, and the automation that took off in the 2000s.)

Most of these digital technologies have been brewing for some time. Some are not yet ready for application at scale. But many are now at a point where their greater reliability and lower cost are starting to make sense for industrial applications. However, companies are not consistently aware of the emerging technologies. We surveyed 300 manufacturing leaders in January 2015; only 48 percent of manufacturers consider themselves ready for Industry 4.0. Seventy-eight percent of suppliers say they are prepared.

**Consider an example of each disruptive trend:**

- **Big data.** An African gold mine found ways to capture more data from its sensors. New data showed some unsuspected fluctuations in oxygen levels during leaching, a key process. Fixing this increased yield by 3.7 percent, worth up to $20 million annually.
- **Advanced analytics.** Stronger analysis can dramatically improve product development. One automaker uses data from its online configurator together with purchasing data to identify options that customers are willing to pay a premium for. With this knowledge, it reduced the options on one model to just 13,000—three orders of magnitude fewer than its competitor, which offered 27,000,000. Development time and production costs fell dramatically; most companies can improve gross margin by 30 percent within 24 months.
- **Human-machine interfaces.** Logistics company Knapp AG developed a picking technology using augmented reality. Pickers wear a headset that presents vital information on a see-through display, helping them locate items more quickly and precisely. And with both hands free, they can build stronger and more efficient pallets, with fragile items safeguarded. An integrated camera captures serial and lot ID numbers for real-time stock tracking. Error rates are down by 40 percent, among many other benefits.
- **Digital-to-physical transfer.** Local Motors builds cars almost entirely through 3-D printing, with a design crowdsourced from an online community. It can build a new model from scratch in a year, far less than the industry average of six. Vauxhall and GM, among others, still bend a lot of metal, but also use 3-D printing and rapid prototyping to minimize their time to market.

These changes and many others like them are sure to be far reaching, affecting every corner of the factory and the supply chain. The pace of change, however, will likely be slower than what we've seen in the consumer sector, where equipment is changed frequently. The coming of steam power and the rise of robotics resulted in the outright replacement of 80 to 90 percent of industrial equipment. In coming years, we don't expect anything like that kind of capital investment. Still, the executives surveyed estimate that 40 to 50 percent of today's

machines will need upgrading or replacement.

## Lightning in a bottle

To capture the potential, manufacturers can consider three moves. Primarily, companies can gather more information and make better use of it. An oil-exploration company collected more than 30,000 pieces of data from each of its drilling rigs—yet 99 percent of that data was lost due to problems of data transmission, storage, and architecture. The tiny trickle of data it did capture was incredibly useful for managers. But so much more can be done. The executives we surveyed said that correcting these data inefficiencies should improve productivity by about 25 percent.

With production data now available for the asking, executives rightly wonder about how to begin. Which data would be most beneficial? Which data leakages are causing the most pain? Which technologies would deliver the biggest return on investment for a company, given its unique circumstances? To sort through the choices, manufacturing leaders can use a "digital compass" (exhibit). The compass consists of eight basic value drivers and 26 practical Industry 4.0 levers. Cross-functional discussions that will help companies find the levers that are best suited to solve their particular problems.

One kind of lost value that is sure to interest manufacturers is process effectiveness. Industry 4.0 offers new tools for smarter energy consumption, greater information storage in products and pallets (so-called intelligent lots), and real-time yield optimization. Swiss giant ABB used the latter in an Australian cement kiln. A computer-based system mimics the actions of an "ideal" operator, using real-time metrics to adjust kiln feed, fuel flow, and fan-damper position. The company found that the new tools boosted throughput by up to 5 percent.


## The bigger picture

Strategists should also take Industry 4.0 into account as they contemplate the company's future directions—the second way to capture the potential. The traditional manufacturing business model is changing, and new models are emerging; incumbents must be quick to recognize and react to these new competitive challenges.

More specifically, executives must consider the following options—and watch for others that may be deploying them. Eighty-four percent of the manufacturing suppliers we surveyed expect new competitors to enter the market soon.

- "Platforms," in which products, services, and information can be exchanged via predefined streams. Think open-source software applied to the manufacturing context. For example, a company might provide technology to connect multiple parties and coordinate their interactions. SLM Solutions, a 3-D-printer manufacturer, and Atos, an IT services company, are currently running a pilot project to develop such a marketplace. Customers can submit their orders to a virtual broker platform run by Atos. Orders are then allocated to SLM's decentralized network of production sites, and subsequently produced and shipped to the customer. Some companies are also trying to build an "ecosystem" of their own, as Nvidia has in its graphics-processor business. It provides software developers with resources, and offers start-ups help to build companies around Nvidia technologies.
- Pay-by-use and subscription-based services, turning machinery from capex to opex for manufacturers. Rolls-Royce pioneered this approach in its jet-engine business; other manufacturers have followed suit.
- Businesses that license intellectual property. Today, many manufacturing companies have deep expertise in their products and processes, but lack the expertise to generate value from their data. SAP offers consulting services that build on its software. Qualcomm makes more than half of its profits from intellectual-property royalties. Manufacturers might offer consulting services or other businesses that monetize the value of their expertise.
- Businesses that monetize data. The SCiO, a Kickstarter project, is a low-cost, pocket-sized spectrometer that uses near-infrared technology to assess the composition of materials.

It is expected to cost $250, whereas traditional machines cost upward of $10,000. Every time a SCiO is used, it contributes to a large database of scanned materials, helping to make the machine more accurate. To be sure, it is a consumer product, and not yet ready for industrial use. But industrial models are on the way. Kaggle, a distributed network of about 270,000 data scientists, has already helped more than 20 Fortune 500 companies solve their toughest data problems.

To get the most out of Industry 4.0 technologies, and to get past square one with a digital business model, companies will have to take a third step: prepare for a digital transformation. Manufacturers should begin today to join the hunt for the best digital talent, and think about how to structure their digital organization. Data management and cybersecurity will be critical problems to solve. Many companies will find that a "two speed" data architecture can help them deploy new technologies at the speed required, while also preserving mission-critical applications.

**About the author(s)**

Cornelius Baur is a director in McKinsey's Munich office, where Dominik Wee is a partner.

INDUSTRY 4.0

# Twenty Two Motors Raises $1.6M in Funding, to Make Affordable Electric Scooters

Gurgaon-based electric vehicle (EV) startup Twenty Two Motors announced on Friday that it had raised $1.6 million in pre-Series A funding. This round was led by Ishwar Singh, CEO, Haryana Industries, and saw participation from Farhaan Shabbir, former director of Harley-Davidson

Parveen Kharb and Vijay Chandrawat

**Story so far**

Twenty Two Motors was incorporated in August 2016 by Parveen Kharb and Vijay Chandrawat with the aim of making EV technology affordable for the current generation. Farhaan was also a founding member of Twenty Two Motors and is currently part of their 15-member team.

Parveen and Vijay were inspired by Tesla's success in the USA and the technological challenges involved and hence decided to enter this sector, taking up the uphill task of indigenous development of EV technology in India. They believe that the current EVs available in India, and most of the new ones, are not progressing fast enough and are also not affordable.

They forged a partnership based on their complementary skills and technology expertise. Parveen is an automation engineer and automobile insider having 15 years of entrepreneurial experience in the sector. He started and is successfully running his two other ventures, JMX works and QCD engineering. Vijay, on the other hand, is a computer science graduate from IIT Delhi and has around 14 years' work experience in the technology, strategy, and operations domain.

