FORSE

FOR PRIVATE CIRCULATION ONLY

SIMSR

MOMENTUM

K. J. SOMAIYA INSTITUTE OF MANAGEMENT STUDIES & RESEARCH

Volume X, December'19 POMS Edition

Supply Chain in the New Environment of Industry 4.0

OPS QUIZ

ARTICLES ON INDUSTRY 4.0

RECENT TRENDS

START UP STORIES

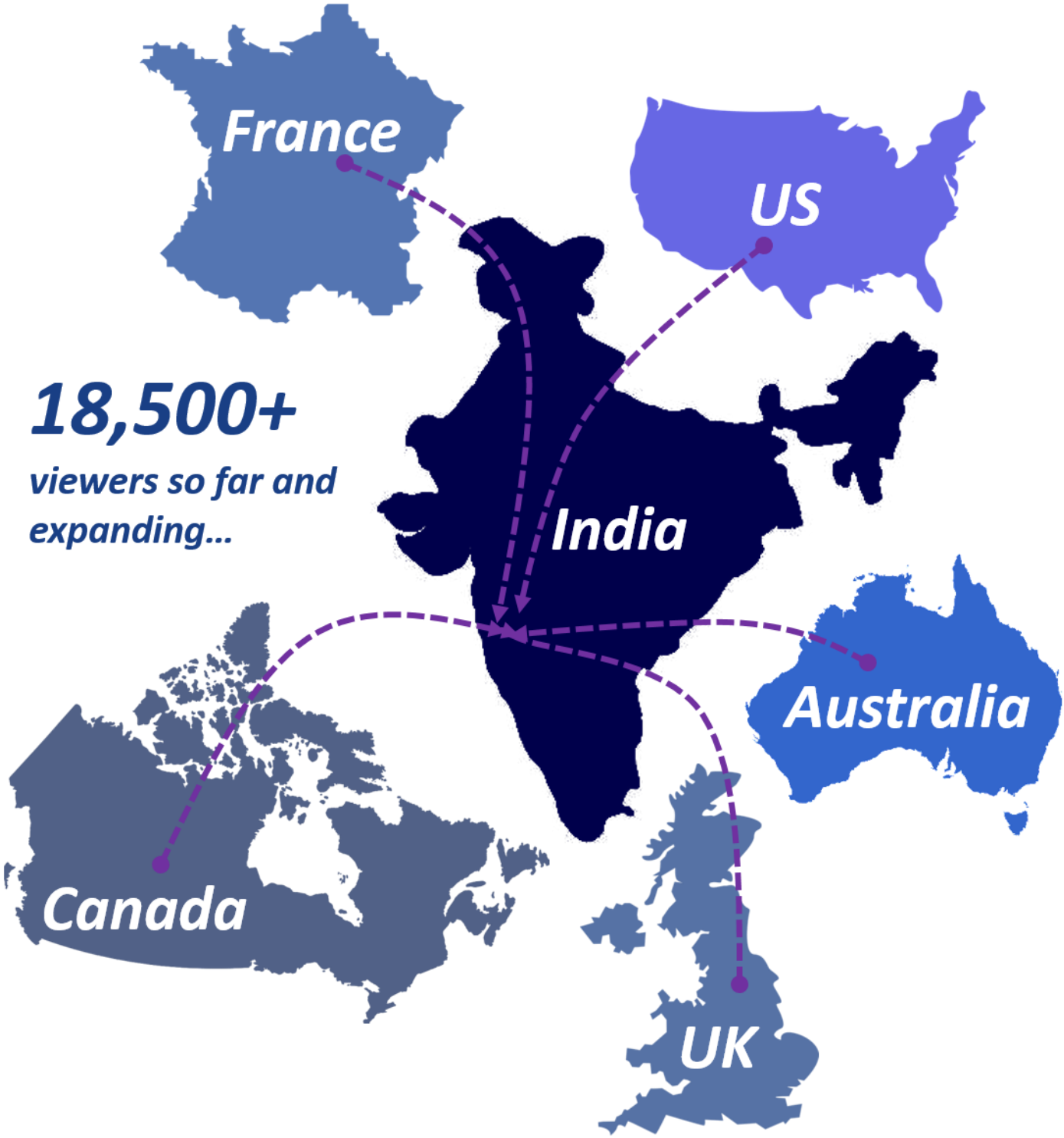
INTERNSHIP EXPERIENCE

BRAIN TEASERS

International Edition

Growing, Evolving and Expanding...

Presenting articles from all over the Globe



18,500+

viewers so far and expanding...

"SUCCESS IS ACHIEVED AND MAINTAINED BY THOSE WHO TRY AND KEEP TRYING."

- W. CLEMENT STONE

Chairperson's Note

With a view to aid practitioners and learners in the vast field of operations and interface areas, FORSE - the committee of enthusiasts has been making efforts to bring new and emerging concepts and topics for the readers. MOMENTUM is an outcome of these efforts.

I am sure the present issue will kindle your thoughts and further your knowledge in the field of Operations and Supply Chain. Congratulations to the team for their efforts in bringing out this issue.

Happy Reading !

Dr. Pramod Shetty
Faculty In-charge - FORSE
Area Chairperson (Operations)
KJ SIMSR, Mumbai

Dear Readers,

"Learning is not attained by chance; it must be sought for with ardour and attended to with diligence" - Abigail Adam

We are elated to bring to you our **POMS 2019 edition of Momentum**. In the past editions we have seen articles focused on specific topics such as Industry 4.0, Ecommerce and many more on similar lines. Operations is huge gamut of things covering various aspects in a business environment. Supply chain as field has evolved over years. This edition is brought forth to you with theme ***"Supply Chain in the New Environment of Industry 4.0"***.

We at FORSE, have the desire to share our knowledge and learnings with everyone. We intend to create a platform for brilliant minds to come and enlighten us regarding enumerable topics, thereby enabling us to be one of the best magazines published by a student body. The struggle for it is going to be long, but we have been successful in getting a notch up with each edition that we bring to you. And as we stand to spread knowledge with each edition, we bring to you some pretty interesting articles in this edition. You would also come across recent trends and Start Up stories in Operation, some Brain Teasers to activate your grey cells, and many articles to make your reading experience enriching.

The articles included provide insights into various topics like Applications of Blockchain in Supply chain management, Digital Twin, Applications of AR-VR in Manufacturing and many more intriguing topics. We hope to generate awareness about the current happenings in the industry.

Last but not the least, we would like to thank everyone who has contributed to the magazine and wish for enthusiastic participation in the future as well. We hope you have a great experience reading this edition of Momentum. We also hope we were successful in leaving you with a richer knowledge base to cherish and apply in various aspects of your career.

Happy Learning,
Team Momentum

Dear Readers,

We at FORSE (Forum of Operations Research & Supply Chain Enthusiasts), since our inception have been striving for excellence & building business acumen of students in SIMSR by not only organising simulation events, case study competition, international conference, magazines but also by executing campaigns, posts through social media handles thereby utilising the digital media space to communicate the very fabric of *supply chain, operations strategy and logistics* with all the operations enthusiasts across different geographies.

MOMENTUM our quarterly magazine is an attempt to bring forward enlightening topics and concepts in the field of operations, supply chain and logistics to our readers. It contains articles based on different themes in each issue. Since its inception, Momentum has covered many topics under various themes including but not limited to Green Logistics and Smart Supply chain, Rise of Service Operations in India, Industry 4.0, SCM & Logistics in E-commerce, Supply chain in 21st Century, Scope of Operations across different Industries & Business Functions and many more.

The rise of new digital industrial technology, known as Industry 4.0, is a transformation that makes it possible to gather and analyse data, making processes more efficient with high quality at reduced costs. Industry 4.0 moves beyond the realm of manufacturing and production to focus on the entire ecosystem of partners, suppliers, customers, the workforce, and operational considerations. So, the Supply Chain in the New Environment of Industry 4.0 would play an important role in the success of business.

Through the POMS December 2019 International Edition of Momentum which revolves around the theme **"Supply Chain in the New Environment of Industry 4.0"**, we strive to enhance the knowledge of our readers on various aspects of Operations ranging from Use of IoT and AI in developing Intelligent systems, Future warehouses and Material Handling Techniques, Digital Twins to Applications of Blockchain in supply chain management.

On behalf of the FORSE Momentum Team, who has worked meticulously to bring this issue to you, we hope that the magazine gives you great insights and aggrandize your knowledge bank. Stay tuned for upcoming issues with more interesting themes.

Keep Learning!

Anuj Agarwal	**Ankit Vyas**	**Vinit Shah**	**Jay Gala**
Convener	**Co-convener**	**Co-convener**	**GSCM President**

Index

Overview of Supply Chain in the New Environment of Industry 4.0

The world we live in changing constantly and so is the way we produce, manufacture, supply and consume and technology is at the center of it.

Industry 4.0 or the fourth industrial revolution is changing the way we do business. It has a very pronounced impact on the key functions of a business. Digitalization aided by disruptive new technologies like cloud computing, IoT, virtual and augmented reality, big data and analytics, 3D printing, robotics, etc. are leaving no component of business untouched.

Supply chain management can be defined as the management of the flow of goods and services that involves all the intermediary processes which aid in the transformation of raw materials into final products.

Industry 4.0 is redefining current manufacturing processes. It has moved the manufacturing sector to a more digitized, automated, agile and efficient operations.

Today, manufacturing, product development, and distribution networks have been brought into a single transparent and digitized system by the supply chain.

Studies show that a more interconnected, digital supply chain reduces operational costs, reduces abnormal losses at the same time reduces inventory requirement making the system more agile, more granular and more efficient.

Key benefits from Supply Chain 4.0:

Greater transparency and accuracy: Digitalization helps companies to track their consignments in real-time using various sensors. This involves combining data from these sensors along with updates from IoT data with supply chain partners which in turn improves order accuracy and time and also enhances lot and batch control, optimizing inventory and reducing associated costs.

Data-backed decision making leading to cost savings:

Advanced machine learning algorithms help in predicting demand by analysing the data. The input for its past trends, weather, social network, etc. The biggest advantage is that they provide a probability distribution of demand instead of a single forecast number. Both the upside potential as well as downside risks associated with the supply chain can be measured with the help of this and further plan can be decided accordingly.

Increased interconnectedness and collaboration:

A fully integrated, digital supply chain software takes collaboration to the next level. This is done by facilitating information to flow smoothly between suppliers, manufacturers, and customers. Planning is transformed into a continuous process through this shared platform and this also results in reduction in lead times due to better communication, since suppliers can provide warnings early, thus an enterprise can respond quickly to risks.

Improved warehouse management: Digitalization can effectively improve warehouse management capabilities — especially concerning transportation logistics and supply chain inventory. For example, sensors that can predict the time it will take for a consignment to arrive by tracking goods in real-time accurately. This real-time tracking mechanism ensures that pickup and delivery are on-time. RFID technology helps in locating the product in such a detailed way, we can even predict its exact position inside a truck This preciseness helps managers provide location-based instructions to workers which saves time and improves efficiency and thus labour hours consumed per order are also reduced. These tracking devices help an organization to be well-prepared and not get affected from sudden last-minute shocks such as inadequate quantity. Accurate demand prediction helps in optimizing inventory storage per square foot. This way the plant managers can easily control the flow of inventory globally.

'Intelligent' supply chain:
"Thinking" supply chains can learn to identify risks and rearrange their supply chain parameters to mitigate such risks. This continuous and ongoing process of evolving and learning helps in handling many exceptions and also eliminates the need for human involvement, apart from those unforeseen and unavoidable risks, when human intervention is very much essential to determine the next course of action.

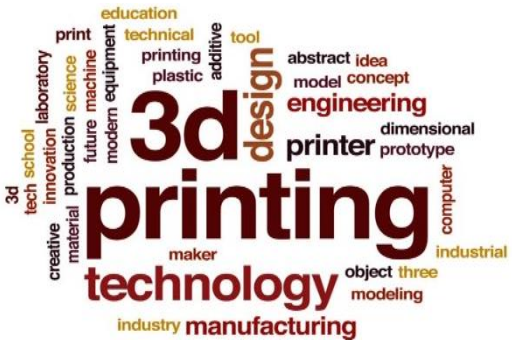
Greater Agility:
Advanced supply chain solutions integrate data from all the nodes of a supply chain i.e. suppliers, service providers, etc. in a "supply chain cloud", ensuring that all stakeholders take decisions based on the same facts. This end-to-end and real-time visibility allows companies to respond more quickly to disruptions or innovations in real-time, thereby minimizing risks. Also, the emergence of "Supply Chain as a Service" will increase agility significantly.

Some of the trends of supply chain 4.0:
- Automated in-plant logistics handle inventory and warehousing.
- Data-driven predictive production and shipping
- Driver in only leading trucks on interstate highways (Platooning)
- Full Data Transparency and integrated, ad hoc mobile planning.
- Drone delivery and last-mile delivery to cover rural areas
- End to end performance management.

Present era is evidence that technology has changed the way an organization conducts its business. It has ensured reduction in cost, improvement in the delivery process, standardization of quality, and emphasises more on customization; thereby creating value for customers. Technology has become part of almost all the business processes right from the procurement and/or manufacturing, to delivery of a product or service etc. Below mentioned are some of the technological advancements in the business operations.

Trend 1: Additive Manufacturing

With changing customer needs, reduction in product life cycle and a large number of competitors in the market, it becomes important for the manufacturers to develop a product at the least cost and in less time; and it should be feasible and easy to produce. With this intent, the companies widely resort to additive manufacturing techniques namely, Stereo lithography (SLA), Fused Deposition Modelling (FDM) etc., which are classified under 3D printing technology. These technologies are not only used for producing prototypes, but also to produce



final products and work as per layered manufacturing principle instead of conventional material removal (subtractive) manufacturing processes resulting in savings in material and cost.

The recent example of this technology is the construction of a 3D printed office in Dubai which holds a world record for being printed in 17 days and assembled in 2 days bringing about a 50 per cent reduction in building and labour cost. This technology is extensively used in medical applications such as treatment of fractures in complex organs like pelvis, in building prosthetic organs etc. and in industrial applications such as bio-medical, space organisations, reverse engineering applications, automobiles etc.

Trend 2: Human Machine Interface

Human Machine Interface or HMI is used in industries to operate, control and monitor multiple machines through one single unit. It comprises of hardware and software systems which can show precise information like temperature, pressure, process steps, material count or water levels in tank. Data from indicators of multiple equipment is connected to one screen for real time monitoring and control. ATM machine is one such HMI we encounter regularly with screen and push buttons to dispense and deposit money.

Modern HMIs can be smart wearables like augmented reality glasses, smart watches with data collection and sharing technologies. It can be used to save work steps in material handling and logistics making workflow more safe and ergonomic. HMIs can thus prove to be a big change in improving efficiency of supply chain processes.

