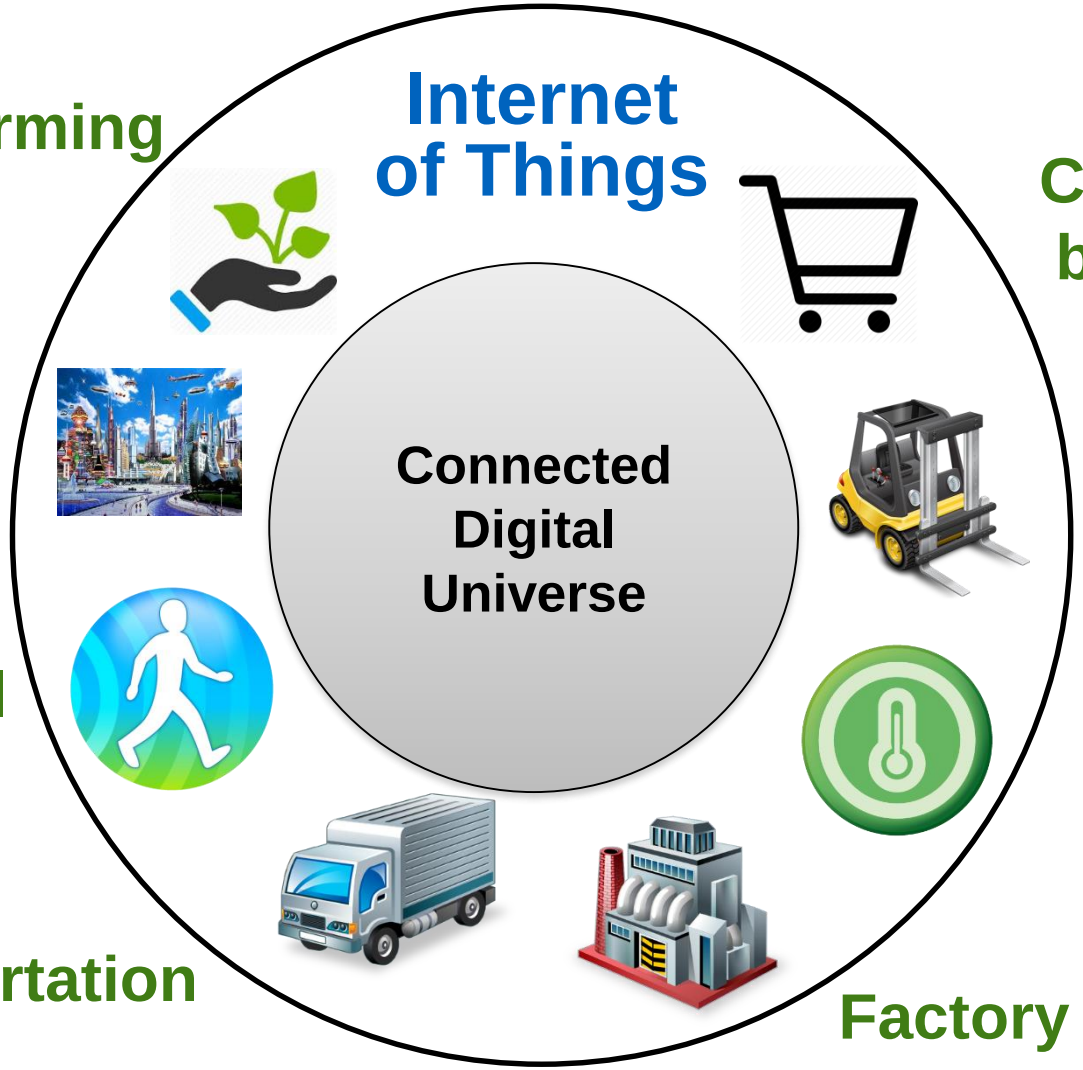
Broad Themes

Smart Precision Farming

Future Campus of Learning

Connected Personal Wellness

Intelligent Transportation



Consumer Experience based Retail strategy

Smart Green Supply Chain

Governance and Self-healing Assets

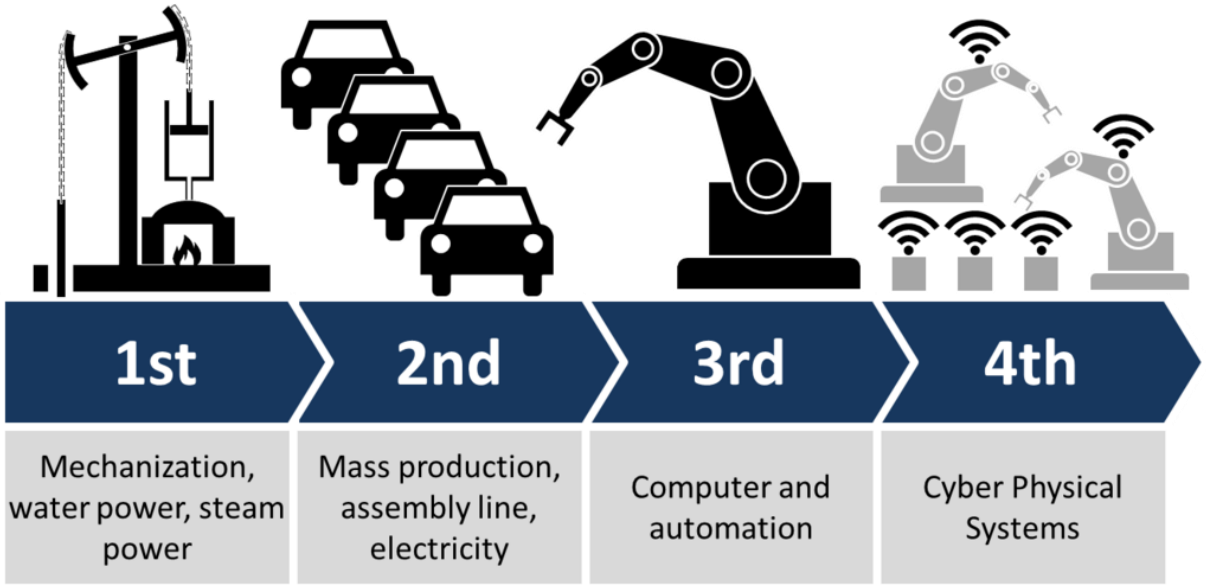
Factory of the Future

Factory of the future

Factory of the Future uses a connected digital manufacturing framework that will enable manufacturing enterprises reduce costs, lower risks, and reduce the time-to-market.

Global corporations are undertaking Digital Re-imagination of manufacturing and realizing full potential of Industrial Internet of Things & Industry 4.0 .

Read perspective and thoughts of TCS leaders who are helping customers in this exciting journey
http://sites.tcs.com/blogs/engineering-the-future/tag/smart-manufacturing/



- What if factory becomes paperless?
- What makes machines to become smarter?
- What will be role of augmented and virtual reality for governance of factory?
- Can usage of 3D printing to simplify complexity of manufacturing ?
- Is it possible to develop digital thread of physical products and can it enhance manufacturing and service quality?
- Can centralized monitoring and self-healing of factory assets enhance manufacturing reliability without security risk?
- Is it possible for robots and chat bots to enhance manufacturing process and people efficiency?
- Can industrial IoT lead to new business model and growth opportunities for manufacturing organization?
- Can smart and connected machines deals uncertainty and reduce rework and manufacturing cost?

Intelligent Transport Systems (ITS)