Twenty Two Motors claims to have successfully developed its core technology platform consisting of a lithium-ion battery pack, battery management system (BMS), and smart electronics. Parveen, CEO, Twenty Two Motors,

noted in the release that since their launch in 2016, they have made a lot of progress in prototyping and developing EV capabilities.

### Building for India and future plans

The startup noted that their lithium-ion battery pack and BMS have been developed taking into consideration the Indian temperature profile, thus optimising performance and battery life. The smart scooter will be fully IoT-compliant, with devices like GPS, GPRS, gyroscope, and accelerometer making it virtually theft-proof. The expected top speed and range on a single charge is 60km to 100km depending on the driving speed.

Data from these IoT devices will be decoded by servers, using data mining and artificial intelligence techniques to determine users' ride behaviour. End users will also be connected to the scooter via the mobile app, which will be able to control scooter access remotely. Scooter information is available on the cloud and hence all the troubleshooting and other services can be managed automatically.

Twenty Two Motors aims to deliver its smart scooters to the masses in Q1, 2018. Talking about their retail and go-to-market strategy, Vijay noted that they aim to invest in their own showrooms and hire people to cater to customers, similar to what Tesla does for its EVs.

Vijay also said that the while electric scooters can be recharged at recharging stations, they feel the Indian market would prefer to swap batteries and hence they aim to offer that service at their showrooms. Apart from that, he believes EVs are generally low maintenance compared to their fuel-guzzling counterparts.

### Sector overview

There is global and local interest in adopting EV technology to reduce the dependence on fossil fuels. In India, many legacy players and new-age startups are looking to get into this space and make EVs mainstream. Priced at Rs 4.79 lakh, Mahindra E20 is noted to be India's first EV. Others in the space include Hero RNT Diesel Hybrid Scooter, Hero Splendor iSmart, Hero Leap, Mahindra GenZe, TVS Qube, and Hyosung ST-E3 EVA.

On the startup front, we have Ather Energy, which counts Flipkart, Tiger Global, and more recently, Hero MotoCorp as investors, Coimbatore-based Ampere Electric, Gujarat-based Yo Bykes, and Tork Motorcycles (backed by Ola co-founders and others), in the space.

---

# KUKA and INFOSYS Announce Industry 4.0 Partnership

KUKA Aktiengesellschaft, one of the world's leading automation companies, and Infosys (NYSE: INFY), a global leader in consulting, technology, outsourcing and next-generation services, today announced plans to jointly develop solutions to support companies embracing Industry 4.0.

The aim of the collaboration is the development of a software platform that will allow customers to collect, evaluate and utilize data for improving their own processes. KUKA will work to extend the connection of machines with the Cloud by establishing an Industry 4.0 Cloud Platform. These software and services will be developed by a newly established subsidiary of KUKA, connyun.

"We want to offer our customers access to a wide ecosystem of partners. We are inviting partners and start-ups to offer their services on our platform. With our own solutions and the expanded range of partner solutions, we can offer customers a wide breadth of production and logistics processes optimization," explains Dr. Christian Schlögel, CTO of KUKA and CEO of connyun. "Infosys is an ideal partner in this endeavor. Their extensive and global technology experience will greatly accelerate the process of platform development."

"With this cooperation, we will extend the spectrum of Industry 4.0 significantly," commented Gordon Muehl, Vice President Industry 4.0 at Infosys. "Robots play a key role in realizing the benefits of Industry 4.0. As a leader in robotics and a pioneer in Industry 4.0, KUKA brings invaluable expertise to this partnership."

The name connyun is comprised from the English word 'connect' and 'yun', the Chinese term for cloud.

### About Infosys Ltd

Infosys is a global leader in consulting, technology, outsourcing and next-generation services. We enable clients, in more than 50 countries, to stay a step ahead of emerging business trends and outperform the competition. We help them transform and thrive in a changing world by co-creating breakthrough solutions that combine strategic insights and execution excellence.

# Accenture Launches Industrial IoT Innovation Center

In its new Industrial IoT (IIoT) Innovation Center in Garching near Munich, Germany, Accenture (NYSE:ACN) is helping clients explore ways to reach new levels of efficiency and agility, unlock new sources of growth, and deliver personalized experiences through smart, connected digital technologies.

The Innovation Center, which has been set-up as an industrial "shop floor," helps enable clients to design and prototype innovative digital solutions for their businesses and customers. It offers an Industrial Design Thinking capability for innovation workshops, a Connected Products Studio for rapid prototyping, and draws on an industrial ecosystem that connects clients with key technology partners, start-ups and academia.

"Many of our clients have begun to take steps to digitize their businesses – be that from experiment to pilot, or from pilot to rollout. But many are missing some of the capabilities required to rapidly explore and scale the solutions they want to use," said Eric Schaeffer, senior managing director, head of Accenture's Industrial practice, and author of Industry X.0 – Realizing Digital Value in Industrial Sectors.

The Garching center includes a large workshop and IIoT experience area with a range of real-life IIoT demos and applications. The area gives clients a hands-on experience of how new automation and IIoT solutions might improve their innovation, engineering, manufacturing and after sales strategies and operations. The key themes, technologies and best practices clients can explore include:

- Invention and Innovation: ideating and prototyping new products, services, solutions and business models using customer insight driven approaches and design thinking
- "Industrial Consumerism": digitizing the industrial customer experience in business-to-business environments, future-proofing the industrial marketing and sales organization
- Human-Machine-Interaction: Leveraging IIoT, cloud and, mobile with AI and augmented or virtual reality for safer, more productive human-machine interactions
- Platforms and Services: leveraging and building IIoT-enabled platforms and services for new efficiency and growth, enabling "Manufacturing in the New"
- Smart Products: embedding software and connectivity in industrial products, applying analytics and machine learning, as well as other IIoT-technologies to enhance product value
- Engineering, Manufacturing and Production: enabling digital engineering, industrial product development, manufacturing and heavy process operations, using intelligent automation, robotics, and integrated shop-floor (e.g. PLM, ALM, MES/MOM) and enterprise (e.g. CRM) systems
- Cyber Security: securing and validating end-to-end industrial networks participating in IIoT

"We built this Innovation Center here because Germany is at the forefront of industry digitization and automation, and Garching is close to many of Germany's leading businesses in automotive, industrial equipment, chemicals and other industries, as well as research centers and universities that are working on IIoT and Industry 4.0," said Frank Riemensperger, senior managing director and country managing director for Germany at Accenture.