Trend 3: Industrial Internet of Tings

The use of Internet of things (IOT) in Industrial applications has significantly improved the efficiency of manufacturing operations by providing real time information of all the participants in the manufacturing process ranging from raw material batch to CNC machines and inventory levels at all the stages of production. The intercommunication between these participants through a centralised application helps in easy detection of malfunctions, process failures and scrap reduction by monitoring overall equipment effectiveness, machine downtime and utilization, production cycle time etc. by comparing the data received from the resources with the set benchmarks.

Trend 4: Cloud enabled Predictive Maintenance

In modern production systems, data recorded and transmitted has a crucial role in detecting anomalies in production and life status of critical parts. Sensors are installed with these components to record and identify patterns of data like component temperature, vibration, and sound that indicate changes in equipment condition typically due to wear and tear.

Data is then sent in real time to cloud and with integration of machine learning techniques, accurate health status and life of component can be determined. This enables better utilization of critical and expensive parts to their maximum life, replacing them at right time just before failure and accurately predicting when maintenance should be performed. Operational efficiency of production is improved as breakdowns can be eliminated and overall safety and effectiveness of operators is enhanced.

Trend 5: Cyber Security

With an increase in the usage of technology in business operations, security exposures like data theft, leakage of intellectual property, corporate sabotage are also growing. The damage from digital attacks like these affect a company's profits, reputation, brand, and competitive position.

Thus, the businesses must develop a cyber security program which focuses on data confidentiality, integrity, and availability. A cyber security plan communicates about how effectively cyber security capability is positioned within an organization.

Further, most of the countries have laws for the national cyber security. India has framed Information Technology Act 2000 and The National Cyber Security Policy 2013, to protect the public and private infrastructure from cyber attacks, and safeguard information.

Use of IoT and AI in developing Intelligent systems in Industry 4.0

- Soumya Kushwah
Indian Institute of Management, Ahmedabad

Many established companies are increasingly using new-age technologies such as internet-of-things (IoT) and artificial intelligence (AI) for expansion of their digital presence, taking on tech giants and global diversified MNCs which are also aggressively elbowing their way into this space in a bid to move towards 'Industry 4.0'. Industry 4.0 is new way of doing business- the fourth industrial revolution. This philosophy is built on the cornerstones of machine learning and Cyber-physical systems. It was first promoted around six years ago at Hannover Fair. It received a mixed reaction from the market, with an almost equal blend of enthusiasm and confusion.

Traditionally, industrial firms crossed roads with the services business for offering operations and maintenance (O&M) support. This provided them with additional revenue streams and helped to strengthen customer loyalty. Industry 4.0 takes this idea forwards where technology investments are not seen as merely a cost-factor, as an enabler for companies to add revenue to their books. Creation of digital twins, i.e. the use of sensors at multiple points for collecting data on a large machine such as aircraft engine and using that data to predict the optimum time for maintenance by running computer simulations/analytics has been one early noted success of Industry 4.0.

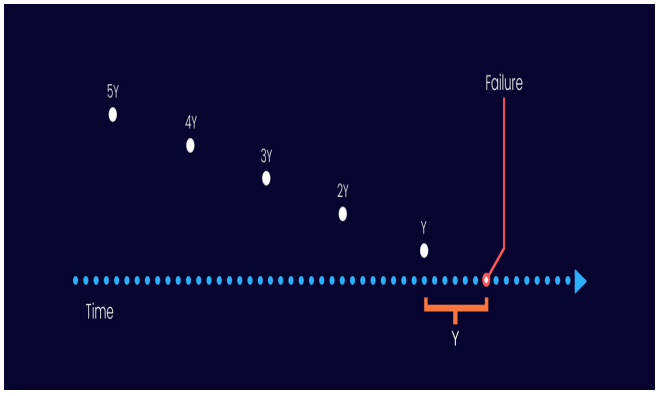
Now, they are taking it to a higher level by putting sensors on products for capturing steady data, and using analytics to predict breakdowns, call for early maintenance and hence, improve efficiency. For instance, L&T has created a digital in-house platform, which seamlessly joins diverse operations, to improve efficiencies and reduce decision time. Another example is that of Siemens, which is partnering with outside companies to build digital platforms for solving operations-related problems. For the automotive industry, Siemens offers a digital enterprise suite that facilitates digitalization and integration of the entire manufacturing value chain, without leaving out suppliers. For Mahindra & Mahindra, Siemens set up a digitalized platform to provide quick translation of market requirements into a vehicle platform, thereby significantly reducing the time required for new product launches. Industry 4.0 has increased opportunities for technology companies, but it has further fueled the race to stay ahead of the curve.

Industrial giants are increasingly developing the capabilities in-house or even if they lack resources for in-house development, they are working with hand-picked providers having niche skills, to explore further price cuts in the commoditized IT services industry (exhibit 1). Interestingly, the technology innovation flow from the corporate to the consumer-side is passé. In fact, the flow is getting reversed now. Consumer technology is becoming the central spot

for driving enterprise technology.

Coming back to the important idea, IoT and AI have driven the development of Intelligent systems in the following ways:

1. Maintenance - Predictive maintenance has become the prime and coveted use case for manufacturers transitioning towards Industry 4.0. Instead of relying on predetermined maintenance schedules, predictive maintenance relies on algorithms to accurately predict the upcoming failure of a component/machine/system and sends out alerts to concerned personnel for performing focused, more relevant maintenance procedures that prevent the failure. Time is of utmost importance here. Alerts need to be sent out at the correct time, neither too late to avoid the disutility of the alert nor too early to avoid unnecessary wastage of downtime.



Regression labelling for Predictive Maintenance. The recorded instants (5Y, 4Y, 3Y etc.) depict the Remaining Useful Life of the asset before prediction of failure. (Source: Seebo)

2. Quality Improvement - Quality improvement in sync with Industry 4.0 means that manufacturers can continually better the quality of their output based on usage and performance data collected from products and equipment in the field. Data is a vital source of information that forms the foundation for identifying faults and scope for improvement, which leads to product development and facilitates taking crucial business decisions.

3. Robo-humanisation - With rising adoption of robotics in manufacturing, AI will have a major role to play in ensuring human safety on the manufacturing floor. Moreover, it will make it efficient and cost-effective to hand over more responsibility to robots for making decisions with regards to further optimize processes by availing real-time data collected directly from the production floor.

4. Generative design - AI holds promises of exploring all the possible configurations of a solution at low cost and great speed. For achieving this, clearly defined design brief needs to be fed as input into an AI algorithm, generally known as the generative design software. The brief can specify restrictions and definitions about material types, time constraints, production methods and budget limitations. With such specific inputs, reliable outputs can be expected.

5. Supply chain - It is no surprise that Artificial intelligence is not only limited to the production floor but permeates the entire Industry 4.0 ecosystem. For instance, the use of AI algorithms to not only optimize the manufacturing operations supply chain

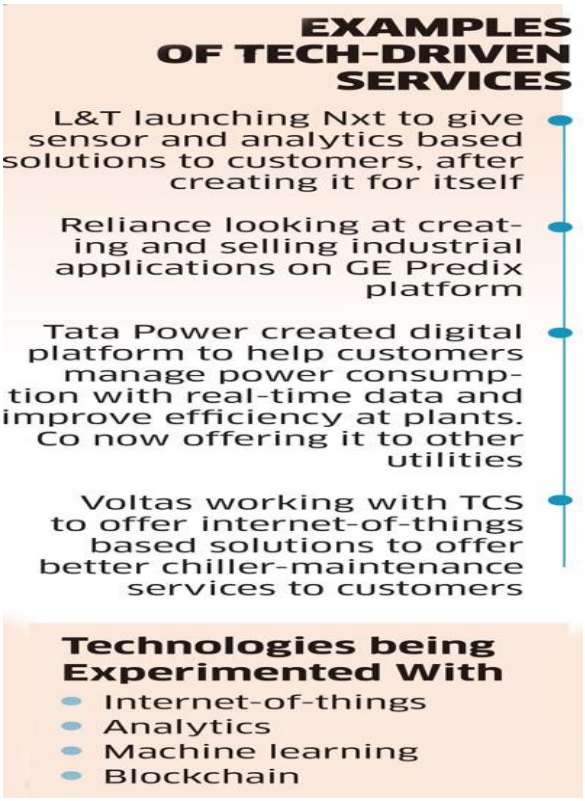
but also enable them to anticipate and respond to the changes in the market better by taking into account demand patterns categorized by date, socioeconomic attributes, location, political status, macroeconomic behaviour, weather patterns etc.
As a result, manufacturers can optimize inventory control, energy consumption, staffing, raw materials, and make better financial decisions about the company's overall bug strategy.

Although there are immense opportunities, but they don't come without challenges, as proven by GE's example. As per GE's forecast, its digital business revenue is expected to reach the level of $15 billion by 2020. However, according to a filing with the US SEC as of 2018, GE Digital's actual revenue dropped 2% at $3.9 billion. Thus, the algorithm seems to have missed the issues in its core power business as well as difficulties in growing the software side that posed the challenge.

Other challenges include:

- **Machine-to-machine interactions-** The inputs fed into the AI algorithm are susceptible to variation due to machine-to-machine transfer. Therefore, there is a need to ensure that individual processes do not interfere with the broad working of inter-connected systems.
- **Data quality-** The entire game of AI is based on massive data inputs. If the data points go wrong somewhere, it can reap havoc in terms of dishing out incorrect outcome.
- **Cybersecurity-** With the growing use of connected technologies, the smart manufacturing systems are exposed to the threat of loose cyber security. This vulnerability is even scarier given the under-preparation in dealing with the same.

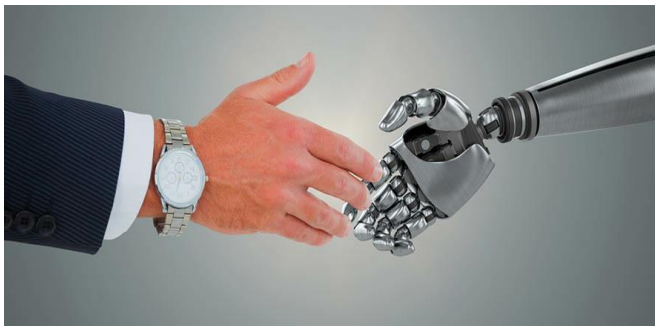
The complexity of deploying artificial intelligence solutions in industrial automation necessitates that manufacturers collaborate with specialists for building customized solutions. Building the specific need-based technology is expensive especially because most manufacturers don't have the required skills and knowledge in-house. To successfully leverage AI, manufacturers will be better of partnering with experts who have an understanding of their goals and can help chart out a clearly defined roadmap and build agile development process linking the implementation of AI with relevant KPIs.



Future warehouses and Material Handling Techniques

-Kartik Parekh
Thompson Rivers University, Canada

Warehouses can be simply understood as the means of assuming responsibility for the storage of goods. By releasing the goods as and when they are needed and required it helps in creating time utility.



Functions of Warehousing

- Storage
- Risk bearing
- Price stabilization
- Creates Time utility
- Creates Place utility
- Helps in optimizing cost

Warehouse Automation

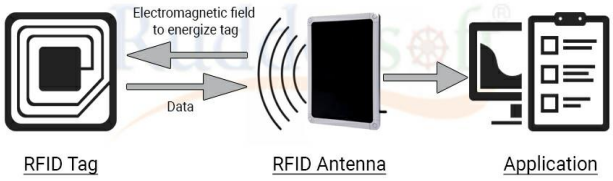
Warehouse Automation simply to increase the outcomes while minimizing the efforts to be put in.

Warehouse automation comes in two parts:

Process Automation

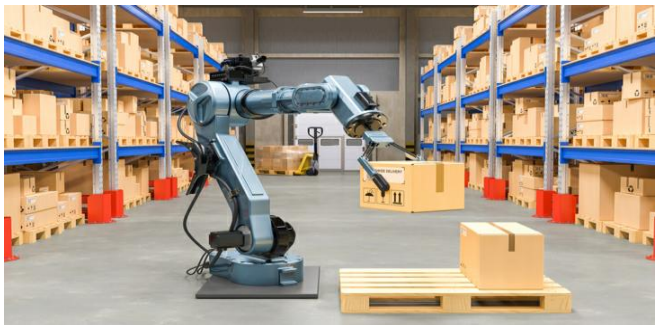
Process Automation also known as System Automation tries to digitize the processes of inventory handling, data collection, and integrates that data into the software of the companies like Enterprise Resource Planning. It makes use of barcode stickers and RFID technology

RFID: HOW DOES IT WORKS?



Physical Automation

Physical Automation involves mechanized automation where there is use of robots and robotics for performance of varied activities. Examples are Goods-to-Person Technology, Automated Mobile Robots (AMR).



Three principles while integrating Industry 4.0 in Material Handling by GE

- Focus on Final-mile delivery
- Build dexterity to fulfill multi-channel fulfillment modes

How GE is integrating Virtual Reality in its Warehouse Management System

How the process works?

Earlier, GE applied FIFO/LIFO methods in Inventory handling. Now it has revamped its process by:

Digital thread accelerates responsiveness

Using Big data technology, each appliance is tracked in real time in terms of the customer who ordered it, when it is scheduled to arrive, and what will happen on its way. All this is done while reducing the inventory.

Smart sensors ensure quality

The use of sensor technology, variable speed controls, navigation maps and cameras enable the operators to handle the products more carefully and efficiently which in turn reduces the damage and overall cost to the company.

Building design vamps up efficiency

The design of the warehouse is such that the product is moved only once which reduces time and efforts. Symmetrical warehousing reduces the product handling by almost 50 percent in all.

Smart yard and Control Towers

The introduction of Smart Yards which uses GPS, Radio Frequency Identification cards and other cloud-based technologies which provides real time visibility of stock items that has helped GE. Using the technologies here by, Control Tower tracks and traces the shipment of products. It does so from any part of this world, with no need of any physical inputs.

Virtual Reality speeds Training

Virtual reality helps in cutting training time in half. It also helps in cutting down the time of product delivery which helps in reducing storage cost.

GE recently launched its new Area Distribution Centre (ADC)

"GEA has the leading distribution network in the appliance industry, and we're applying the best in smart technology to take a quantum leap forward on our journey to serve customers better," said Mark Shirkness, vice president of distribution for GE Appliances.

GE Appliances uses a total of twelve ADCs and as much as 170 local locations for delivery that too every 4 seconds, for delivery of an appliance. GE Appliances' legacy of innovation includes the first appliance delivery app, a patented e-commerce platform, full distribution services for many national retailers and builders, and the ability to deliver in one day to 90 percent of the U.S.

Conclusion

So computerization and digitization of warehouses helps in -

- Improving productivity
- Control of physical operations
- Optimize the space utilization

- Minimize the costs
- Motivate the employees
- Work scheduling
- Shipping schedules and transportation is faster
- Warehouse performance reports
- Quality assurance and control

The traditional warehouses are becoming obsolete and JIT, WMS, development of automation are paving the way for development of automation in warehouses.