Intelligent transportation is a end-to-end solution both for private and public transportation including the environment/ traffic sensing.
This involves intelligent, still affordable sensing, high precision control and communication between infrastructure and vehicle nodes.
The safety features are not “nice-to-have” but “must-have” for this community.
IEEE 26262, NCAP are the standards and programs are related to automotive safety, functional safety and new car assessment.
http://sites.tcs.com/blogs/engineering-the-future/iot-enabled-computer-vision-and-analytics/

- How can the trade-off between safety and autonomy in vehicle dynamics is addressed ?
- How relevant intelligent transportation is in India geography (Chaotic traffic situation) where legislative traffic rules are hardly followed ?
- What makes a vehicle intelligent?
- How intelligent and smart transportation can help differently-abled people ?
- What is the trade-off between accuracy and performance for intelligent transport ?
- How can the trade-off between accuracy and cost be addressed ?
- How a new value can be brought in to the ITS community other than the autonomous vehicles ?
- How communication/ networking/ cloud infrastructure can help ITS ?
- What is the possibility of coordination between traffic and vehicles nodes through IOT ?

Future Campus of Learning (FCL)

Future campus of learning is a campus enabled with IoT and analytics to ensure quality learning environment for the students and better work environment for the faculty members.
This includes optimized and efficient energy utilization, comfortable environment, adaptive modulation of assignment, grading, assessments.
This system would have direct influence on the group study and modulate the teaching methodology.