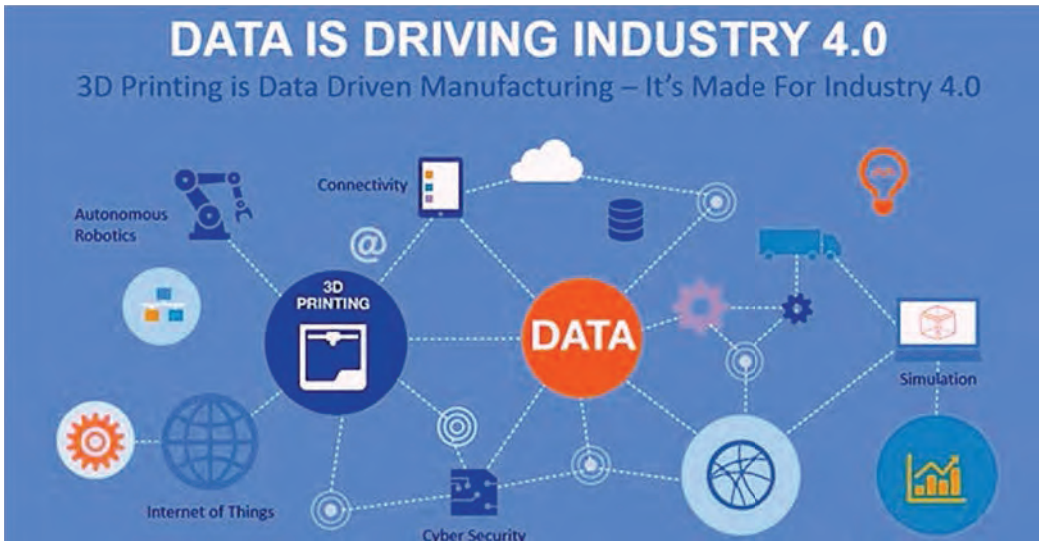
Industrial clients that begin their innovation journey at the Garching IIoT Innovation Center can also leverage the wider, Industry X.0 Global Innovation Network including Budapest, Hungary, for industrial automation; Clermont Ferrand, France, for digital asset management; Cluj, Romania, for industrial software; Modena, Italy, for Digital Manufacturing; and in the United States, Houston for energy, chemicals and other process industries and San Jose for Accenture's Industry X.0 research program.

The center is also building specific capabilities to co-innovate and co-develop with SAP new industry-specific digital solutions based on the SAP® Leonardo portfolio. Accenture is applying its Industry X.0 approach and IIoT expertise to develop use cases based on real-world client requirements in areas including:

- End-to-End Manufacturing: Uses IIoT to allow manufacturing assets to collaborate as a connected ecosystem by creating a virtual model known as a Digital Twin, helping enable real-time views of plant performance.
- End-to-End Food & Beverage: Leverages IIoT and advanced analytics to help enable end-to-end tracking of all ingredients and monitoring of machinery status across the production value chain.

Clients visiting the center can also take advantage of Accenture's other alliance relationships and joint offerings with leading vendors like AWS, Dassault Systèmes, GE, Microsoft, PTC, Schneider Electric, Siemens, and edge analytics start-up Lone Star Analysis along with others. All of these offerings are designed to help clients achieve better results and generate more value through their analytics, IIoT, and software investments in Accenture alliance partner technologies.

# 3D PRINTING -
## A key actor for realising industry 4.0




Ever since the Industrial Revolution, the face of machines, trade, technology and production has changed and evolved drastically. In the beginning, there were steam powered machines, then came electrically run mass production assembly lines which were followed by computer automated machines. Once again there has been a transformation with Industry 4.0, which has taken industries from the present hybrid state to a true digital enterprise. This has opened two thoughts, what is the present state? And what is a true digital enterprise?

When computers first came into existence, the design industry got a big lift with manual engineering drawing drafts being automated to get CAD (Computer Aided Drafting). Powered by Moor's Law, which predicted the growth of the technological revolution, it has brought many reforms in the manufacturing process to include CADD (Computer Aided Designing and Drafting) and CAE (Computer Aided Engineering). We then saw CIM (Computer Integrated Manufacturing) enterprises, which had their technical drawings converted into solid models. This was done using parametric software with the power to design involving material properties, volume properties and simulation which came to be called digitally mature industrial enterprise.

When Manufacturing Post MRP I (material requirements planning) and MRP II and MRP III (manufacturing resource planning), the industry embraced Enterprise Resource Planning (ERP) systems to optimise resources to maximise efficacies and profit by including Customer Relationship Management (CRM) and Finance. ERP stopped at Source Code Management (SCM) and CRM never included design data beyond BOM (Bill of Materials).

With no Design – Bill of Materials (BOM) - Source Code Management (SCM) integration, the Enterprise Resource Planning (ERP) was not able to deliver the real value to the enterprise. This gap was filled by the PLM (Product Life Cycle) platforms which heralded the road to hybrid digital industrial enterprises. Computer power further developed beyond Moor's law and we came to realise the exponential power it has along with economic viability. This sensing became the main stream for data gathering and is pushing the potential to go beyond optimisation to analytics driven agile manufacturing. This has brought new optimism in every industry that loved or hated ERP! This is the power of BIG Data analytics which opens a Pandora's box of possibilities into system optimisation. This can only be better with rapid communications across a 5G network. This state of an agile super optimum enterprise is called the true Digital Enterprise.
A true digital enterprise will deliver value through physical products or services at the core, through a network of customers and suppliers augmented by digital interfaces and data driven industrial digital ecosystems. These developments will profoundly change individual enterprise, as well as transform market dynamics across the globe. This is the transformation state of art is Industry 4.0.

The seeds of Industry 4.0 took shape with the emergence of the Cyber-Physical Systems (CPS) concept. Cyber-Physical Systems or "smart" systems are co-engineered interacting networks of seamless integration of physical and computational components. PSs are systems that link the physical world through sensors, actuators, robots and 3D Printers with the virtual world of information such as Data Servers, Cloud and Expert systems. We know how the transformation of digital Bits into Atoms happens with 3D Printing. If this digital data is driven by the customers on demand over a network, we are talking of a Cyber Physical System in action! Each standalone system or device are searchable, identifiable &

controllable through its native Internet of Things (IOT) module. The IOT is the controlling capability over systems and devices with the use of sensors coupled with intelligent microcomputers.

In the Industry 4.0 space,3D printers will help us materialise the products and form the output end of Cyber Physical Systems. Further, industrial 3D printing will be augmented by Robots and AI will produce anything on demand over the internet network. The Hybrid In-situ 3D printing systems will make costly transportation unnecessary.
The adoption of Industry 4.0 is indeed a major deportation from traditional manufacturing culture. It not only needs new systems and new set of skills but also a new mind-set, to create a new culture to drive Industry 4.0

Since the dawn of civilisation humans have been using tools to augment their limited power at hand. Today while our senses are replaced by sensors, output, the hand work is done by a 3D printer! The hands got extended and not just by meters, continents but beyond the astronomical units! It is a wonderful time to be alive to see such digital transformation in action and enjoy the comforts it can offer.

Read more at:
http://economictimes.indiatimes.com/articleshow/59755726.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

# Correct Breathing and Holistic Balance is all you need for a Beautiful Mind

The term psycho-neuro-immunology has been coined by American neuro-scientists who have recently made huge breakthroughs in identifying that there are actual chemical links between our psychology (the way we think), the Autonomic Nervous System and the Endocrine glands which govern our immunity. Though new to western thinking, this knowledge has been the foundation of Vedanta and Ayurvedic philosophy for centuries. This philosophy understands that all the internal activities of the body and mind are connected and therefore the importance of acknowledging the whole person is essential in order to achieve optimum health, happiness and wellbeing. The nature of your thoughts carry a certain vibration which in turn stimulates the release of specific neuro-chemicals and hormones that influence the way we actually feel. Happy and contented thoughts will relax the central nervous system which then creates harmonious vibrations of well-being.

These vibrations stimulate the body to manufacture essential hormones which are released directly into the bloodstream through the ductless glands of the endocrine system. As these 'happy' hormones such as serotonin and endorphins flow throughout your body benefitting all the organs and muscles these hormones contain the ingredients that alter our chemistry sending messages of well-being to the body, mind and emotions. These calming thought processes alkaline the body through the release of these specific neuro-chemicals. The cycle comes full circle and rejuvenates the system in a fundamental way. This whole process serves to regenerate your blood cells thereby boosting the immune system and improving your overall health.