The new developments will enhance return on investments to the businesses by optimizing the cost of inventories which forms a major part of costing.

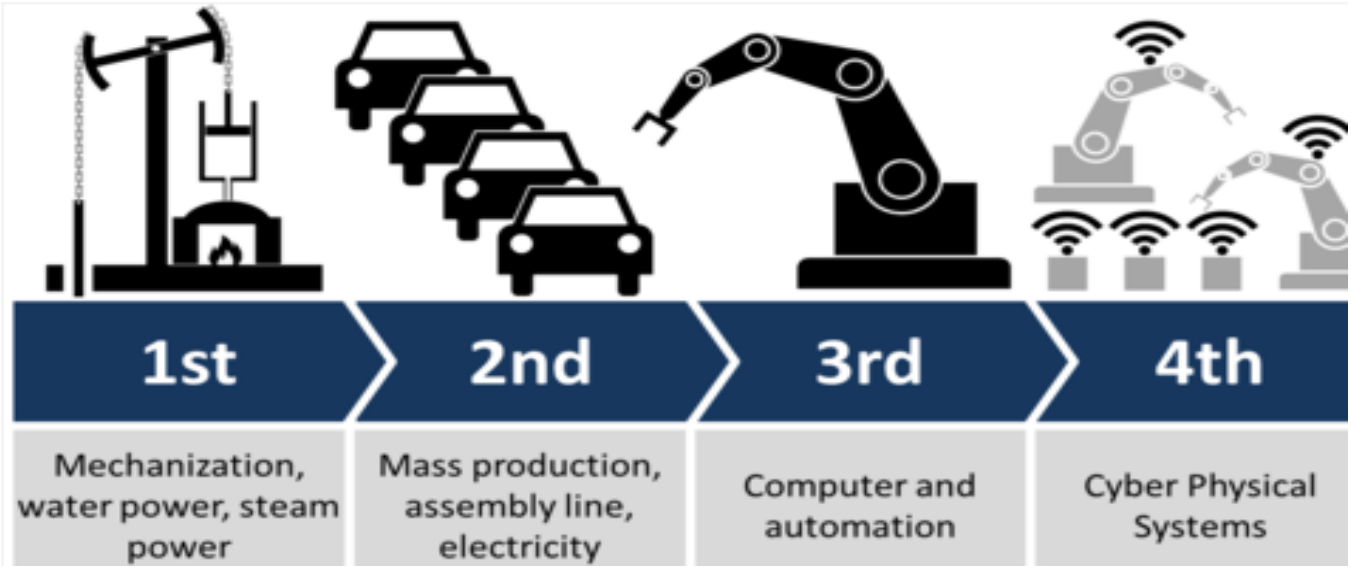
Digital Twins: Bringing Closer the Reality of the Present and the Future

- Ajith Kumar B
Narsee Monjee Institute Of Management Studies, Mumbai

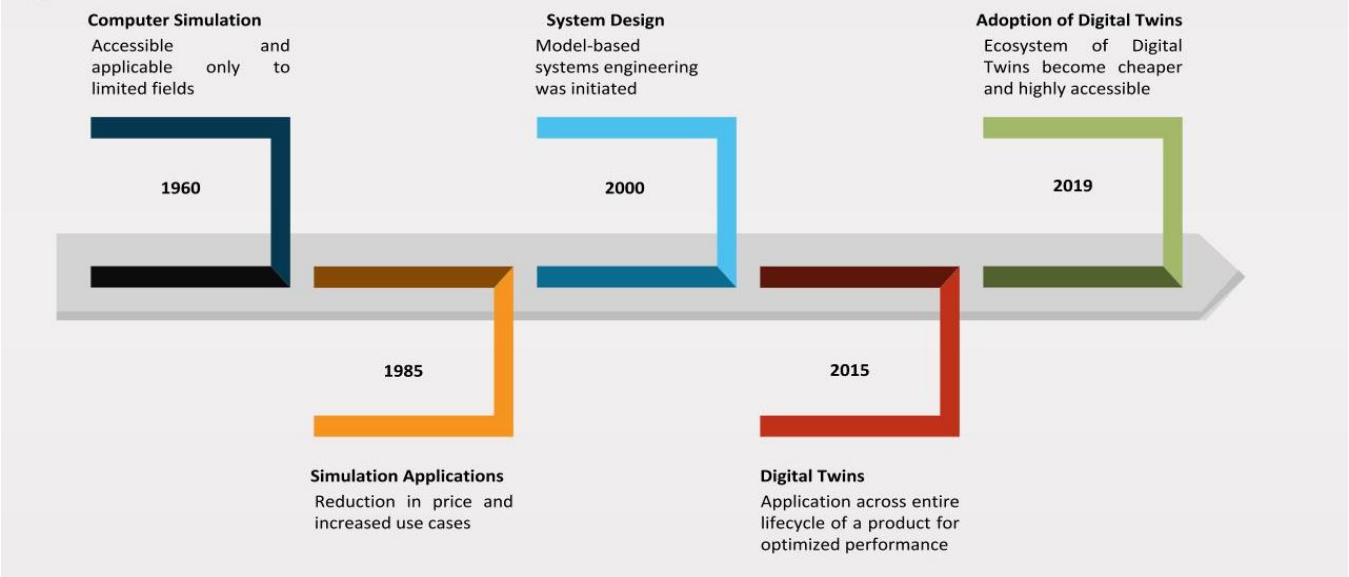
Trying to make life easier has been every human's mission. When we toiled under inhumane conditions, the First Industrial revolution took place in the 18th century; the baby steps into the world of automation. In the mid 19th century, aided by electrification, industrialization and mass production profused rapidly resulting in the second revolution. The widespread belief was that
"The nation which gains control of iron soon acquires the control of gold"
Electronics was the next big thing that humans came across. It opened a portal to faster, smaller and multipurpose technologies that redefined the way we thought about the functioning of the world. The transition from physical to digital had just begun.

We are the witnesses of the fourth industrial revolution. The physical and digital worlds have never been this close before.

Imagine you have the superpower to create a virtual model of an entire oil rig - you can create infinite scenarios to test, retest and compute the optimum make-up of the rig. Data about each and every part (their max capacity, their life, at what points do they need preventive maintenance) is made available beforehand with the highest accuracy. The potential risk has been significantly reduced. This superpower, a combination of simulation, optimization and data analytics, is called Digital Twin - the future of disruption risk management



What is the history of Digital Twin?



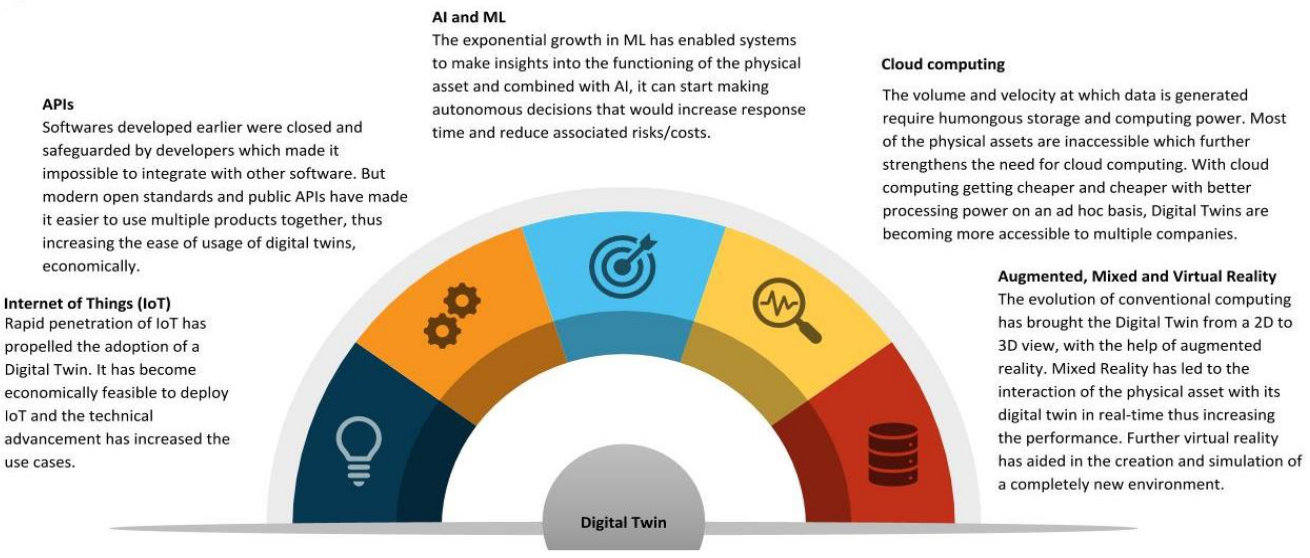
What are the factors that fuel the growth of Digital Twin?

Digital twin has evolved into a complex and intricate ecosystem. It doesn't operate in a silo but is rather dependent on multiple technological trends, as listed below.

What is the value proposition offered by Digital Twins?

The application of Digital Twin depends upon people, processes, products, and organizations. Broadly the value addition falls under one of the following

- **Descriptive** - Visualisation of entire data obtained
- **Analytical** - Simulation of data impossible to obtain in real-time
- **Diagnostic** - Using measured data to arrive at root causes using ML
- **Predictive** - Using historical data coupled with AI to predict the future operating state of the physical asset



Source: www.presentationgo.com

What is the Current Market of Digital Twin?

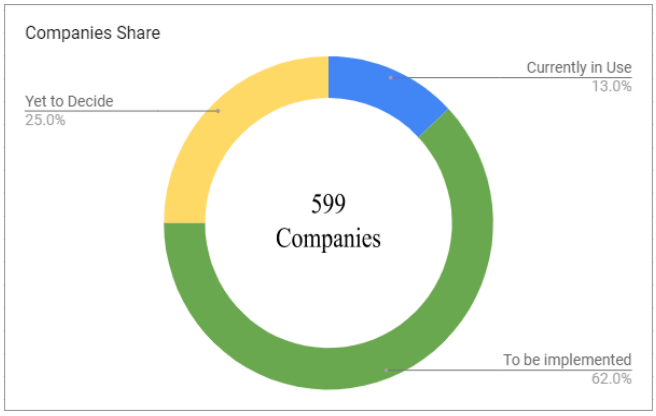
According to a report by Markets and Markets, the global market size of Digital Twin stands at $3.8 Billion in 2019 and is expected to reach $35.8 Bn by 2025 which results in a tremendous CAGR of 37.8%. Gartner, Inc conducted a year-long survey on the adoption of Digital Twin by companies from 6 countries - India, Japan, USA, UK, Germany, and China.

Furthermore, 54% of the respondents use Digital Twins for single-purpose while nearly 33% said they have deployed the same Digital Twin for multiple purposes. Also, 61% of companies that have multiple Digital Twins have at least one pair that are integrated with each other, while 74% of companies that haven't integrated Digital Twin will do so in the near future.

The inference from the findings is that Digital Twins have slowly started entering the mainstream as companies have started to recognize the opportunity provided by them to differentiate the brand's products and thus acting as a business driver.

Is Digital Twin really widespread?

The adoption of digital twins is on the rise and some of the existing use cases across multiple industries have been discussed below for better understanding.



Layout Design

An interesting area where governments have started implementing digital twins is Smart City planning. The Government of Andhra Pradesh, after the state split, has planned to make the city of Amaravati as its new capital at a cost of $6.5Bn. In association with architects Foster and Partners, it has modeled the entire city digitally with all development planning and operations being run on a single platform using the software Cityzenith. The plan is to make Amaravati the most digitally advanced city in the world.

Global Logistics

The terminal model of the Digital Twin in logistics would be the model of all networks - airways, waterways, roads and rail. India has also started digitally mapping the country that could tremendously improve logistics. One important driver in developed countries is the combined working of GIS, satellite and aerial photography and autonomous driving solutions which collect tonnes of data every second. The real-time data collection enables companies to

- make improved decisions to plan delivery routes
- estimate arrival time
- predict the weather conditions

- Analyze delays and congestions
- Study demand pattern

Manufacturing

Baker Hughes is an OEM for the oil and gas industry. It created a digital twin of its plant in Minden, Nevada that collects data from thousands of machines and its inventory. The digital twin has helped the company to perform Kaizen and respond to issues faster. The net impact is the increase in throughput which resulted in on-time delivery of finished products.

Maintenance

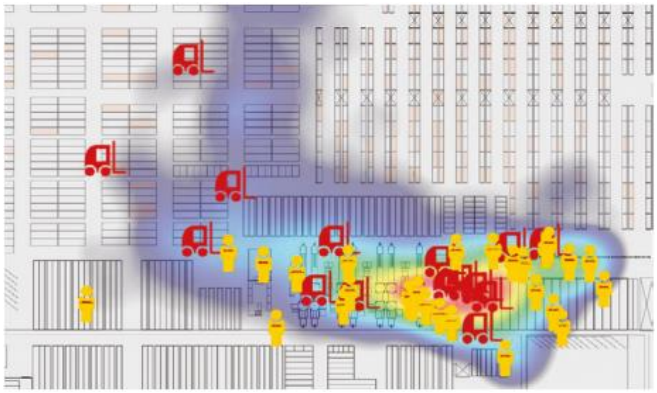
CNH Industrial assembled Iveco vans at its plant in Suzzara, Italy. A particular process in the line involved spot welding by robotic arms. The problem was the reliance on the flexible copper conductor, called Lamellar Pack, which has to be flexed during operation. This resulted in damage to the copper layers. Sufficient damage could lead to hours of breakdown which made preventive maintenance vital.

A digital twin was modeled that took into account multiple types of chassis, different welding angles and speeds, different stations and the number of robots in each of them. ML was made of use to understand the probability of failure for multiple scenarios. Thus, tool inventory was optimized and planned and unplanned downtimes were minimized.

Warehouses and Distribution Centres

One of the pioneers in the adoption of Digital Twin is DHL. It has partnered with Cisco and Conduce to setup smart warehouses that employ state of the art IoT infrastructure.

The data obtained is used to generate heat maps of worker and physical assets movement. This is, in turn, analyzed to facilitate better layout planning, reduced worker movement, reduced inventory levels, and a safer workplace. For the first time in Asia, DHL recently implemented Digital Twin for Tetra Pak's Warehouse in Singapore.



What are the bottlenecks for full-fledged mass adoption of Digital Twins?

Though the deployment of Digital Twins is on the rise, there are several factors due to which companies are reluctant to make use of it.

Cost

Considerable capital investment is required in technology. Though the costs are falling, companies prefer using other approaches to create the same value at lower costs.

Precise Representation

No digital twin can be made to be a perfect replication of actual physical assets. So assumptions have to be made to balance out the misfits.

Data Quality

Hundreds of sensors are used to collect data. These operate in challenging conditions while communicating via unreliable networks. Data cleansing is a huge task which further makes companies resistant to application.