- How is connectivity relevant in FCL ?
- Is authenticity based access to different nodes of smart campus important ?
- Can IoT help in distant group study even including the professors' supervision on need basis ?
- Can we generate cognition based comprehensive feedback from students for the instructors ?
- How can IoT help in modulation of the teaching methodology, time table, laboratory experiments and so on?
- How can grade system be tagged to the attention of the students ?
- How the environment, water management, energy management and lighting condition be controlled automatically in campus, playground and classrooms ?
- Can we synchronize the class timings ?
- Can we generate automated assignments and assessments studying the class-response of the students and teaching patterns ?

Connected Personal Wellness (CPW)

Connected Personal Wellness aims at providing ears to hear what one's body is saying. It is one arena which is catching eyeballs.

CPW is combination of day-to-day fitness as well as detecting and treating diseases and ailments. It includes analyzing one's fitness and providing insights on development of anomaly in operation.

It can also help individuals to involve in right kind of planning in terms of insurance plans, correct diets and measures to stay healthy. This arena being new has space for lot of development.

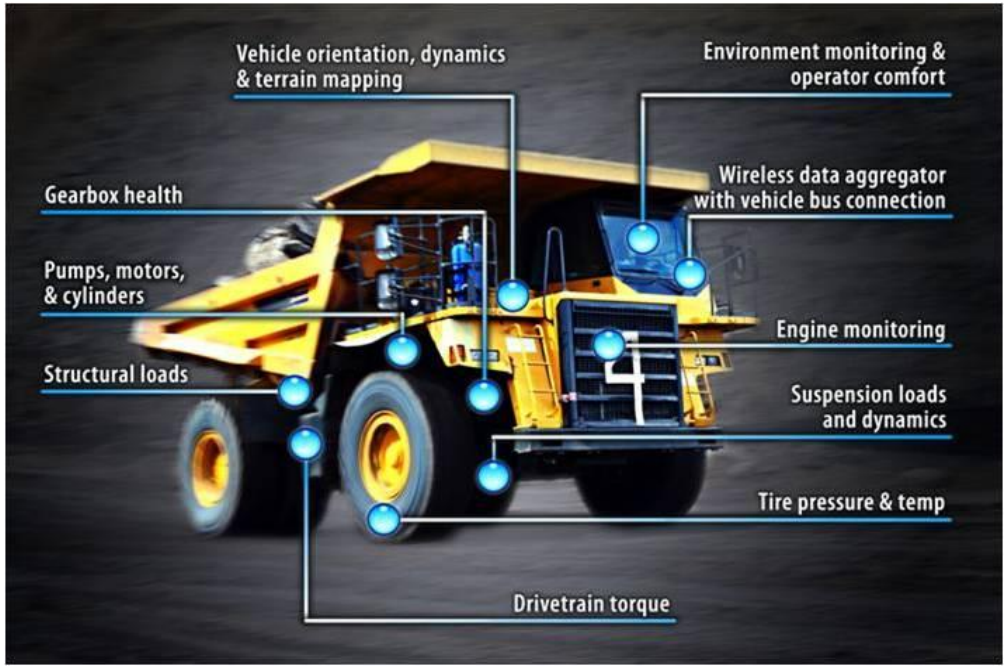
- Is it possible to have Connected Personal Wellness for all (urban or rural)?
- How can we look beyond fitness tracking?
- Can augmented or virtual reality play role to reach out remote areas?
- Can we predict a medical situation well in advance?
- Health data for a person can be sensitive, how secure can it be?
- Can we analyze and connect people with similar traits?
- Will it help in de-addiction?
- Can we make people more conscious about their health?
- At the same time can we make the process more enjoyable and less frightening?

Asset Health Monitoring

Machine condition monitoring has been an area of interest for large machines. It has been the driving force in automotive and energy industries.

Similarly, we can look for health monitoring of various assets and bring out value like predictive maintenance, live performance monitoring and anomaly detections.

This will ensure cost for maintenance, down time and timely action. These together will contribute in a better lifecycle of an asset.



- How can we bring value if we can monitor a machine?
- Can assets say when they are not well, and how can we get to know?
- Is it possible to create a soft model for every machine?
- How can we reduce variability and down times if we govern an asset?
- Can machine tell how to operate it?
- Predicting maintenance of assets, is it dream or reality?
- Can a machine communicate to another to make up for its shortcomings?
- How would an asset react to changes in the ambient?