Likewise negative unhappy or stressful thinking aggravates the body by causing tensions that create corrosive acidic neuro-chemicals that degenerate the bodies tissue and block the healthy circulation of fluids and oxygen to the nervous system and brain. If left unchecked and allowed to continue over a long time these degenerating toxic elements will weaken the immune system and may cause hardening of the tissue and arteries causing heart disease, tumours and other malignant imbalances.

One of the most influential tools we have in our natural human tool box is the breath. It is free, always available to you and can become your friend and ally. The chemistry of deep breathing also has a powerfully alkaline effect and can immediately alter our mood via the burst of oxygen to the brain. In today's demanding work and city environments it is a tool we should all know how to use skillfully.

As we are rarely taught how to breathe correctly, unhealthy breathing habits are common. Most people tend to breathe only into the upper lung which not only puts pressure on the heart, but weakens the full functioning of the lungs, reducing the energy supply to the rest of the body. The whole physical system is short changed by shallow breathing which greatly impairs the vitality and energy within the body and mind creating many common psycho-somatic problems such as asthma, high blood pressure , heart disease, headaches, anxiety, insomnia, nervous tension and depression. Many people inhale and exhale through the mouth, instead of the nostrils. This poor quality of breathing bypasses the physiological inner structure that has naturally evolved to nourish and balance your whole system.

The power of correct breathing directly accesses what is referred to as your `abdominal brain` or `hara` (energy centre). It is your center of gravity and is located behind the navel

and extends through the abdominal bowl. Here there is an intricate network of nerves and fibres that influence the management of the energy resources passing through this vital area and on a more subtle level is the second chakra `svaddisthana` (translated as `her special abode`). This center acts like a battery that stores and accumulates energy for future use, recharging your body and mind, balancing your emotions and sustaining you during times of stress. It is in effect your `creative center` or your 'happy center' that speaks to the rest of your body. Yet it can also become the storehouse or `waste ground` of undigested waste, tired misdirected energy and emotional tensions that can fester and block the healthy circulation of vital creativity.

This energy centre responds with powerful spontaneity to emotional stimuli throughout our lives. During times of stress or conflict this is often the first place to react, and symptoms of imbalance within the digestion and elimination are well known, such as irritable bowel syndrome or ulcers. Recently medical research has identified `abdominal migraines` which are common in children whose mental faculties are not as developed as most adults and their unhappiness blocks their emotional state causing 'tummy aches' and cramps in the belly. When breathing is habitually shallow, or a build up of tension has caused the abdominal muscles to tighten, the hara becomes depleted and will drain the vital energy resources.

A beautiful mind is maintained through the correct bio-chemical balance and breathing supports the circulation of all the elements needed to achieve this balance. The goal can be to find ways to alkaline our system through positive thinking, positive experiences and good breathing habits. Pranayama, breath awareness meditation, deep relaxation therapy, all these practices support a clear tranquil mind and therefore a happy and healthier body.

Read more at: http://economictimes.indiatimes.com/articleshow/59803886.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

---

INDUSTRY 4.0

# Yep. Your watch just got smarter. HBand: Turns your hand into a phone

HBand is a luxury leather watch strap with built-in Bluetooth Audio fob. It is a compact Bluetooth headset embedded in watch strap that provides phone call convenience in two ways.

- In Hands on mode, the user would flip open the fob and start taking the phone call by holding hand to ear. The audio is fired from bottom of the wrist to user's ear. An ideal solution for quick phone call
- In Headset mode, the user can remove the audio fob from watch strap, insert in ear and use the device like a normal Bluetooth headset

HBand makes Apple or any other smartwatch/ Classic watch complete by adding private call feature not provided in any watch today. With ultra slim removable audio fob on the high-quality leather band. Hband provides both private calls using your wrist and a BT headset docked in the band.

The watch strap is made of high quality Italian leather with quick snap magnetic buckle. The buckle also provides docking for the Bluetooth audio fob. Below are some of the watches that H-Band will work with.

**Lift your hand to ear to take phone call**

Answer the call without reaching for the phone. Flip open fob on wrist, raise your hand to ear and start talking. Your palm acts

as a parabolic reflector and directs the sound to your ear. This patented technology provides convenient call handling while on the move

**Bluetooth Headset on your Wrist**

Pull out the audio fob from the wrist band and use it like a Bluetooth headset for long calls. Your headset is always on your wrist providing both call and music audio functionality

**HBand Smart Features (Coming Soon)**

The smart fob can be used as a replacement for audio fob on the strap. The smart features are in addition to standard features.

- High resolution graphical OLED display
- High accuracy fitness and sleep tracker
- Notification with scrolling text
- Call Alert with option to mute and reject
- Time, Date, Weather and other information display
- Meeting and Alarm Alerts
- One week battery life
- Music control, Selfie and Call control Gestures
- Advanced gestures for presentation and other control

# SUSTAINABLE MOBILITY

## Bosch pursues the aim of sustainable mobility, which is low in harmful substances and does not rely on fossil fuels.

A growing number of people around the world own their own vehicles, especially in Asia and eastern Europe. Bosch is making a significant contribution to shaping developments in the area of personal mobility. In so doing, we strive to achieve low-carbon, sustainable mobility solutions that do not depend on fossil fuels. For instance, in cooperation with our customers, we are researching ways in which conventional and alternative drive technologies can be combined with one another, as well as possibilities for purely electric driving. At the same time, we continuously improve the internal combustion engine. Our aim is to reduce its fuel consumption by another 30 percent in the years to come.

### Fuel Savings

In the medium term, the number of newly registered vehicles with internal combustion engines will continue to increase around the world. For this reason, legislation to limit $CO_2$ emissions has been introduced in several regions. In Europe, for instance, the $CO_2$ emissions of an average passenger car will have to be reduced from 130 grams per kilometer today to 95 grams in 2020. The company has already developed many fuel-saving technologies.

**These include:**

**Gasoline direct injection:** As early as 1951, Bosch launched a technology for gasoline engines. The system sprays fuel at high pressures directly into the combustion chamber. This enables higher engine compression, which translates into greater efficiency. As a result, gasoline engines with direct injection can perform better and are more fuel-efficient. Combined with downsizing and turbocharging, gasoline direct injection contributes to a $CO_2$ reduction of up to 12 percent. Since the year 2000, an equivalent technology has also been available for diesel vehicles.

**Coasting function:** With the start/stop system, driving vehicles that operate with diesel or gasoline engines can be emissions-free, noiseless, and low-resistance over considerable distances. The engine is automatically turned off whenever the vehicle can maintain its speed while coasting. On average, coasting reduces fuel consumption by up to 10 percent.

**Predictive navigation:** The system connects map data with the vehicle's drive system. Using the preview of the road ahead, the engine management system can automatically determine how much power the powertrain needs and controls the internal combustion engine. This enables fuel savings of up to 15 percent.

### Electric Driving

Driving a car without producing $CO_2$, which is harmful for the climate, is the aim the gradual transition from conventional internal combustion engines to battery-operated electric cars. Bosch already offers important components to this end.

**Systems for hybrid vehicles:** With this type of system, the electric drive takes over for the internal combustion engine in fuel-intensive driving situations such as starting or accelerating. $CO_2$ savings compared with the internal combustion engine: up to 25 percent.

**Systems for plug-in hybrids:** These vehicles are equipped with an internal combustion engine and an electric motor. They can be operated either individually or simultaneously. The integrated lithium-ion battery is charged before the start of a trip, which gives vehicles a longer range than hybrids with

motor generators. $CO_2$ savings: 65 percent.