Education

The human skill required to operate and meaningfully derive insights from digital twin is very high. A cultural shift among employees is required.

IP Protection and Cyber Security

Data collected by Digital Twin might be sensitive and might be the reason for competitive advantage. And so data ownership, identity protection and governance of data provide huge challenges to companies.

Furthermore, digital twins create a new channel to perform cyber-attack on. Also, a digital twin controlling and operating a physical asset makes it more vulnerable to an attack.

As technologies evolve, it is accompanied by its own set of challenges. At the same time, continuous innovation helps in tackling the obstacles and gaining user acceptance aka mass adoption. The evolution of feature phones to smartphones is the best-suited example of that.

What will the future look like?

Gartner reports predicts that by 2021, nearly 50% of large industrial companies would have implemented Digital twin resulting in a 10% improvement in effective functioning. It is important for organizations to look at integrating multiple Digital Twins thereby multiplying the value generated. Edge computing will result in cleaner and local availability of data which can be used to make faster and better decisions. A huge step would be combining blockchain with digital twins to validate data across the entire supply chain and create new insights, improve operational efficiency and drastically up the security of data.

Get, Set, Drone – The New Mantra

- Darshak Rairakhia & Parth Dedhia
The University of Texas at Arlington, U.S.A. &
K. J. Somaiya Institute of Management Studies and Research, Mumbai

In an era which consists of innovation and transformation, soon will arrive a time when you will no longer check the front gate of your house for a delivery person to arrive. Instead, you will look high in the sky to find whether the shoes you ordered or the food you craved till now has reached your destination or not. Times are moving ahead and the industry along with it. Rapidly than ever before. Soon enough we will see those mini-copter things, namely 'Drones', all over our heads. They are all set to become a regular sight in our recent future.

The History behind Drones

Drones are basically unmanned aerial vehicles which are controlled remotely by a remote or a controller. Drones first came into existence in the mid-nineteenth century where it were used as a catalysts and support gears to actual planes or air crafts. For most part of the twentieth century, drones were used for naval and military purposes. It was only when the third industrial revolution took place, the drones starts to make a mark in the commercial segment.

What lies ahead?

As drones are becoming more and more viable and commercially available, cost-effective as well as easy to use, it is likely that drones will soon tap into the supply chains of businesses and make a strong hold for themselves for the generations to come. They have already started hitting the markets and a huge success among travelling and photography enthusiasts. However, there is still a resistance from the governments and legal boards for public use of these unmanned vehicles as they pose a security and privacy threat under the hood.

Drones in Supply Chain

Industries have now started to realize the potential of what this type of technology brings to the table. Firms have now started investing and boosting research and development for newer drone-related technologies. The following are the industries where drones are gaining immense popularity and are soon expected to create a huge revolution.

Vlogging and Films

Drones have become an integral part of the crew that works behind the camera to bring to you those larger than life and exotic movies with cinematic shots and sky high views.

Internet Service Providers

The major leaders in the internet business, namely Google and Facebook are making use of these portable flyer to maximize the reach of internet in the remote rural areas. They are using drones

charged with solar energy to make this reality.

Agriculture Industry

The traditional model of industry also paves the way for the modern technology of using unmanned flying drones as a part of the process, which won't act as a scarecrow for the birds but will instead monitor the fields. They might also be helpful in spraying the pesticides over the fields.

E-Commerce

E-Commerce giants like Amazon and Walmarts are coming up their own version of miniature drones called 'Miniature UAV' (Unmanned Aerial Vehicle) which will revolutionize the delivery service by introducing 30 minute delivery by using drones which will automate the process and in turn inculcate the Industry 4.0 in the supply chain logistics of e-commerce based delivery businesses. The drones are expected to reach speeds of upto 50 miles per hour which is equivalent to almost 80 kilometers per hour.

Food Delivery

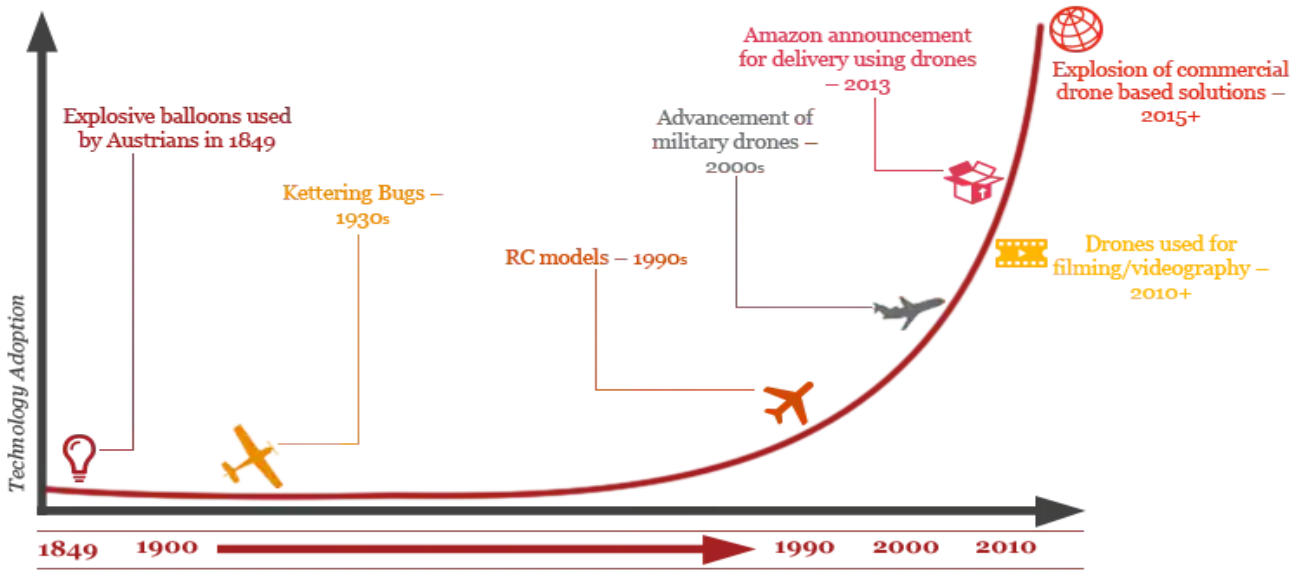
World's major pizza maker Domino's is developing copters to deliver its freshly baked tasty Pizzas which are hot and smokin' at your doorstep. Other delivery prowess like Swiggy and Zomato are also testing out the use of drones for their delivering services.

Challenges ahead

The challenges faced by the industry which regards to the implementation and integration of drones as an integral part of the supply chain eco-system lies ahead with barriers not so much from the technological point of view. The major resistance which everyone is facing is from the legality point of view. Government and defense personnel of the country are divided with the industry thought process on the use of drones on a commercial and more freely available source of transport. They argue on the basis of safety and security as drones pose as a viable threat if fallen into the wrong hands. Hence, it is very essential to gaze an approval from government for the drones to make a strong foothold in the upcoming industrial revolution. Although there is still some resistance from them, signs are showing that things are changing rapidly and that too for the good of the industry.

What the numbers suggest?

Since the turn of the nineteenth century, all the way into the 1990s, drones were majorly used to fulfill any military requirements. May it be case in 1850s as explosive balloons used by Austria or as the Kettering bugs in the twentieth century. 1990s were the initial years where they started gaining more commercial value when the first RC Models were out. The number of drones manufactured in a year also saw a rise gradually from this era. As the years went by, advanced drones emerged with exponential growth in numbers. The



Timeline of drones and exploration of drone-based application

beginning of this decade witnessed a steep J-curved growth in the drone segments where newer industries like filming and vlogging started accepting the technology. Amazon was quick to announce the use of drones for delivery in 2013. While, we saw an explosion of companies who begun using commercial drone based solutions since 2015. There are pretty good signs ahead for the technology, as it is here to stay and will play a major role for the years to come by.

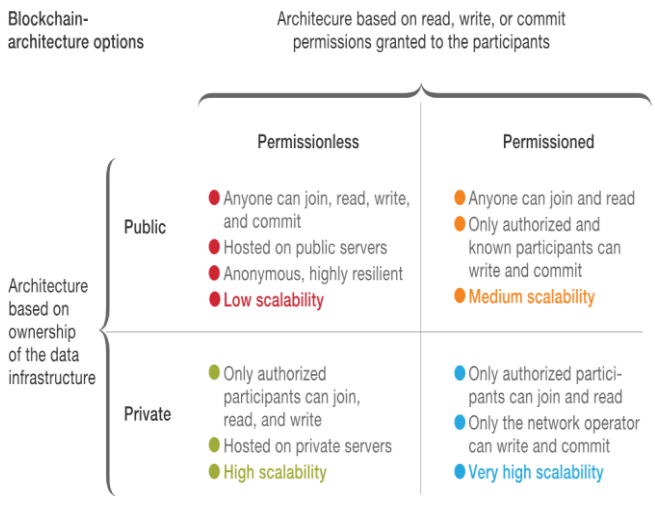
While we are witnessing a major Industrial revolution, namely Industry 4.0, which consists of Internet of Things and automation with newer technologies like Augmented Realities and Virtual Realities having the potential to rule the industry, the automated unmanned copter technology of Drones will act as a perfect catalyst for effective and efficient processing of the supply chain in the coming era. Drones are the upcoming present and the future of logistics, which in itself, is moving towards automation and augmentation gradually.

Applications of Blockchain in supply chain management

- Marathe Ameya Jaiprakash
Indian Institute of Management, Kozhikode

What is Blockchain

Blockchain is a distributed database which provides decentralized transactions which are secured through cryptographic consensus algorithms. It also enables transparency and immutability of transactions by maintaining redundant copies of blocks in distributed ledgers across all the nodes in the network. Blockchains can be broadly classified based on two dimensions i.e. permissioned and permissionless as well as public and private. Enterprises prefer private permissionless blockchains to harness the distributed architecture while reaping benefits of high scalability and data protection. Contrary to popular belief of associating distributed ledger technology with the cryptocurrency Bitcoin which gained popularity in 2017 by rising in market capitalization from $20 billion to $200 billion, this article aims to explore the various use cases of blockchain in supply chain management.



Issues with supply chain management

Supply chain forms a primary component of the operations of any company and is especially critical for manufacturing industries. Global supply chains are known to have hundreds of intermediate steps before reaching the final destination. The following are some of the issues faced by supply chains across industries globally – (a) Frauds and errors in quantity and quality of goods (b) High cost of excess inventory piled due to incorrect demand forecasts (c) High transportation costs (d) Heavy reliability on paperwork, spreadsheets and human intervention (e) Low inventory turnover and high days of sales outstanding (f) Time spent in identifying issues (g) High working capital requirements. Blockchain aims to solve most of the above issues, if not all by providing a decentralized chain of transactions which can be updated by any node in the supply chain and is visible to other participants using consensus algorithms. The retail market in India is dominated by the unorganized sector which accounts for 90% of sales by volume. To track the products from suppliers, manufacturers, distributors, retailers up to customers is a mammoth task faced by almost all the Indian companies.

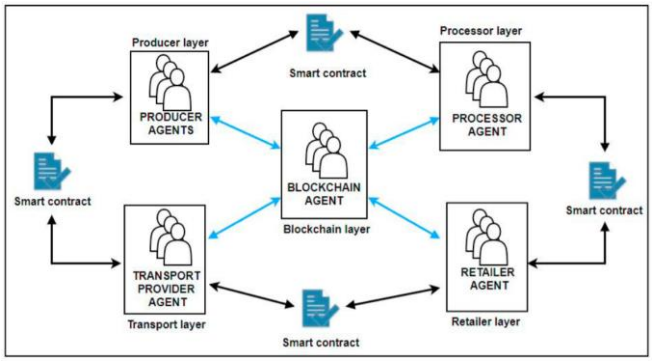
Promise of Blockchain

Provenance – In layman's terms, provenance means tracing the origin of something in history. In supply chains, it becomes critical to know the trace of all the locations and environments a component has been through before reaching a particular stage.

Coopetition – It literally is a portmanteau of cooperation and competition. In the context of supply chain, blockchain provides a way to store information which is replicated across all the nodes in the network thereby eliminating the possibility of fraud.

Smart contracts – Smart contracts offer a potential solution to the problem of overproduction which wastes valuable human resources as well as water and electricity. Imagine if an industry as significant as the automobile industry utilized a system in which cars would be manufactured only when a fixed number of requests were received. With smart contracts, it is possible for funds to be locked into a contract, whereupon manufacturers would begin production only after a certain number has been reached. It would eliminate the worry of overestimating demand and resource consumption, and could also eliminate middlemen by directly connecting consumers with manufacturers.

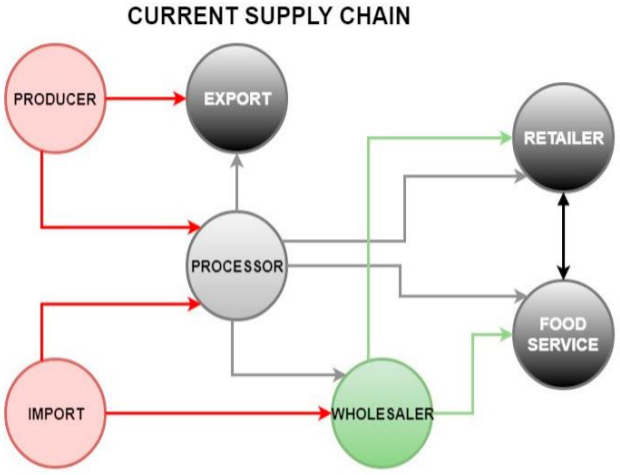
Blockchain as a Service (BaaS) – The Hyperledger project provides Hyperledger Cello BaaS which provides

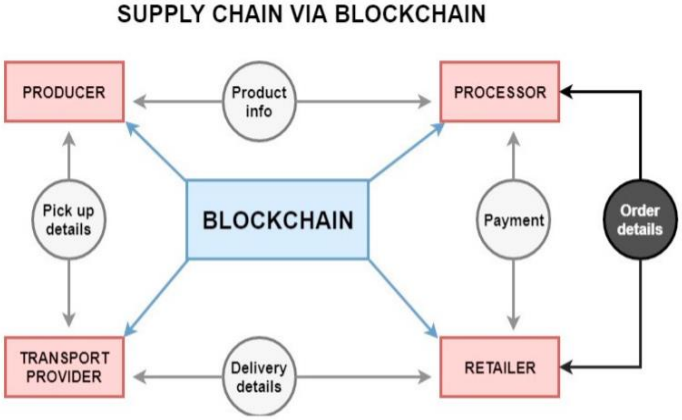


application programming interfaces (APIs) to ERP systems that integrate with the benefits of blockchain's distributed ledger technology.

Cost leadership – Although there are multiple companies using blockchain for their operations (especially in the BFSI sector), very few have used it to increase their top line. Most of the use cases are to gain competitive advantage through reduction in costs of supply chain as per the survey conducted by Digital Supply Chain Institute (DSCI). The cost reduction comes through reduction in number of frauds, removal of middlemen and intermediaries, improvement in efficiency and reduction in the risk of losing items. The legacy Electronic Data Interchange (EDI) format used to track the status of items in the supply chain has been made obsolete by blockchain.

.





Industry wise applications in India

Food – The supply chain of perishable foods has been a subject of great discussion over the years. Milk products, seafood and refrigerated products must be delivered from one place to another within the stipulated time and failure to do so may render them inedible. Blockchain, in association with Internet of Things (IoT) and radio-frequency identification (RFID) devices can help track the various environments the product has been subjected to in the supply chain. Companies like Amul which source milk from millions of households all over India can make use of blockchain enabled devices to track the amount and time of collection, storage and dispatch of milk. This will reduce the losses due to incorrect measurement and will also increase the trust in the operations. Seafood suppliers like Ananda Group and Castle Rock Fisheries can use IoT enabled sensors to ascertain appropriate handling of fish during transportation.

Pharmaceuticals and Healthcare – Drugs are vulnerable to theft due to the significant presence of illegitimate market in India. Blockchain can provide a way to track the provenance of drugs up to each and every raw material used in its manufacturing. For specialized drugs such as those used in the cancer treatment, it is essential to ensure that certain temperature and humidity controls have been satisfied throughout the time the drug leaves the manufacturing plant and reaches the customer. Companies like Sun Pharmaceuticals, Lupin Limited and Cipla who are at the frontier of Indian pharmaceuticals business can use a blockchain of barcodes to track the drugs from manufacturing plants up to the retail stores.

E-commerce – It is one of the fastest growing sectors in India with a CAGR of 17.8% as per the data provided by Statista. With the market dominated by Amazon and Flipkart, whichever firm achieves cost leadership will emerge as the leader in the long run. In order to incentivize customer adoption, the margins in e-commerce are razor thin. Blockchain has been proven to provide reduction in cost through efficient tracking of goods which reduces loss, theft and inefficiencies. Barcode tracking of packages has already been implemented across logistics firms like Ekart and Amazon Logistics. Hence it will be easy for the firms to transition to an order tracking system based on distributed ledger technology.

Automobile – India is one of the largest two-wheeler markets in the world. Market leaders like Bajaj Auto, Hero MotoCorp, Honda and TVS manufacture around 20 million vehicles annually. These vehicles are then transported to dealerships via road, rail or sea. Blockchain finds applications in tracking the movement of each consignment right from the manufacturing plant up to the destination. The same is applicable for cars and other heavy vehicles. Maersk Line, the largest container shipping company in the world, has come up with a blockchain based solution in collaboration with IBM to manage its supply chain.

Mining – Behemoths like BPCL, GAIL, IOCL and BALCO dominate the Indian mining industry. BHP Billiton, the Australian giant and world's largest mining company, has introduced blockchain in its operations to eliminate the tracking of samples through spreadsheets. Similarly, Indian companies can leverage the technology to reduce the risk of illicit mining and loss of goods in transit.

BFSI – Blockchain has already found wide scale adoption in the cryptocurrency market which aims to replace all global currencies with a single ubiquitous one which can be mined by solving complex NP hard problems. Bitcoin caught the world unaware when its market capitalization grew exponentially in 2017. Apart from cryptocurrencies, blockchain finds applications in insurance claims settlements, trade finance and international remittance settlement. In 2019, 11 Indian banks including ICICI, HDFC, Axis and Yes Bank came together to form India's first blockchain-linked funding initiative for small and medium enterprises (SMEs).

Jewellery – A major challenge in the $60 billion industry is the presence of counterfeit and artificial jewellery. In the Indian context, the industry can be broadly classified into gold, silver and diamonds. India is the highest importer of rough diamonds in the world at around $16 billion. The diamond sector has gained negative publicity due to the recent financial frauds and misappropriation of funds. The Kimberley Process Certification Scheme (KPCS) is a global watchdog for monitoring the trade of conflict diamonds that is, those used in funding wars and ammunition. In India, Gems and Jewellery Export Promotion Council (GJEPC) is responsible for issuing KP certificates. Blockchain can be used to track the movement of diamonds in order to eradicate blood diamonds from entering the Indian market. Everledger is a start-up which provides provenance tracking services for precious metals and gemstones.

Government – Electronic voting can be achieved through blockchain by making the voter a part of the network of nodes. With speculations regarding the authenticity of voting instruments in India, blockchain based e-voting techniques can be a replacement to the proposed voter verifiable paper audit trail (VVPAT) machines which are expensive and difficult to scale to over 1 billion voters.

Limitations of Blockchain

Though technological disruptions attempt to alleviate the operational inefficiencies in Industry 4.0 blockchain is not a silver bullet. Following are a few challenges with blockchain:

Scalability – With increase in the number of nodes, scalability becomes an issue as the transactions need to be updated and validated across multiple nodes in the network through consensus algorithms.

Integration issues – Legacy ERP systems provide SCM modules which are widely used across all industries in India. A solution which provides seamless transition to a blockchain platform is needed. For example, IBM provides

TradeLens for shipping supply chains.

Human intervention – Indian supply chains are heavily dependent on manual labour and interventions. Blockchain based services would have a paradigm shift in the way companies operate, which is always difficult to implement.

Esoteric technologies – Subject matter expertise in the field of blockchain is concentrated to a few industry experts and it will take a few years for it to reach the mainstream market.

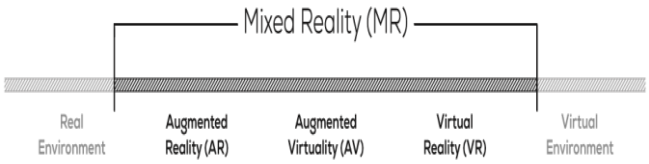
Conclusion

Although presently in a nascent stage, blockchain has tremendous potential to disrupt the Indian industrial market through innovations in supply chain management. BaaS start-ups and technology services companies are offering new solutions every month. It is only a matter of time when blockchain will hit the mainstream market in order to realize the aspirational Industry 4.0 in India.

Application of Virtual Reality, Augmented Reality and Mixed Reality

- Pritham Shetty & Hiral Mody
Macquarie University, Australia &
K. J. Somaiya Institute of Management Studies and Research, Mumbai

When we think of Manufacturing, a basic process of converting raw materials to finished goods comes into our mind. While Industry 3.0 made automation a vital process in manufacturing, it was Industry 4.0 which brought Augmented and Virtual reality into actual processes along with Internet of things (IoT) and Industrial Internet of Things (IIOT).
What does it mean?



Augmented Reality

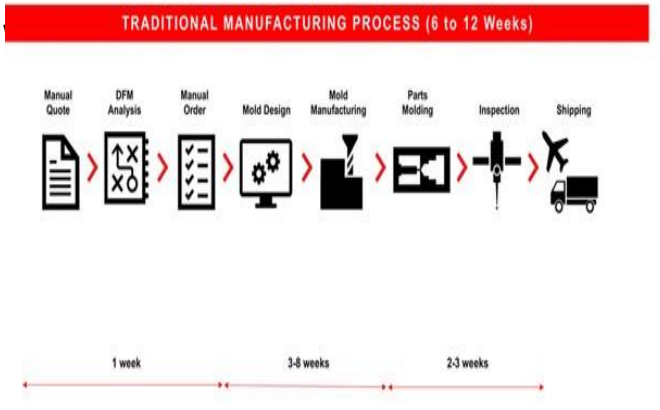
In simple words, this reality allows users to interact with the real world digitally (virtual objects are overlaid on real world). This picture shows how a manager is using this to know the items that are available in stock.

Virtual Reality

This reality helps the user to immerse themselves totally in the virtual environment which is created through virtual environment devices and computers. Users can experience a whole new digital world.

Mixed Reality

Mixed reality is a combination of both the Augmented and Virtual reality which helps the user to experience the real and the digital world simultaneously.



As we can see in the picture above how the traditional manufacturing process was conducted.

It used to take around 6-12 weeks from the time the order was received till it was delivered to the end consumer.

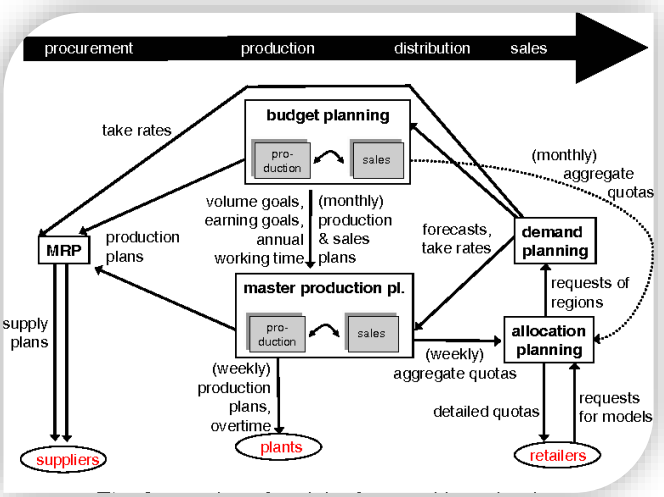
The factories were huge and were laid out over a vast area to perform all the activities properly. Decisions regarding the following were of utmost importance:

- **Plant Layout:** To determine the position of various machines in order to optimize the space and minimize the cost.
- **Process Layout:** To determine the position of various processes through which a single or multiple products had to pass and manager tried to reduce the time by proper arrangement of processes.
- **Product Layout:** To determine how a process can be laid out in a factory so that there is maximization of production of a particular product.
- **Plant Location:** One of the most important decisions to take so that the overall cost of product is minimized and the profit margin is increased in order to compete with the competitors.
- **Material Handling and Warehousing:** Inspection, storage and handling of materials is very important to make sure quality products are produced.

How the Augmented and Virtual Reality will help create the future of Manufacturing?

Product Design and Development

Creating a product design without physical appearance makes it easier because a lot of constraints are removed.



The above image shows how production takes place

The time consumed to create a prototype of a product using physical resources is very large and also there is wastage of resources due to trial and error methods. Virtual and Augmented reality removes and eliminates these problems helps the manager design the product as per his requirements without use of resources and saves him a lot of time in return.

Error Detection

AR powered devices helps in eliminating, minimizing and mitigating any human errors to which the product process was prone to before the application of digital technologies. It will help in saving huge cost to the company which will help in increasing the profit margin and an edge over the competitors.

Training

Virtual models will help training the workers and the managers in understanding the manufacturing process in a much easier way. 3D models will provide more convenience and ease of work.

Understanding how Mahindra Rise is using Virtual Reality

In Mahindra's 7TH Annual Safety Conclave the HTC Vive VR simulation was unveiled.

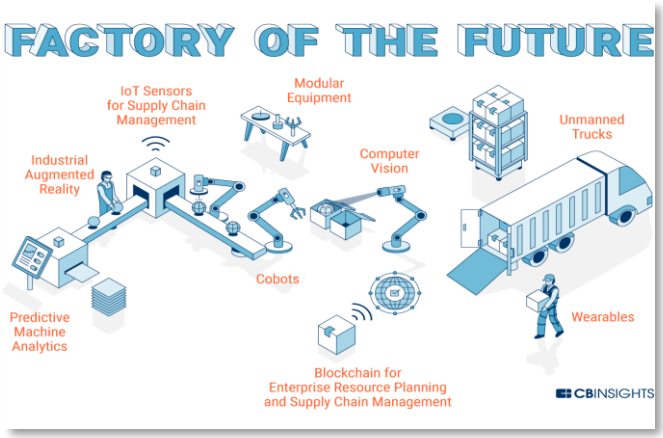
The HTC Vive VR simulation was developed to train factory workers to follow crucial operational procedures in order to prevent hazards that can compromise their safety.

As a part of Industry 4.0 , where automation and data exchange are used in manufacturing processes, the use of technologies like Virtual and Augmented Reality helps the business in creating a safe and better working place which in turn helps the organization immensely.

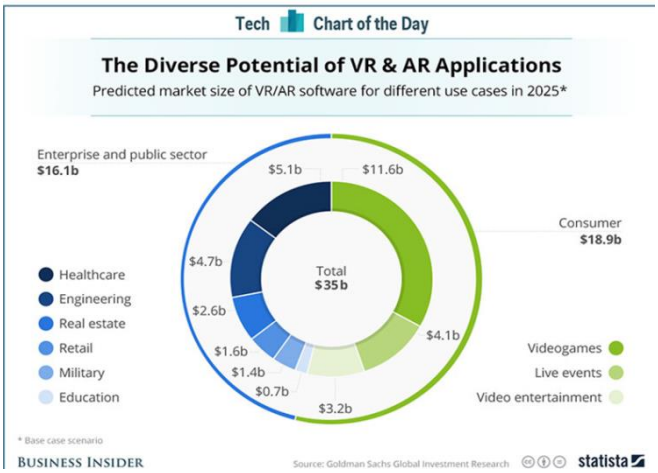
Benefits to Mahindra Rise

- Simplified the process
- Innovative and enjoyable for the workers
- Realistic scenarios helped in better understanding
- Improved retention and increased productivity
- Reduced the time taken
- Optimizing cost
- Operational efficiency
- Less chances of errors

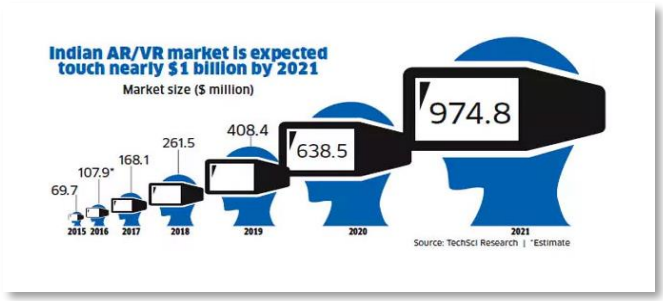
Mahindra Rise was the winner of IMC Digital Technology Award Excellence in IT Service in 2018



How the factories of the future will look?



The Road Ahead



India has a lot of potential and with Industry 4.0 at its peak there are a lot opportunities to look forward to. Currently the market size is around $ 408.4 million which has the potential to increase to $ 978.4 which more than double. So, India has a lot of opportunities lying ahead which will help it in development of industries and forge into Industry 4.0 at a much faster pace

Retail Supply Chain in the Face of Artificial Intelligence (A.I.)

- Shreya Jain
Indian Institute of Management, Calcutta

Global retail industry is expected to grow 5.3% CAGR to reach USD 31,880.8 billion by 2023. Dramatic shifts in the industry has created new winners over the past decades, displacing as many as six of the ten largest US retailers.