**Systems for electric vehicles:** For purely electric vehicles, Bosch offers electric motors and power electronics in addition to chargers, batteries, and regenerative braking systems. Electric vehicles are a milestone on the road to independence from fossil fuels, as they do not need any fuel and thus do not produce any $CO_2$.

The feasibility of the electric car depends mainly on three factors: a range that meets most drivers' everyday needs, an affordable battery price, and an adequate charging infrastructure. In all three areas, Bosch is cooperating with partners from industry and science to come up with promising solutions. Each year, the company spends some 400 million euros on its e-mobility research and development activities.

### Safe driving

Some 1.3 million people around the world die as a result of traffic accidents each year. This is why the United Nations has declared 2011-2020 the "Decade of Action for Road Safety". The aim is to cut the number of traffic-related deaths by half during this period.

Bosch has been working to improve road safety for decades. For instance, its ESP® electronic stability program went into series production in 1995. ESP® detects imminent skidding and automatically intervenes to keep the vehicle on its course. According to studies, the anti-skidding system prevents almost half of all serious accidents involving only one vehicle. For this reason, ESP® has been mandatory for all newly registered vehicles in Europe since November of 2014.

Modern driver assistance systems help detect and prevent critical situations at an early stage. For instance, the Bosch driver drowsiness detection system analyzes the driver's steering behavior and issues a warning if micro-sleep is imminent. By the same token, Bosch's predictive emergency braking detects forward collisions and helps with braking. In the future, driver assistance systems will be able to support drivers in increasingly complex traffic situations. They may even be able to act on their own.

---

# A French car company and a U.S. startup are traveling halfway around the world to launch a self-driving car.

Nutonomy, the self-driving car startup that span out of MIT in 2013, has inked a deal that will see it work with Peugeot-maker Groupe PSA to test autonomous vehicles in Singapore.

Nutonomy is more than familiar with Singapore: it has a relationship with local Uber rival Grab and the Singapore Economic Development Board was an investor in its recent $16 million fundraising. This new tie-in will see its autonomous vehicle tech, which includes software and sensors, integrated into a customized version of the Peugeot 3008. Trials will take place on public roads in Singapore from September, both companies confirmed.

The partners will start with two compact crossovers, but plan to deploy thousands of autonomous vehicles in the United States and Europe by 2020. They envision using the self-driving Peugeot in a ridesharing service.


The PSA Group partnership with nuTonomy could help speed the arrival of self-driving technology. The automaker was drawn to nuTonomy's expertise in handling challenging urban situations. nuTonomy has been giving Singapore residents rides in self-driving cars since last August, and its CEO Karl Iagnemma is a longtime player in autonomous vehicles.

This is not the first deal between a company specializing in self-driving software and an automaker. Waymo, the global leader in self-driving software, has a similar arrangement with Fiat Chrysler and recently announced plans to grow its fleet of self-driving Chrylser Pacificas to 600 vans.

Uber announced an agreement with Daimler in January, to operate its self-driving vehicles on the Uber network. The partnership between nuTonomy and PSA Group is not exclusive, leaving both sides open to work with additional companies. The teams are still determining how they'll share profits and data generated from the pilot service.

# PACE OF INNOVATION RINGS IN THE ERA OF INDUSTRY 4.0

## Companies must rethink their growth strategies if they are to stay in the game


The number of engineers trained in handling unstructured data and big data tools—crucial for the type and scale of data generated by connected systems—is gradually increasing, but still falls far short of anticipated future demand. Photo: iStock

Manufacturing companies are entering an era of profound change. The future is unfolding in an environment of evolving customer needs, digital connectivity and increasing complexity and risk. Exponential technologies and advances in materials are accelerating the pace of innovation.

This paradigm shift in manufacturing is creating new ecosystems which challenge companies to alter their traditional business model boundaries and rethink their strategies for growth.

There are many definitions of Industry 4.0 and interchangeable terms are currently being used, including smart manufacturing and Manufacturing 4.0.

Industry 4.0 is the integration of the Internet of Things (IoT) and relevant physical technologies, including additive manufacturing, robotics, high-performance computing, artificial intelligence and cognitive

technologies, advanced materials, and augmented reality, that complete the physical-to-digital-to-physical cycle.

within these imperatives, the business objectives around productivity, risk reduction, and new sources of revenue.

## Manufacturing in the Industry 4.0 era

**Key business objectives**

**Business operations**

| | |
|---|---|
| Productvity improvements | ● Maximizing asset utilization and minimizing downtime<br>● Driving direct and indirect labour efficiency<br>● Managing supply network costs and synchronization |
| Risk reduction | ● Ensuring schedule and plan stability and accuracy<br>● Ensuring raw material price and availability<br>● Managing warranty and recalls effectively<br>● Mitigating geographic risks |

**Business growth**

| | |
|---|---|
| Incremental revenue | ● Finding sources of growth for the core business<br>● Growing aftermarket revenue streams<br>● Deepening customer understanding and insights<br>● Strengthening customer integration and channels |
| New revenue | ● Creating new products and service offerings<br>● Expanding internationally and in emerging markets<br>● Indentifying attractive M&A opportunities |

Source: Deloitte analysis

**Ranking of future importance of advanced manufacturing technologies by CEOs**

| Advanced manufacturing technologies | US | China | Europe |
|---|---|---|---|
| Predictive analytics | 1 | 1 | 4 |
| Smart, connected products (IoT) | 2 | 7 | 2 |
| Advanced materials | 3 | 4 | 5 |
| Smart factories (IoT) | 4 | 2 | 1 |
| Digital design, simulation and integration | 5 | 5 | 3 |
| High performance computing | 6 | 3 | 7 |
| Advanced robotics | 7 | 8 | 6 |
| Additive manufacturing (3D printing) | 8 | 11 | 9 |
| Open-source design/direct customer input | 9 | 10 | 10 |
| Augmented reality (to imporve quality, training, expert knowledge) | 10 | 6 | 8 |
| Augmented reality (to increase customer service and experience) | 11 | 9 | 11 |

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2016 Global Manufacturing Competitiveness Index

Throughout the manufacturing value chain—from design and development to manufacture, sale, and service—business outcomes may emerge from the integration of information technology (IT) and operations technology (OT).

Firms typically have two business imperatives in mind—to improve business operations and to find avenues for growth—and

As companies implement Industry 4.0 practices, there are several challenges that have impact at both the organization-level and broader, ecosystem level. Of particular note here are the challenges related to talent and cyber security.

**Talent:** Digitalization is changing the workforce.

The workforce of the future will be increasingly mobile and people will not be bound by location due to greater use of technology to help people work smarter.

Expectations of employees are shifting towards greater collaboration, on-demand access to information, and engaging work environments.

Also, as companies integrate IT and OT via the use of Industry 4.0 practices, they often face a shortage of talent to plan, execute, and maintain new systems.

The number of engineers trained in handling unstructured data and big data tools—crucial for the type and scale of data generated by connected systems—is gradually increasing, but still falls far short of anticipated future demand. The challenge extends to the shop floor as well.

By collaborating with other companies, high schools, technical colleges, and universities, companies are addressing this talent challenge to develop a flow of talented workers versed in and attracted to advanced digital and physical manufacturing technologies.

**Cyber security:** Customer data privacy and ethical implications in the use of data are important considerations.

In order to manage potential threats and areas of vulnerabilities, firms need to secure their systems, be alert about new risks, and be resilient to limit the damage and restore operations.

As manufacturers extend IoT-enabled processes and systems beyond their own organizations to encompass other parties, information flows across multiple external devices and databases; it becomes a complex challenge to proactively manage as to who controls and protects this information.