US revenues, $ billion

New to top 10 in 2012
Dropped out of top 10 by 2012

Rank	1990		2012	
1	Wal-Mart Stores	32.6	Wal-Mart Stores	328.7
2	Kmart	32.1	Kroger	92.2
3	Sears	32.0	Target (formerly Dayton-Hudson)	72.0
4	American Stores	22.2	Costco	71.0
5	Kroger	20.3	Home Depot	66.0
6	JCPenney	16.4	Walgreens	65.0
7	Safeway	14.9	CVS Caremark	63.7
8	Dayton-Hudson[1]	14.7	Lowe's	49.4
9	A&P	11.4	Safeway	37.5
10	May Department Stores	10.1	Amazon.com	34.4

[1]Dayton-Hudson changed its name to Target in 2000.
Source: *Stores*; US Securities and Exchange Commission filings; McKinsey analysis

Fig1. Shifts in the retail industry often create new winners

According to a study by Forrester, there has been a shift in the balance of influence from manufacturer (Age of Manufacturing) to consumers (Age of the Customer), empowering the latter to drive the retail trends (figure 2). Juxtaposition with competitive pressures from disruptive e-commerce has caused existential crisis to the traditional way of doing retail business, impacting the way traditional retail supply chain was organized. These shifts have necessitated knowing what the consumers want even before they themselves know!

Consequently, experience-per-square foot has replaced the traditional sales-per-square foot as the primary measure of retail performance.

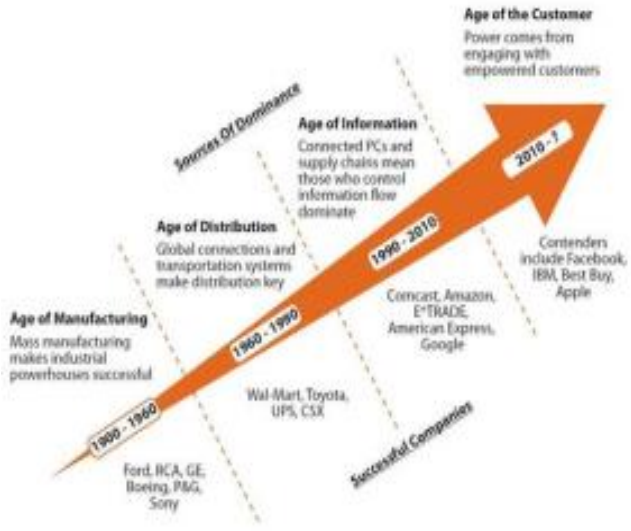


Fig2. Shift in balance of power and rising consumer influence

Walmart generates a whopping 2.5 PB data/hour from customer transactions, but data alone is meaningless. Algorithms, however, applied to the 'dumb data' aids businesses in problem solving and faster decision making, eliminating human biases and guesswork, thereby providing the right logic and more importantly, at the right time. Cost savings has been identified as the major impact of retail analytics, majorly realized at four levels (figure 3) through prescriptive and predictive modeling. A recent McKinsey study has discovered that retail analytics has resulted in upto 19% increase in operating margin. No doubt that retail analytics industry is anticipated to grow by more than 20.08% over the forecast period 2017-2025.

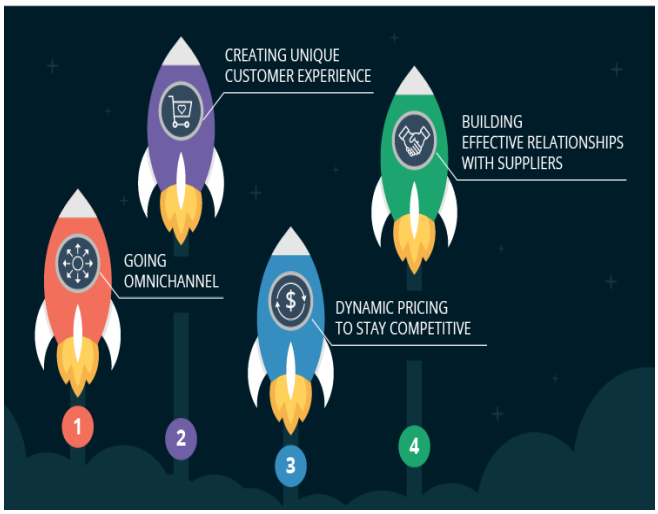


Fig3. Four retail trends supported by data analytics

A report by Deloitte has identified more than twenty ways in which retail analytics can help increase the size of the retail value and supply chain. Macy's 'On Call & Doing', a shopping assistant platform in collaboration with IBM's Watson, has helped to create a seamless omnichannel experience for its consumers, empowering them to order online, pick up/return in store, door step delivery etc.

Nordstrom, with their initiative 'Reserve online & Try in store' has gone a step further: customers passing by the store receives a message "*Hello. It looks like you are nearby, and your item is ready to try!*" with curated list of personalized items, and to top it, customers find their name on the door of fitting room once inside the store! This has given rise to a new 'brick & click' business model to create a unique 'phygital' experience for the customers. WD retail consultancy has pointed out to the need to have flexible configurations with modular elements of experience, product, services, and localization.

Algorithmic retailing (AR) has also enabled retailers to create a detailed perception maps of consumers and find out characteristics of longer lifetime customer value by analyzing greater number of variables (market, influencers, social activity, shopping history etc.), thus making targeted marketing successful.

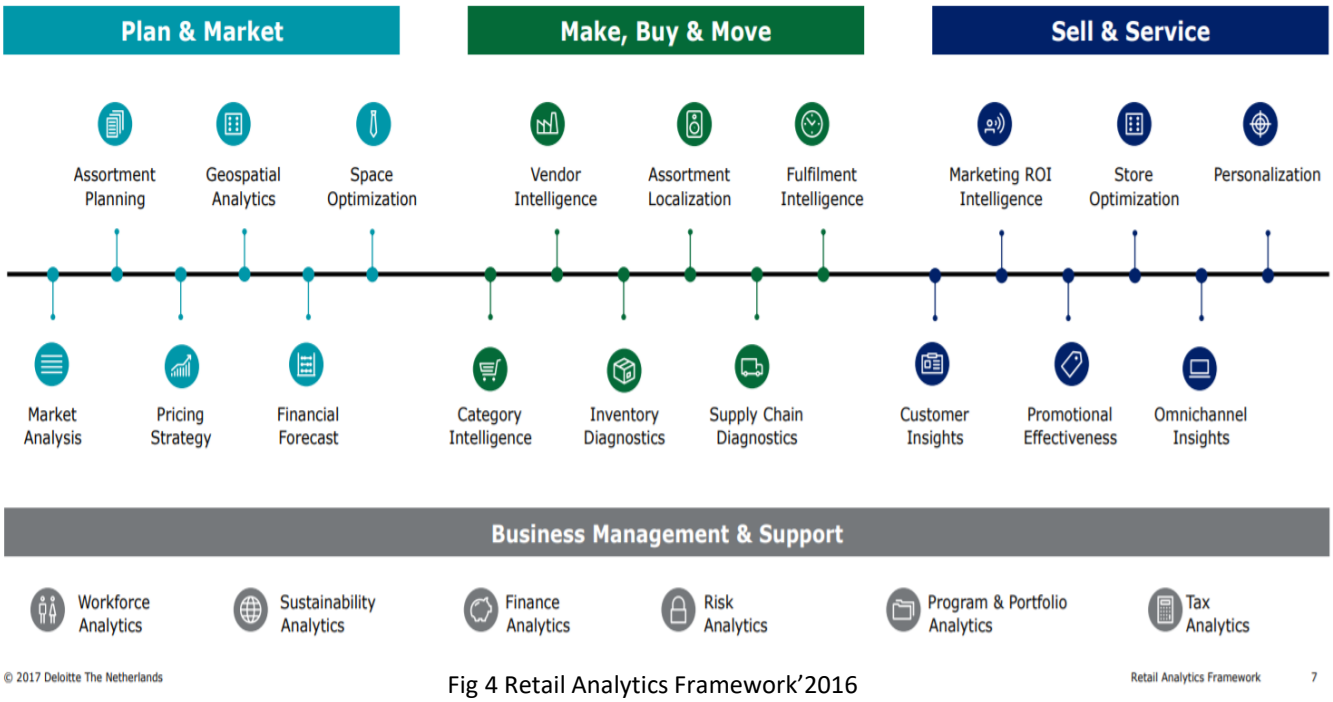


Fig 4 Retail Analytics Framework'2016

For example, Amazon's 55% of the total sales is driven is its recommendation engines. In another example, Home Depot used 'geo-fencing' technique to increase footfall in its store. To move a step ahead, AR is also being used by jewelry retailers like John Lewis to pre-prepare their staff for sales' pitch and upselling tactics.

Walmart, in 2004, stocked up huge amounts of 'Strawberry Pop-Tarts' in Florida just before the hurricane Frances. Why? Through predictive analytics, they found that customers demand for the product increased seven folds during that time! In another case, Walmart's *'On-Time, In-Full'* principle quantified the value of strategic partnerships with its suppliers, helping it optimize supplier base, reduce inefficiencies of bullwhip effect and shorten the lead time, thus creating a potential add of $ 1 billion to its revenue. As per a survey by 100 corporate retail professionals, 87% support the view that inaccurate inventories are to blame for more lost revenue than theft, which is increasingly resolved through inventory diagnostics. Route planning is another key area that has benefited from AR. Connected logistics, i.e. trackers and sensors collecting complete story at each point, applied by the brewing giant Anheuser-Busch led to increase in productivity and efficiency.

Despite the myriad of benefits that algorithmic retailing offers, there are a number of challenges that hinders the growth; data privacy being the most pressing issue of all. In 2013, Nordstrom faced a major backlash for using Euclid Analytics (a tracker that tracks every movement of people inside and outside of the store through Wi-Fi/ Bluetooth).

Collecting and collating the data from disparate systems, valuable time being used up in multiple boardroom meetings and approval cycles for the 'real-time data', and the lack of public private partnership are some other pertinent issues to be taken into consideration. Also, a recent survey by Jabil of more than 300 retail decision makers (figure 5), brought out that 71% of the respondent are not strongly confident in their current organizational structure and partner relationships to be fully capable of delivering needed technology innovation. Nonetheless, as pointed out by McKinsey, IoT in retail could have an economic impact of $410 billion to $1.2 trillion per year by 2025, which makes algorithmic retailing as the future of retailing.

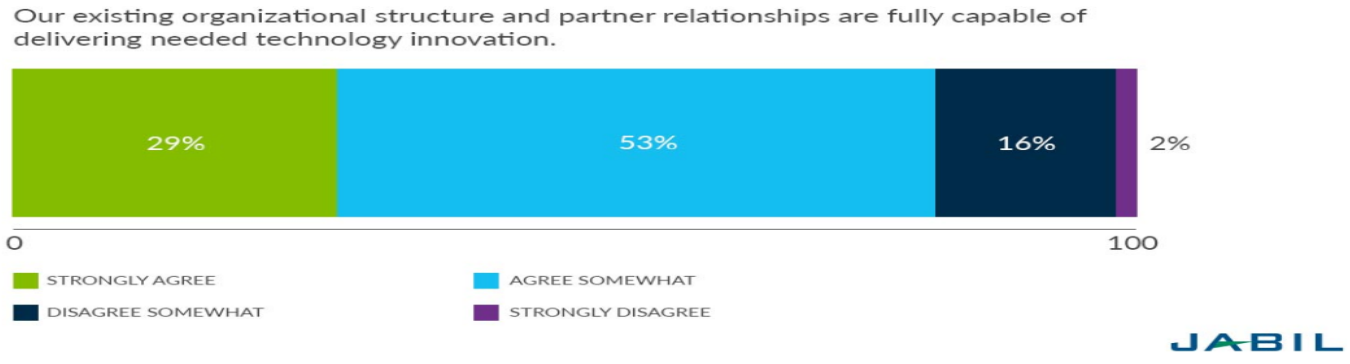


Fig5. How Retail Technology is Transforming a $3.53 Trillion Industry

Startups in the field of Operations

The field of operations is continuously evolving to make processes better across established organizations and also within these organizations which includes bringing about changes in their internal policies and activities. However, startup founders have recognized the need of mastering their companies' operations way ahead of established firms and a lot of new ventures today are laying their foundations on their company's operations. After all- operational strategy is the back bone of corporate strategy.

Here are some Indian start ups which have based themselves on providing solutions to challenges based on the various principles of operations, namely, artificial intelligence, supply chain and logistics:

1. Hand tribe: Founded in 2017 by Arihant Singhvi and Manavika Phukan- is an open marketplace for handmade products, arts & craft products and for digital print downloads. It is a peer to peer marketplace that sources products from Micro-Entrepreneurs & SME's, all across the country, to bring the best of the internet to its customer. They have always believed in strengthening their supply chain. The main issue, they realized, was not the dealer's skepticism with e-commerce, but the lack of platforms catering to the needs of a small retailer. Features such as being able to answer buyer queries via an inbuilt messaging system eased the transition for them. Along with strengthening the supply chain, they curate products especially for the buyer who is looking beyond discounts- at products that are fun-filled and quirky and satisfy certain needs.

2. Rezo.ai: Automation of customer experience with AI. The start-up is founded by an IITian couple Manish and Rashi Gupta. It uses an artificial intelligence driven platform that simplifies daily work flow by automation of manual tasks in customer experience and satisfaction. It uses AI engines to improve customer experience for different brands. The problem they identified was that brands spend around 10% of their top line on customer experience. But then also customers are sick of pressing 2 for reservations and 3 for service. At the same time, service reps are sick of answering the same questions over and over. Hence, Rezo.ai uses historical data for that particular brand and feeds this textual conversation into its AI engine. The machine learning algorithms has been developed by Rezo.ai over the period of two years. Automating the conversations helps the particular client understand the intent, issues, concerns and queries raised by the customers and also respond to them quickly. Apart from machine learning, Rezo.ai uses natural language processing, feedback mechanisms, predictive analytics and algorithms to automate the daily work flow of the client. It is useful for improving customer service by giving them a personalized, frictionless, on demand and data driven experience.

3. Rivigo: The Indian road freight market size is estimated at around $155 billion, of which around $135 billion is full-truckload (FTL) market, but it has been facing a growing challenge of shortage of truck drivers. . Founded in 2014 by Deepak Garg

and Gazal Kalra, Rivigo currently owns a fleet of over 3000 trucks. It received $65 million as part of its Series E round from its recent investors SAIF Partners and Warburg Pincus. This Gurugram-based logistics startup announced, in June this year, that its driver relay model has been granted patent rights by the United States Patent and Trademark Office (USPTO). Their model ensures that the drivers are behind the wheel for at most 4 to 5 hours at a stretch and reach home the same day. It uses algorithms to develop an intelligent driver allocation system that picks the driver for duty and allows equal driving hours, rest hours, and transit hours for drivers.It's system also records the driving behavior of the drivers on duty. In its bid to bring transparency in the road-freight marketplace, they have launched National Freight Index (NFI) that will provide live freight rates for different lanes and vehicles across the country. Stating a severe shortage of only 482 drivers for every 1,000 trucks in India, the logistics startup claims that their 'Relay-as-a-Service' will provide a sustainable and scalable solution to fleet owners.It competes with others like LEAP India, Locus, LogiNext, Shadowfax and even Delhivery, which is the first Indian logistics provider to achieve unicorn status.

4. Craftsvilla: A centralized distribution system will require an efficient logistics system to meet the demands of customers spread over wide geographical areas. Thus, Craftsvilla.com has acquired Mumbai-based virtual logistics startup Sendd, a move that marks the retailer's first acquisition this year. The all-equity deal valued the logistics company at close to $5 million. Manoj Gupta, the founder of Craftsvilla.com, said that the acquisition was done so that they could get complete control over logistics. Sendd showed they could reduce RTO (Return to Origin) by more than 25% and logistics pricing up to 30%. Gupta swears by the startups' logistics engine, which can predict in real-time, which shipment should be given to a particular courier company based on its efficiency levels like delivery time and RTO. According to the terms of the deal, the startup will continue to operate independently and will also be able to sell its products to other e-commerce firms and marketplaces. Sendd will work on building a new data-driven virtual logistics platform. The platform will allow users to select among different courier companies to deliver products in the most time and cost-effective manner.

Craftsvilla.com
THE LARGEST ONLINE ETHNIC STORE

The strengthening of logistics of a company is strengthening its supply chain thus ultimately delivering value addition to the customer and strengthening customer ties. Overall, Indian startups are ready to take on challenges of the new world and solve them with operational efficiency.

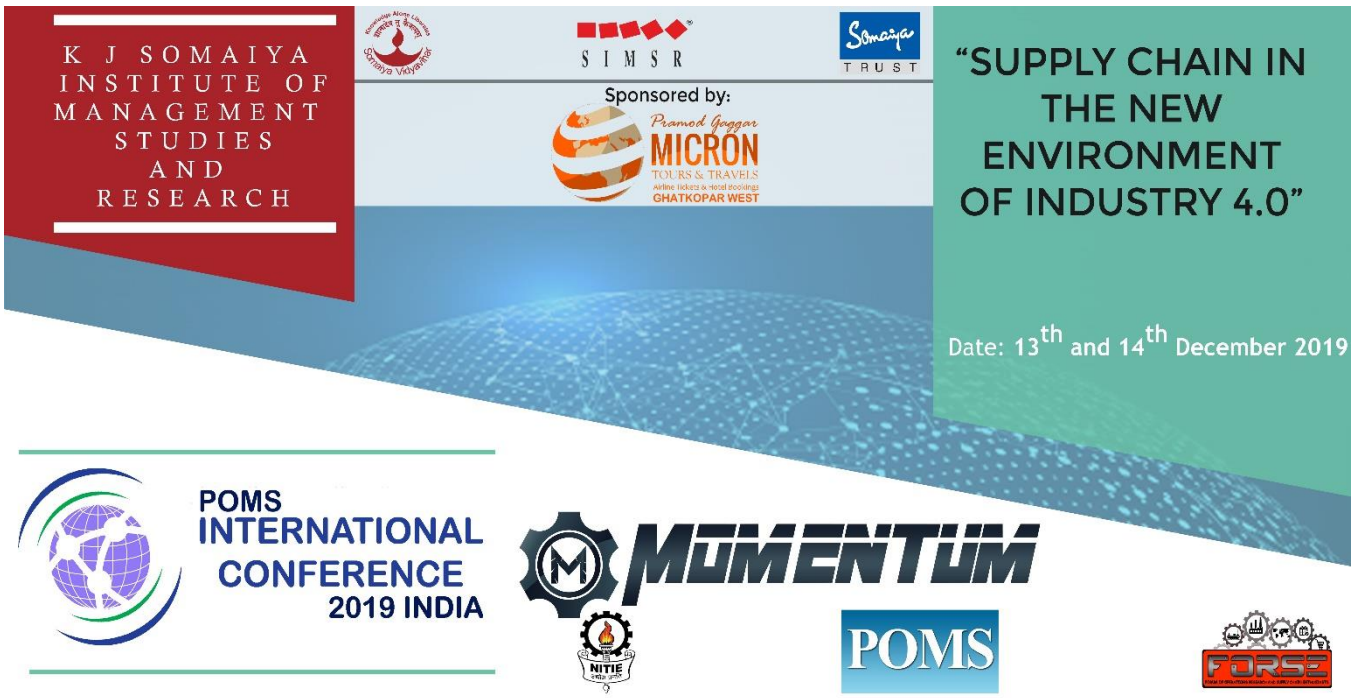
POMS International Conference, 2019

This year the flagship event of FORSE, an international conference on Operations and Supply Chain, in collaboration with the National Institute of Industrial Engineering (NITIE) and Production and Operations Management Society (POMS) India Chapter, was held on 13th -14th December 2019.

More than 75 research papers were received from across India and outside India such as Germany, U.S.A., U.K., Australia, China and other countries.

Key note speakers for this conference were Prof. Sushil Gupta (Executive Director POMS USA), Prof. M. R. Rao (Professor Emeritus ISB Hyderabad India) and Mr. Neeraj Verma (Partner C&O at KPMG). Conference also had Panel Discussion on Industry 4.0 and Practices in Supply Chain & Operational Excellence by industry experts.

Students of DHBW Stuttgart, Germany also visited SIMSR and participated in this conference. Members of FORSE got a chance to interact with them. Also, Industrial visits were organized to companies such as Technova, TOI Press & BPCL for students of DHBW & members of FORSE.



Visit POMS Website for updates:
www.scmconferencesimsr.somaiya.edu

Follow us on LinkedIn:
www.linkedin.com/company/poms-international-conference-2019

FORSE on YouTube

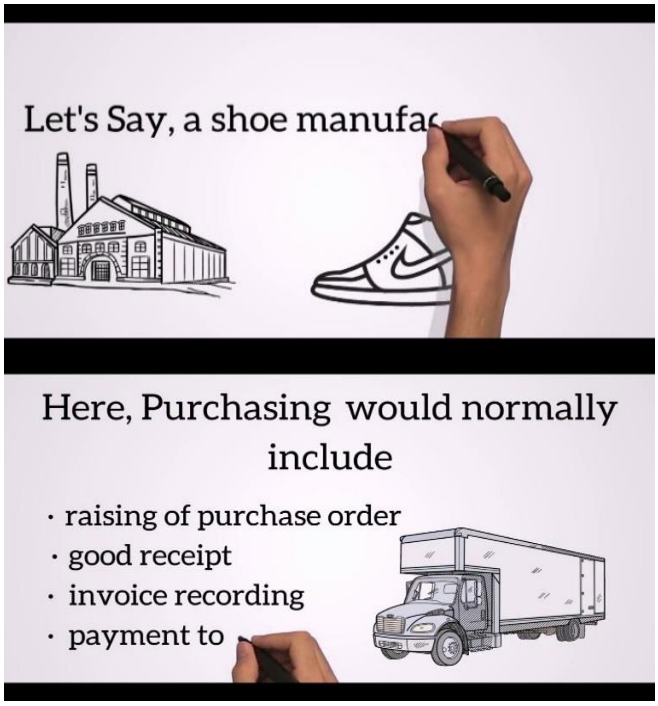
YES, you heard it Right!!!

FORSE - the official operations committee of SIMSR is going **LIVE on YouTube** with its official YouTube channel.

The thought behind this initiative is to share knowledge through YouTube as well.

With its strong knowledge base, FORSE is coming soon with this KSS initiative where content and video would be created and designed by FORSE itself and would be shared on its YouTube channel.

Stay tune for the updates….



The Walk of Green

What's better than to bring improvement, where you spend most of your time?

This time FORSE came up with its new event: **The Walk of Green,** which gave the SIMSRites a chance to take **Green Initiatives** in their campus. Sustainability in Operations was the basic theme which gave the participants a chance to pitch their ideas on how simple processes in our campus be turned into meaningful green ventures. After evaluating through different rounds, finalist shared their ideas in the presentation round

Green initiatives shared by them included E-laundry, Food Management System, Online Examination and Connect within the campus (Biometrics). These ideas were evaluated by our faculty judge Dr JS Lamba sir.

The participants earned cash prizes, certificates and most important of all, they got a chance to pitch in their ideas in front of our respectable faculties about their unique green ideas which can help make our campus a better place.

OpsQuest: Simulation Game

We at FORSE believe in active, practical and application based learning and what's a better way to learn than through a simulation game?

After working on around 4 months and spending hours on brain storming and designing, we developed our own new **in house game, a hard-core operations management based scenario** that requires practical problem solving skills for progressing.

The participants were required to implement the concepts and principles of operations management, they had learnt in the academics to real world problems and challenges faced by the industry. The students were tested over a range of concepts from procurement to logistics and demand forecasting aspects along with logical reasoning.

There were many challenging scenarios and constraints they faced and had to brainstorm before making an informed decision.

Sanrachna: Case Study Competition

In today's world, businesses are undergoing digital transformation with the introduction of automation, AI, cloud computing, additive manufacturing to survive in the more than ever dynamic, volatile, complex and global nature of the supply chain.

Sanrachna, a national level case study competition, was one of the three pre-buzz events before the International Conference on Supply Chain held in the first week of December. The first round was an online quiz which included questions from all specializations and after shortlisting from the various teams that had registered, only 40 teams were selected for the next round. The second round was the case study round in which the selected candidates had to solve the given case study and send in their solutions through a PPT. The case study dealt with waste management in Mumbai. Participants are asked to design the waste collection and handling system and were tested on the logistics of waste collection given the constraints, marketing and HR knowledge. The last round was an on-campus round.

Organizing Sanrachna was an enriching experience for the team FORSE and a lot of hard work and dedication was put into it to make it a successful event.

Six Sigma by KPMG

In the era of fierce competition, organizations need to improve business processes. Six Sigma provides students the disciplined methodologies for that.

FORSE provided opportunity of Lean Six Sigma Green belt conducted by KPMG to students of all specializations. It was conducted from 7th to 10th September 2019. This 4 days 32 hours program helped students to learn how to improve business productivity by eliminating waste and reducing process variations. With the additional refresher course, concepts were even clarified further.

With overwhelming response and the reviews received from the first batch of this year, the second batch was kept from 30th November to 3rd December. Six Sigma contributes to the variety of fields and hence it is extremely helpful to the students.

Intern Diaries

Power is gained by sharing knowledge and not hoarding it."

FORSE conducted a session of Intern Diaries for the first-year students. Second year students, who had interned with good companies such as RBI, HP, EY GDS, Piramal Glass, Hikal and many more shared their internship experience with the students and gave them several useful tips that could help them to crack internship interviews and ace their internship preparations.

Interns from various fields such as Finance, Operations, Marketing and HR were a part of this event. The event was an interactive one and helped the first year to gain useful insights.

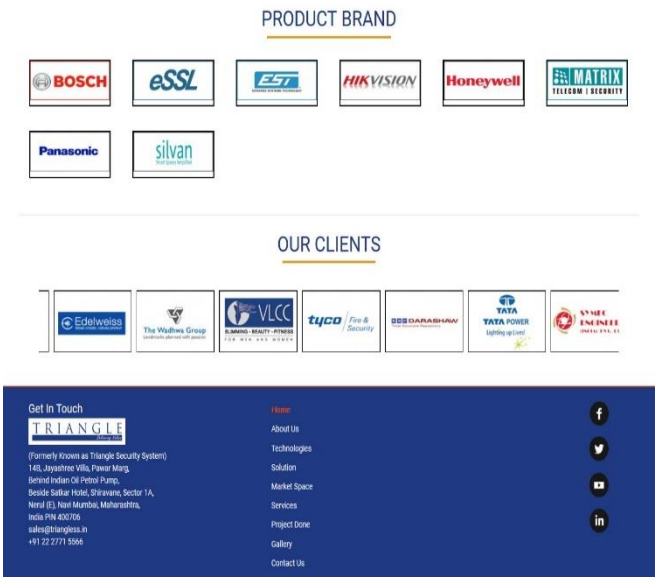
Live Project: Triangle

Live projects are important as they provide hands-on experience on ongoing work of a company. Students get to apply their skills and knowledge to real time projects as well as to develop their skills. Triangle Technology Private Limited was founded in 2012. They provide Electronic Security Solutions such as Home Automation, Video Surveillance, Gate Automation and Smoke Detectors. The FORSE presented this live project opportunity to the students.

The selection process was on the basis of telephonic interview. After which few students were shortlisted for the live project.

The students worked on B2B Business Development. This is an excellent opportunity to learn how to deal with B2B clients. It helps in understanding the concepts of B2B as well as B2C sales. Apart from this, students also learnt how to analyse target audience and how to pitch them accordingly. Also students learned Business communication through this opportunity by making pitch presentations and approaching clients.

The students may also be offered internship opportunities on the basis of their performance. Thus, live projects helps one to add value to their CVs.



Intern@ GEP®

SHASHANK KATTISHETTI
PG-Marketing
2018-20

GEP Worldwide is world's leading Procurement Consulting firm headquartered in New Jersey, USA. It is a global leader in Digital Procurement and Supply Chain Solutions with offices in over 18+ countries. I had the opportunity to intern at GEP, Mumbai for 2 months of April and May, 2019

Internship process at GEP was pretty streamlined with detailed planning for the whole course of internship. There was a dedicated 10-member core-internship team responsible to manage the internship experience. Beginning on April 8th, 2019 with 3-day induction program the internship saw interns from leading B-schools all over the country. Two evaluations were conducted, Mid-review and Final-review, each after 4 weeks and finally the internship ended with an extravagant Farewell party.

During my 3-year stint at Deloitte, I developed great passion for consulting and GEP provided an excellent platform for me to explore management consulting. My client is the world's leading water technology company and I worked for its offices in USA and Europe. My work revolved around Packaging, Office Supplies and HR categories. Packaging demanded tasks like Opportunity assessment, Request for Proposal (RFP) preparation, RFP Analysis, Price analysis, Benchmarking and negotiating with the incumbent suppliers. Spend analysis, Product standardization, Demand optimization and cost savings were the activities performed in Office Supplies. During the course of my internship, I was fortunate to deliver the Office supplies project end-to-end for which good cost savings were realized and appreciated at the client side. As part of internal firm building activities, I developed a White paper on the topic "How should CFOs respond to Recession?" which was published in GEP's Annual Thought Leadership program.

One of the best things I liked about GEP was its work culture. The entrepreneurial spirit, energy on the floor and fun-loving attitude just rubs off on you over time. The flat-structure and focus on meritocracy gives ample growth opportunities for your career.

Working with some of the best minds in the business, I got to learn a great deal about the Management Consulting industry in general and Procurement domain in particular. The 8-week internship experience was equally enriching and memorable with my crowning of 'GEP SUMMER IDOL KING' at the Farewell party being the cherry on the cake ;)

Intern@

Piramal Glass

Shrenik Karia
MMS Operations
2018-20

Summer Internship enables a MBA student to get a practical exposure of the theoretical knowledge gained and a 2-month experience in their respective areas of interests.