### Expanding the possibilities

Rapid developments in technologies—such as additive manufacturing, robotics, artificial intelligence and other cognitive technologies, advanced materials, sensors, and augmented reality—are expanding the possibilities of manufacturing.

It is the development of these advanced technologies which is vital to global manufacturing competitiveness. According to the *2016 Global Manufacturing Competitiveness Index*report from Deloitte Touche Tohmatsu Ltd and the US Council on Competitiveness, predictive analytics, smart, connected products (IoT), and advanced materials are the top three most promising cited by CEOs in the United States.

In China, CEOs are prioritizing predictive analytics and smart factories, and seeking to create a competitive advantage through high performance computing. And in Europe, smart factories, smart, connected products, and digital design, simulation and integration rank as the top priorities for CEOs.

Companies are seeking growth opportunities in delivering services to their customers. Two examples include after-market

services where connected devices in machinery are used to monitor equipment performance and, through analytics, predict potential failures and engage in proactive repair and maintenance.

Also, more and more companies are identifying pay-by-usage or subscription-based models for their products.

**Emergence of new ecosystem**

New ecosystems are emerging, bringing together multiple players to create, scale, and serve markets in ways that are beyond the capacity of any single player or industry. Through their collective ability to learn, adapt, and, innovate together, these ecosystems have the potential to capture new value.

For new ecosystems to thrive, public policy and collaborative investments from government and business are vital.

Many countries continue to invest in building world-class advanced manufacturing capabilities to be more globally competitive.

For example, governments are providing regulations and incentives, and investing in infrastructure that foster advanced and sustainable manufacturing practices.

Yet, government investment alone is not enough. Increasingly, there is a growing level of private investments also needed to promote advanced manufacturing. Some examples include joint investments in talent development and training, and opening facilities that simulate advanced manufacturing at manufacturing sites.

The future is here with digitalization opening up exciting possibilities for businesses. These technologies have been evolving and will continue to evolve.

To be globally competitive, companies need to strategically think about how to get on board, and address both the challenges and opportunities presented. Success will be defined by the ability to integrate the IT with the OT.

A focus on the "digital" sans consideration for new capabilities needed in the "physical" world (and vice versa) will leave companies with only half of the solution: they need to account for both.

*Tim Hanley is the Deloitte Global Leader of the Consumer & Industrial Products Industry group, and Mark J. Cotteleer is a research director with Deloitte Services LP.*

*Source : http://www.livemint.com*

Tim HanleyMark J. Cotteleer

# INDUSTRY 4.0 SHOULD BE INDIA'S BATTLE CRY

India needs to swiftly but convincingly invest in the right infrastructure to adopt Industry 4.0 to be able to manufacture everything from a pen to an airplane at global quality standards

The Indian Space Research Organization (Isro) has successfully launched multiple space initiatives in recent times—including the country's heaviest rocket on 5 June and a record 104 satellites in a single mission on 15 February. Yes, we are so proud. These and other feats such as *Mangalyaan* (the Mars Orbiter Mission, or MOM) are proof points of India's fantastic engineering and technical talent and expertise.

But this also gets us thinking. Despite all these feats, Isro and India still wouldn't feature on the list of leaders and innovators in space missions. Reliable, yes. Commendable, yes. Inspirational, not yet.

Why? Because we didn't do it first. We never seem to—when it comes to actually making or building things. The Germans led the last Industrial Revolution—and are today the doyens of precision engineering along with the Swiss. The Chinese, too, are world leaders in other kinds of manufacturing.

That said, India is unarguably the back office of the world—a software economy, after an agricultural one. Information technology/ IT-enabled services is the biggest source of foreign exchange income for India and it is difficult to find a major consulting or software firm without a strong base in the country. But signs for IT have been flat for a few years now. With the uncertain international environment, pegging our continued hopes on foreign income from that quadrant would be a risky bet. Besides, if all that talent (Indian scientists and researchers are considered Silicon Valley's biggest assets) were to come back to the country, would we have enough jobs for those bright minds?

We need a new growth engine—a revival battle cry—now more than ever. My argument is that we should build on the success of our technical firepower and talent, and transition into a product economy from one relying solely on software. This means we need to make finished products. Every export and GDP (gross domestic product) statistic in the world points to the economic advantages of a country adept at making finished products.

Is this even possible? Yes, it is. First, because we are a country of 1.3 billion people which gives us immediate capitalistic motivation to produce end products and not just raw materials. Second, the efforts and liberalization in the past few years have allowed India to be considered Asia's Silicon Valley ahead of the manufacturing mecca, China. Third, courtesy the "Make in India" campaign, India is fast becoming one of the largest recipients of foreign direct investment: at an annual rate of $75 billion, India is perhaps poised to be the world's favourite manufacturing investment destination. I believe we have the opportunity to lead the world. The time is right, but we need one more thing.

**Need to embrace automation**

The world is at the cusp of the fourth Industrial Revolution—fondly called Industry 4.0—which envisages smart factories in which cyber-physical systems will monitor the physical processes of the factory and make decentralized decisions. The physical systems will become the Internet of Things, communicating and cooperating both with each other and with humans in real time via the wireless Web. Fact-based decision-making, peak productivity and clear understanding of commercial impacts are just a few of the central factors that will underline the concept.

Industry 4.0, in its very construct, envisages that both hardware and software will work hand in hand, stitched together seamlessly and powered by analytics. We are good at software and analytics. We know how to stitch up technology—thanks to our system integrators. With this "unfair advantage", we already have half the mission accomplished.

Besides, world-class manufacturing using advanced technology and robotics is not a virgin territory for us. The Indian automotive sector has caught the world's attention and has attracted many global brands to set up manufacturing units here. The automotive sector alone contributes more than 45% to the country's manufacturing GDP (and about 7.1% to India's GDP) and employs 19 million people.

Clearly, there is opportunity for India to move from a lethargic manufacturing outfit stuck somewhere between Industry 1.0 and 2.0 to Industry 4.0 and beyond.

The country is recognized as the breeding ground of some of the most sought-after technology start-ups and visionaries, developing solutions in the industrial automation space. We have the wherewithal to transition into a modern, connected industrial economy, curtailing the technology adoption life cycle.

Can India undergo this ambitious sea change? Yes, I believe so. India has the uncanny knack of surprising the world in terms of technology adoption. We leapfrogged generations in telephony—moving straight from fixed line to 2G/2.5G to 4G/LTE (long-term evolution). Today, besides being the biggest market for smartphones, we are also having serious discussions on the introduction of 5G, ahead of many other countries.

India needs to swiftly but convincingly invest in the right infrastructure to adopt Industry 4.0—the most tectonic shift in industrial production—to be able to manufacture everything from a pen to an airplane at global quality standards.

Akash Gupta

*Source : http://www.livemint.com*

Clearly, there is opportunity for India to move from a lethargic manufacturing outfit stuck somewhere between Industry 1.0 and 2.0 to Industry 4.0 and beyond. Photo: Bloomberg

## THE FAB FOUNDATION

FABFOUNDATION

The Fab Foundation was established on February 9, 2009 to facilitate and support the growth of the international Fab Lab network. The Fab Foundation is a US non-profit 501(c) 3 organization that emerged from MIT's Center for Bits & Atoms Fab Lab Program. Our mission is to provide access to the tools, the knowledge and the financial means to educate, innovate and invent using technology and digital fabrication to allow anyone to make (almost) anything, and thereby creating opportunities to improve lives and livelihoods around the world. Community organizations, educational institutions and non-profit concerns are our primary beneficiaries.

The Fab Foundation is steward for building the National Fab Lab Network, the subject of Bill H.R.1289 introduced in Congress in early 2013 to provide community access across the USA to advanced manufacturing tools for learning skills, developing inventions, creating businesses, and producing personalized products. Additionally, along with Fab Lab network partners, the Fab Foundation is guiding efforts globally to bring digital fabrication into education in both in- and out-of-school settings.

Fab Labs in more than 100 countries

A community of practice has grown around the Fab Lab concept. The Fab Foundation stewards this global network; supporting an international community of people who want to collaborate and share knowledge. There are more than 1100 Fab Labs in the world in more than 100 countries with more in development. The community meets once a year at a new Fab Lab in the world, to share best practices, form collaborations, learn about the state of the art of digital fabrication in manufacturing and research, and to make the personal connections that are so important to building the community.

Please see: www.fab10.org and www.fab11.org.

## THE FAB ACADEMY

The Fab Academy is a global, Fab network supported advanced technical education program providing training for new Fab Lab managers, teachers, entrepreneurs and lifelong learners. The Fab Academy provides instruction and supervises investigation of mechanisms, applications, and implications of digital fabrication.

Just as communications and computation went from analog to digital, resulting in PCs and the Internet, the digitization of fabrication is leading to personal fabricators that will allow anyone to make almost anything, anywhere. The development of digital fabrication is based on creating codes that don't just describe things, they are things, much as proteins are coded in molecular biology. This research roadmap is ultimately aiming at a Star Trek-style replicator, but prototype versions of these capabilities are already available in field Fab Labs.

The Fab Academy was launched to provide access to advanced instruction for students in these labs exceeding the educational resources locally available to them. It links groups of students and instructors in Fab Labs, with online video collaboration and lectures by a global faculty. Unlike remote instruction from a central campus, the digital fabrication tools in a Fab Lab effectively allow the campus to come to the student, for distributed rather than distance education.

Fab Academy is directed by Professor Neil Gershenfeld, run by the Fab Foundation and a global team. The course offering is modeled on the MIT course How To Make (Almost) Anything. Fab Academy faculty who are leaders in their respective fields provide global video lectures, supervise academic content, and guide research. Hands-on instruction in the labs is provided by instructors who supervise and evaluate Certificates, develop and disseminate instructional material, and assist with projects.

For more information, please see:
http://www.fabacademy.org

## MOBILE FAB LABS

In 2007 a group of MIT students got together and developed the first mobile Fab Lab 1.0. Their goal was to bring the excitement of making and the power of digital fabrication to anyone anywhere. In 2009 after several years of success with the stationary Fab Lab at MC$^2$ STEM High School in Cleveland, the STEM partnership sought and secured funding from the state of Ohio to build the first mobile Fab Lab outside of MIT. In partnership with Lorain County Community College and Max Hayes High School, mobile Fab Lab 2.0 was built. The goal of this mobile lab was to extend the kind of high quality hands on learning at MC$^2$ STEM High School to students in the rest of the district and surrounding communities.

Most recently Fab Foundation has partnered with a number of organizations to build mobile fab labs. The goal of these organizations is to reach a larger service area and take the benefits of a stationary lab to as many community members as possible.

Mobile Fab Labs are a growing portfolio with a dozen constructed and/or operating across the United States. Some as stand alone programs or key features to comprehensive programs for education, workforce and career. There are also a growing number being built and operated abroad in Turkey, Saudi Arabia, the Netherlands, and on the Amazon.

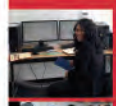
## FABED

As Fab Labs grew in popularity, innovators in education recognized the enormous potential that Fab Labs could bring to students in a school environment. As the technology of digital fabrication became more readily available, affordable and easy to use, the potential for Fab Labs in schools became a reality. But the original Labs as conceived weren't built to serve the distinct needs of a school district.

FabEd is a Fab Lab network collaboration, in partnership with the Teaching Institute for Excellence in STEM (TIES), to bring Fab Labs into formal educational settings. FabEd bridges the enormous potential of Fab Labs with the tactical and practical needs of schools and school districts by building relevant tools, resources and consultancies: STEM curriculum support, Professional Development, and aligned Fab activities and modules.

**For more information, please see:**
http://www.facebook.com/groups/179034145601887/
https://www.twitter.com/@InfoFabEd
http://www.tiesteach.org/projects/fab-lab

## FOLLOW-UP INFORMATION: FAB LABS



For general background on Fab Labs please see the following links, articles, publications and videos.
**Fab Labs are described here:** http://www.fabfoundation.org/fab-labs/what-is-a-fab-lab/

**PAPERS AND PUBLICATIONS**

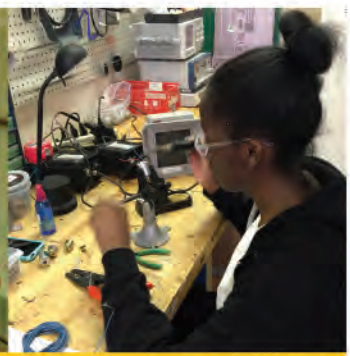
**Foreign Affairs:** http://cba.mit.edu/docs/papers/12.09.FA.pdf

**Walter-Herrmann, J. & Büching, C. (Eds.). (2013). FabLabs: Of Machines, Makers and Inventors. Bielefeld, Germany: Transcript Publishers.**

http://www.cleveland.com/science/index.ssf/2009/06/fabrication_labs_let_student_a.html
http://www.forbes.com/2008/08/13/diy-innovation-gershenfeld-tech-egang08-cx_ag_0813gershenfeld.html
http://money.cnn.com/magazines/fortune/fortune_archive/2006/11/13/8393124/index.htm
http://www.nature.com/nature/journal/v442/n7105/full/442862a.html
http://www.boston.com/news/globe/ideas/articles/2005/01/30/how_to_make_almost_anything/
http://www.usatoday.com/tech/news/techinnovations/2005-11-06-fab-lab_x.htm

**VIDEOS**

**Prof. Neil Gershenfeld's Fab Lab Ted Talk:** https://www.youtube.com/watch?v=5rA-APFrlXDs
**Prof. Gershenfeld talks about the digital revolution and Fab Labs on CNN:**
http://www.youtube.com/watch?v=TggiXmhmOmM
**Jens Dyvik, designer, TedX Talk:** http://www.youtube.com/watch?v=tYnCb-zCXxw
**Fab Lab Japan: What is a Fab Lab:** http://www.youtube.com/watch?v=iICtsrtGYe0
**Mahtomedi High School Fab Lab news feature: (starts at 6:25):**
https://www.youtube.com/watch?feature=player_embedded&v=khy4lWoYrgKk#t=400
**Student-made video on Fab Lab from Mahtomedi High School:** http://www.youtube.com/watch?v=Th2hyo9CGVc



## WHAT IS A FAB LAB?

Physically a Fab Lab is an advanced digital fabrication laboratory that consists of a suite of fabrication and rapid prototyping machines, including a large CNC Router, a 3D desktop mill and scanner, a vinyl cutter, a laser cutter, an electronics work bench, a 3D printer and the accompanying computers and software. Fab Labs across the world share the same base machines, tools and software such that collaborations can happen seamlessly across national and international borders. The impact of a Fab Lab, however, goes well beyond the machines it contains. Fab Labs allow people to explore the entire engineering design process in authentic and real world contexts by providing tools that enable people to go from concept to drawing and models to prototype to redesign to final product. Fab Labs provide the opportunity for people with little technological expertise to develop highly complex inventions using technology previously only available to engineers at large tech companies.