When Piramal Glass came to the campus for summer internship selection process, it had one of the rarest selection processes inside SIMSR. The selection process consisted of just an aptitude test and a telephonic interview. They selected only 1 intern from the campus for summer internship.

Since my summer internship work location was at Surat, I was quite excited to work, considering the hot climate and working in a manufacturing plant as I intended to pursue Operations as my specialization in the 2nd year. On the very 1st day itself, I was put into a project which consisted of Lean Manufacturing. My job was to do process optimization of the resorting area in the manufacturing plant. Resorting area is the place where all the defective units are brought for defect inspection after being rejected by the Quality Assurance department. My first month of the internship was focused on collecting data for the various non-value added activities done by the sorters apart from the regular defect inspection. The major aim of the project was to enhance resorting efficiency by creating an productive workplace by integrating ergonomics and lean thinking. After 1 month of data collection thereby reducing non-value added activities of motion and transportation. After 1 month of data collection, I recommended suggestions to the middle management and started implementing the same. The number of glass bottles sorted before the project started were 5000 bottles per sorter per day and after the project was completed, the number increased to 6000 bottles per sorter per day.

One of the key learnings during my summer internship experience was that as a prospective leader/manager in the future after MBA, it is very important to have patience to get the work done especially in these kinds of environments wherein the workers are doing the repetitive activities since years. In such cases, the patience in yourself in order to tackle their behavioural moods and changes plays a key role.

I'm thankful to the whole management team in the manufacturing excellence cell at Piramal Glass for guiding me and giving me such a wonderful opportunity to explore and implement my ideas in the project and for being cooperative in my internship tenure.

- **Queenci Kotak and Maitri Shah, Prin. L. N. Welingkar Institute of Management Development & Research (WE School), Mumbai**

The article writing experience was very insightful. We had done extensive research on the chosen topic. We got to explore the field of operations and learn new things. It also helped us to broaden our perspective about the several management functions and how important they are to each other."" - Winner and Writer of Interdependence between Operations and Other Departments, September 2019 Issue

- **Ekta Arora and Ankit Vyas, K. J. Somaiya Institute of Management Studies and Research, Mumbai**

"Information technology has been breakthrough in the field of Operations. The theme of September edition of Momentum was an opportunity for us to research on how IT has helped business in today's competitive world. Writing an article helped us to gain knowledge in such a vast field of IT Operations. We thank FORSE & Momentum for providing this opportunity." - First Runner-up and Writer of Information Technology – At the Core of Business & its Operations, September 2019 Issue

- **Daaman Bhatia, Delhi School of Economics, New Delhi**

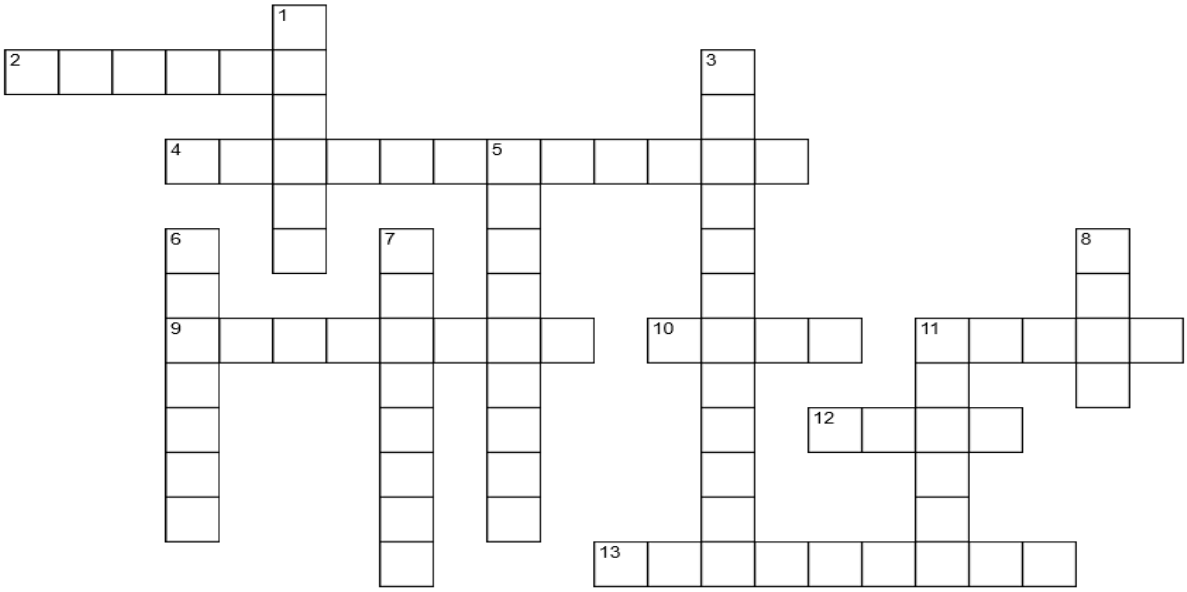
"It was a great experience to write about HR and operations management. This was my first experience and fortunately secured 3rd rank. For writing this article I have gone through numerous research papers and accordingly I formed my opinion on the topic." - Second Runner-up and Writer of Interdependence between HR and Operations and Its Impact, September 2019 Issue

- **Payal Nobokumar Golui and Deepansh Garg , K. J. Somaiya Institute of Management Studies & Research, Mumbai**

"Technology has disrupted every aspect of the business and will continue to do so. Working on this article for momentum gave us the opportunity to dive deeper into such change, gather relevant data and share our findings with everyone." - Writer of Robotic Process Automation: The Game Changer, September 2019 Issue

Brain Teasers

• OpsWords



Across:

2. It is a correction factor defined as the ratio between the real distance travelled by road and the straight line between the two points

4. An order fulfilment method where a store doesn't keep the stock of the materials it sells instead, it delivers the product to the customer through 3rd party or shipped directly from the manufacturer.

9. A type of inventory that is at the end of the Product Life Cycle. This inventory is not sold for long period nor is expected to be sold in the future

10. Maximum amount of time in which product needs to be produced in order to satisfy customer demand.

11. The trilogy which consists of Quality Planning, Quality Control, Quality Improvement

12. Japanese term which means wastefulness, uselessness and futility

13. A type of intermodal transport, which is a combination of rail and motor services.

Down:

1. A set of software development practices that combine software development and information technology operations

3. A tool of strategic management, that allows organizations to set goals and measure productivity on the basis of best industry practices

5. Set of rules which define the responsibilities of sellers and buyers for delivery of goods under sales contract

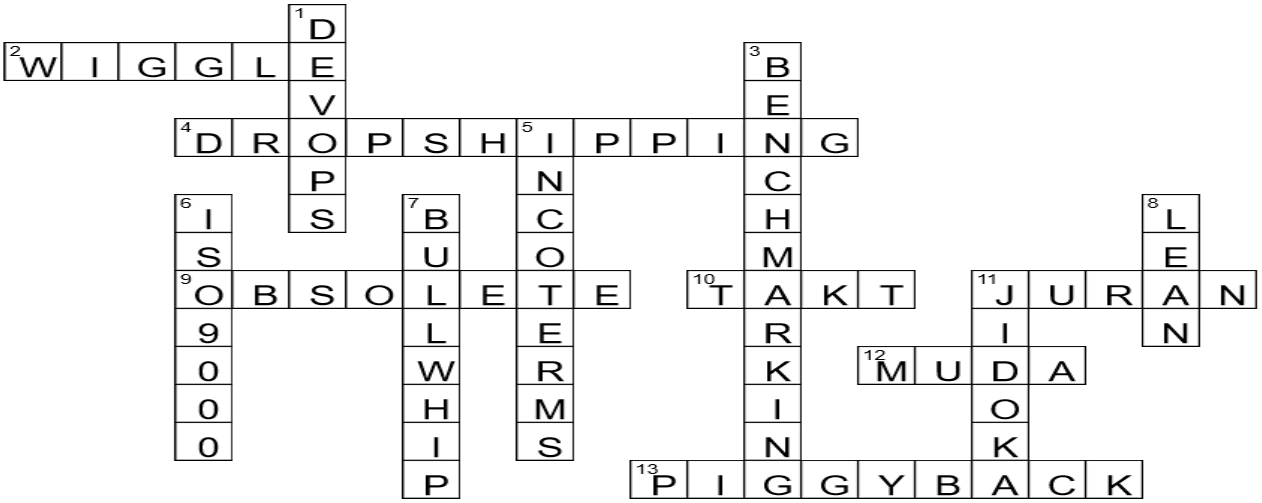
6. A set of international standards on quality management and quality assurance developed to help companies effectively document the quality system elements needed to maintain an efficient quality system.

7. The phenomenon of increasing fluctuations in inventory in response to shifts in customer demand as one move further up the supply chain

8. A type of management technique developed with the aim of minimizing waste

11. One of the pillars of Toyota Production System, highlights the cause of problem because works stops immediately when the problem occurs.

• Answers of OpsWords of September 2019 Edition:

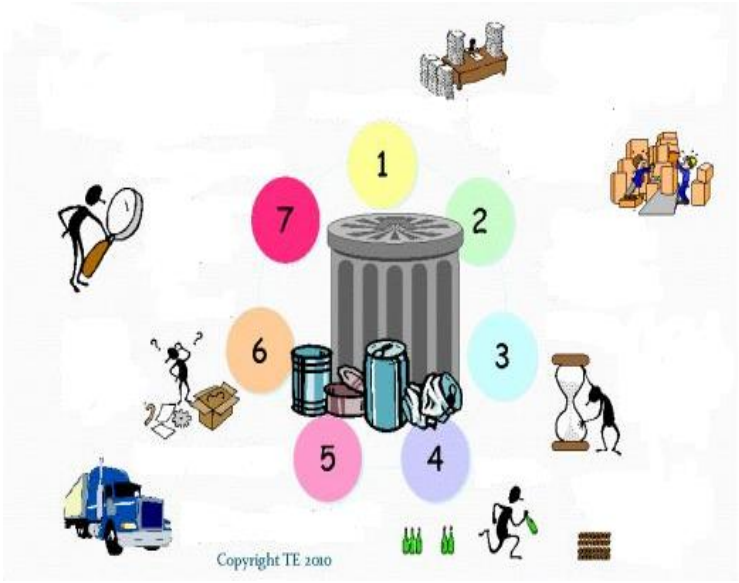


Brain Teasers

- **Quiz**

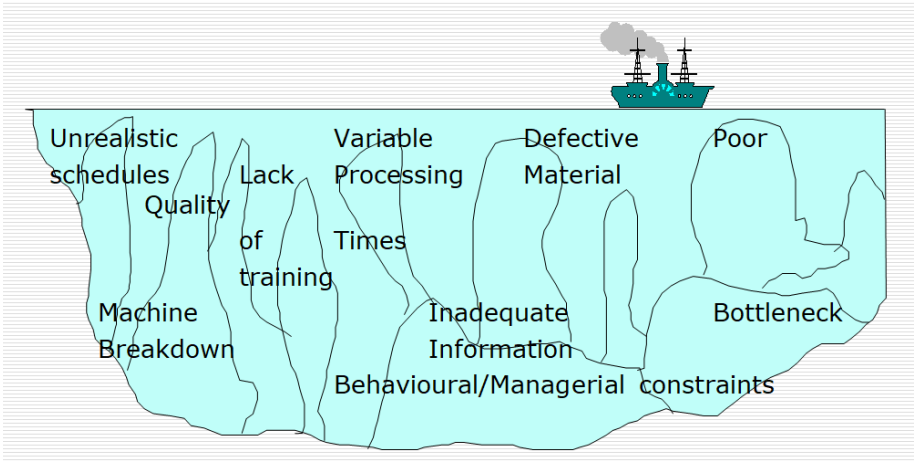
Identify the System/Processes/Terms/Analogy from the below pictures

1

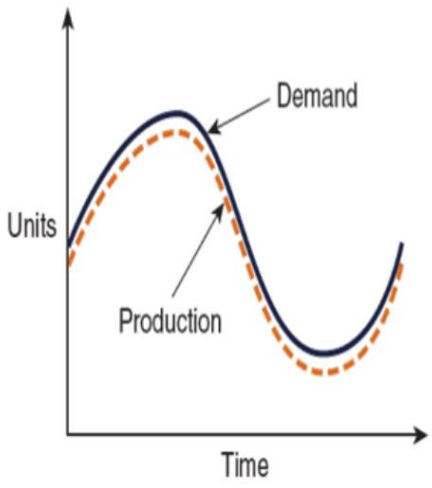


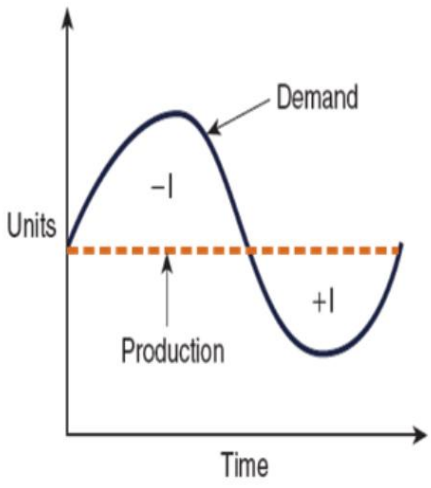
2

3



4. Hint: Capacity planning strategies





5. Hint: Inadvertent error prevention

SPONSORS for the POMS International Conference

Pramod Gaggar
MICRON
TOURS & TRAVELS
Airline Tickets & Hotel Bookings
GHATKOPAR WEST

JSW
Cement

ComfyBus
Your Comfort Matters

iraje
Enterprise Data Security

Rasik
PUBLICITY CO.

Since 1965
Bharti
Jewellers

The Gamechanging Acers…

"There is **no shortcut for hard work** that leads to effectiveness. You must stay **disciplined** because most of the work is **behind the scenes**."

- Germany Kent

TEAM MOMENTUM

"If everyone is moving forward together, then success takes care of itself." - Henry Ford

Faculty In-Charge

Dr. Pramod Shetty

Area Chairperson
Operations

Designer

Ankit Vyas
Jay Gala

Editor

Nidhi Ghadialii

Key Contributors

Anuj Agarwal | Bikramjeet Sandhu | Bradley Fernandes | Deepansh Garg | Devendra Panda
Harin Gada | Hiral Mody | Kaustubh Karanje | Mahima Khathuria | Manav Barbhaya
Mehul Jain | Navpreet Bolla | Neha Sarkar | Nikhil Mhatukade | Parth Dedhia
Payal Golui | Pratik Landge | Rohit Deshpande | Rohit Srivastava | Sanket Mehta
Shrishti Sarda | Shubham Shah | Srishti Mall | Vandana Shivani
Vedang Makwe | Vinit Shah | Vrushank Pundlik

simsr.forse forsesimsr forse.simsr