## FAB LABS BACKGROUND

The Fab Lab program is the educational outreach component for the Center for Bits and Atoms (CBA) at the Massachusetts Institute of Technology. While originally designed for communities as prototyping platforms for local entrepreneurship, Fab Labs are increasingly being adopted by schools and communities as platforms for project-based, hands-on STEM education. Users learn by designing and creating objects of personal interest or import.

Empowered by the experience of making something themselves, they both learn and mentor each other, gaining deep knowledge about the machines, the materials, the design process, and the engineering that goes into invention and innovation.

## FOR INFORMATION ON HOW TO GET YOUR OWN FAB LAB, PLEASE CONTACT US!


**THE FAB FOUNDATION**
50 Milk Street, 16th floor
Boston, MA 02109
**www.fabfoundation.org**
Tel +1-857-415-3989
info@fabfoundation.org

**Follow us:**
**Twitter:** @FabFndn
**Facebook:** @FabFoundation

**Sherry Lassiter,** *President and CEO*

**Luciano Betoldi,** *International Operations Director*

**Tomas Diez,** *European Program Manager*

**Pamela King,** *General Manager*

**Jean-Michel Molenaar,** *Senior Consultant for International Projects*

**Jean-Luc Pierite,** *International Procurement and Logistics Manager*

**Sonya Pryor-Jones,** *Chief Implementation Officer*

**Ashok Kumar Meda**
**Innovative Technology Services, Bengaluru, India**
sp.gmexim@gmail.com
Ph: +9180 95853054
www.innovativetechnologyservices.in


FABLAB

FABLAB

A GLOBAL NETWORK FOR **EDUCATION** AND **INVENTION**

**Guided by The Fab Foundation**

# Engineering Staff College of India

## Autonomous Organ of The Institution of Engineers (India)

**(ISO 9001 Certified, AICTE & CEA Recognized Institution)**

*Engineering Staff College of India (ESCI) is a unique Centre for Promotion of Quality Training and Professional Excellence in Engineering, Science, Technology & Management had completed more than three decades of its dedicated service to the Nation in imparting Continuing Professional Development Training, Consultancy Projects, Research & Academics in the following domains :*

## ESCI ACTIVITIES

**Centre for Climate Change :** Promote Principles & Practices of adaptation & mitigation through integrated multi disciplinary approaches, including management perspectives. Center offers tailor made training programs, promotes collaborative initiatives in the areas of action research and offers advisory / consultancy services. Initiating "Incubation Lab" to encourage young research scholars and aspiring entrepreneurs. Focus special attention on Mainstreaming Disaster Risk Reduction as an integral part of Development Planning.

**Civil & Transportation Engg. :** Areas include – Construction Project Management, Water Leakages & Structural Repairs & Rehabilitation Techniques, Road Transport Regulation & Administration, Crash Data Analysis and Investigation, Rural Road Technology for PMGSY Projects, Transportation, Road Safety, Traffic & Contract Managements. Arbitration and Dispute Resolutions etc. Our Clientele : MORTH, PR&RDA, Housing Boards, APTDC, ONGC, ISRO, NRRDA, NBCC, HPCL, Ramky Industries, SEW & Aparna Constructions, Indu Projects and Meenakshi Infrastructures etc.

**Environment Management :** Environmental Legislations, Environmental Impact Assessment, Monitoring and Modeling of Air & Water Pollution, Waste Management (Bio-medical, Solid Waste, e-waste etc. **Water Supply and Sanitation :** Service Level Benchmark-24*7,STPs, ETPs CETPs, EPANET & LOOPNET Software, SCADA & PLC Methods, Sewer CADD Software, Zero Discharge Compliance, DPR, Tender documents, Financial Planning, PPP Options, e-Governance, RS and GIS in Master Plan Preparation, Non-motorized Transport, SWACHH Surveykshan and Green Parks and Spaces.

**Information Technology :** offers training modules in diverse areas of IT Infrastructure Service (IT IS), Software Development & IT Applications, Cyber Security, Data Analytics & IoT. Network Administration, Wireless Technology, Cloud Services, Web Development using PHP, ASP.NET, HTML5 & CSS3, Mobile App Development (Android Studio/ IOS), Oracle 12C, SAP( BASIS, FICO, HR, MM). IT Applications like MS Project 2013, Oracle Primavera, Cyber Security, Information Security Management System ( ISMS) Lead Implementer (ISO 27001:2013) and Big Data Analytics.

**Management & Technology :** The division has core Competency on **Management**-Human Resources Development, General Management, Personality Development, Operations Management, Organizational Behaviour, Project Management, Materials Management and Financial Management etc. **Technology**-Drilling and Blasting, Mining, Welding, Corrosion, Vibrations, Supercritical, NDT, Condition Monitoring, Pumps, Heat Exchangers and Pulverisers, Tools, Instrumentation and Cutting Parameters etc.

**Power & Energy :** Trains in the areas of Generation, Transmission & Distribution. Power Systems Protection, Energy Audit, Smart Grids, Smart Meters, Digital Control Systems, Assest Management Regulatory subjects, Franchise Models, Power Trading, Power Exchanges & Merchant Power Plants. Design & Construction of 400 / 220 KV Substations, Earthing Practices, Reactive Power Management, Pilferage, Laying, Maintenance of Underground Cables, Failure of Transformers, , O & M Practices & Strategies for Power Plants & Process Industries.

**Quality & Productivity : System Related:** Lead Auditor Training on ISO 9001-QMS, 14001-EMS, 18001-OHSAS,ISO 50001-EnMS, ISO/IEC-17025 and Integrated Management System etc. **Function Related:** Training Needs Analysis, NBA/NAAC Accreditation, Total Quality in Purchase, TQ in Vigilance etc. **QM Tools Related :** Six Sigma Green & Black Belt, Mistake Proofing – Poka Yoke, Lean, Balance Scorecard, TPM, Bench Marking and Reliability & TQM. Consultancy Services are provided for facilitation to obtain accreditation / certification and implementation of ISO/NABL etc.

**Water Resources Development :** The areas of specialization include Irrigation and Water Supply & Sanitation sectors. Courses being offered in Flood Management, Dam Safety, Watershed Development, Project Management, Contract Management, RS, GIS & Total Station Applications, etc. customized programmes are also being conducted to Depts. of Irrigation, Water Resources, Rural Water Supply & Sanitation, PHED of various states which include Telangana, Andhra Pradesh, Jammu & Kashmir, Bihar, Uttar Pradesh etc.

**Design & Prototyping Cell :** is a **Technology Demonstration Centre** at ESCI. This facility promotes emerging technologies such as Additive Manufacturing, Automation & Robotronics, Internet of Things (Smart Technologies), Reverse Engineering to name a few. The Cell facilitates Industry-Research Lab-Academic Institute Interaction through various collaborations & partnerships.

**Faculty Development Cell :** Academic Faculty members from Higher Education i.e. from Universities, Engineering Colleges and Institutes get updated on latest technologies in their relevant area.

**Consultancy Projects :** ESCI provides Third Party Quality Control consultancy services to suit the requirements of clients in all Engineering disciplines. ESCI's group of thoroughbred consultants with proven expertise executes these assignments.


Contact : The Director, ESCI
Gachibowli, Hyderabad, Telangana – 500032
Ph : 040 – 66304100, 23000465,
Fax : 040 – 66304103, 23000336
E-mail : director@escihyd.org, ic@escihyd.org
Wesite : www.escihyd.org