Smart Precision Farming

Smart Precision Farming enables a farmer or agriculturist with intelligence that allows him to effectively utilize the environment, weather, soil condition, crop condition and irrigation ecosystem towards driving better quality, quantity and financial return in a sustainable way.

Precision agriculture uses digital technologies to optimize crop yields. The data collected from various sources can be processed to help farmers make decisions with regards to planting, fertilizing and harvesting crops in maximizing efficiency of operations

- What are the best methods of connectivity for the “things” in the farm given the proximity and spread (area) of the farm?
- What are the cost-effective IoT infrastructure approaches that can be applied to enable Smart Precision Farming?
- How can the farmer best leverage the weather conditions and weather predictions to lower operational costs?
- How can selective irrigation be achieved depending on soil conditions in different parts of the farm?
- How can crop conditions be monitored remotely?
- How can wastage of water used for irrigation purposes be reduced?
- How can uniform distribution of seed and fertilizer be ensured?
- How can one ensure optimal use of pesticides without adversely affecting the crop quality and environment?
- How can farm equipment and implements be made more intelligent?
- Can crop yield be predicted based on environmental, soil, crop growth rate, irrigation regularity and other parameters?
- Can the principles of energy harvesting be innovatively applied to reduce operational costs?

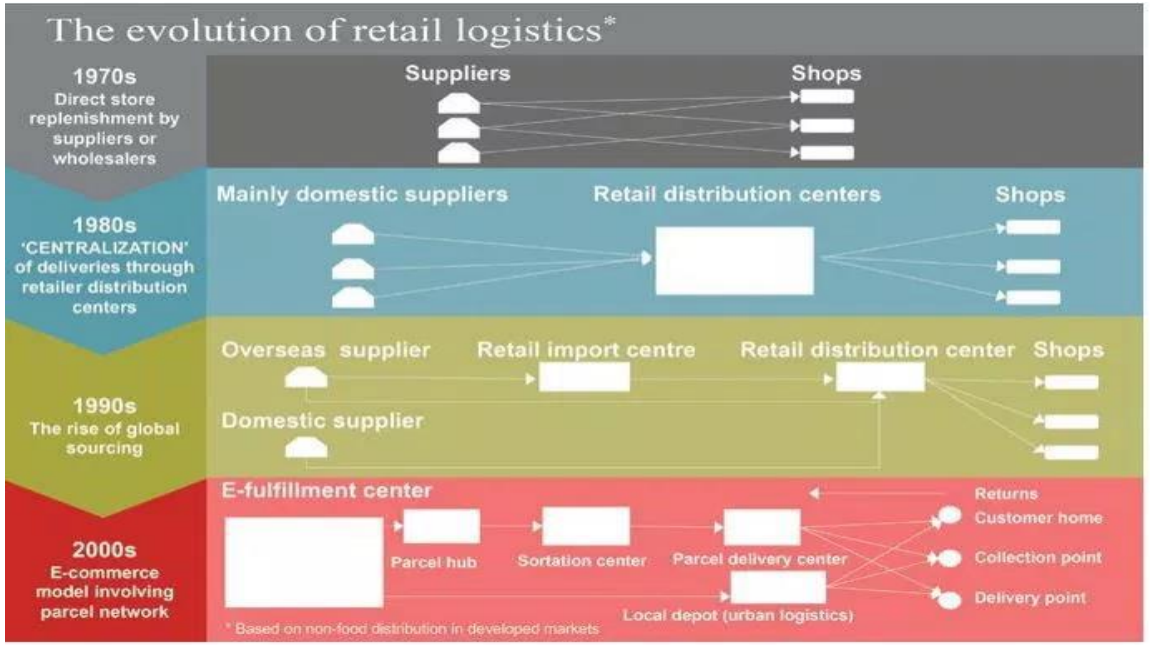
Smart Green Supply Chain

Re-Imagine Supply Chain: This theme would be a culmination of Factory of the Future, Next-Gen Transportation, Precision Agriculture, Freshness Monitoring etc. Smart warehouse or Distribution Centers are unique to Supply Chain theme. Hence the focus here will be WH/DC

DC's are the main hubs from where goods are transported to multiple locations. The typical size of a DC could range anywhere from 200,000 sq ft to a size of 10 football stadiums. The most important KPI is the through-put of the DC.

How can IoT and Automation impact the DC Operations?

(DC - Distribution Center)



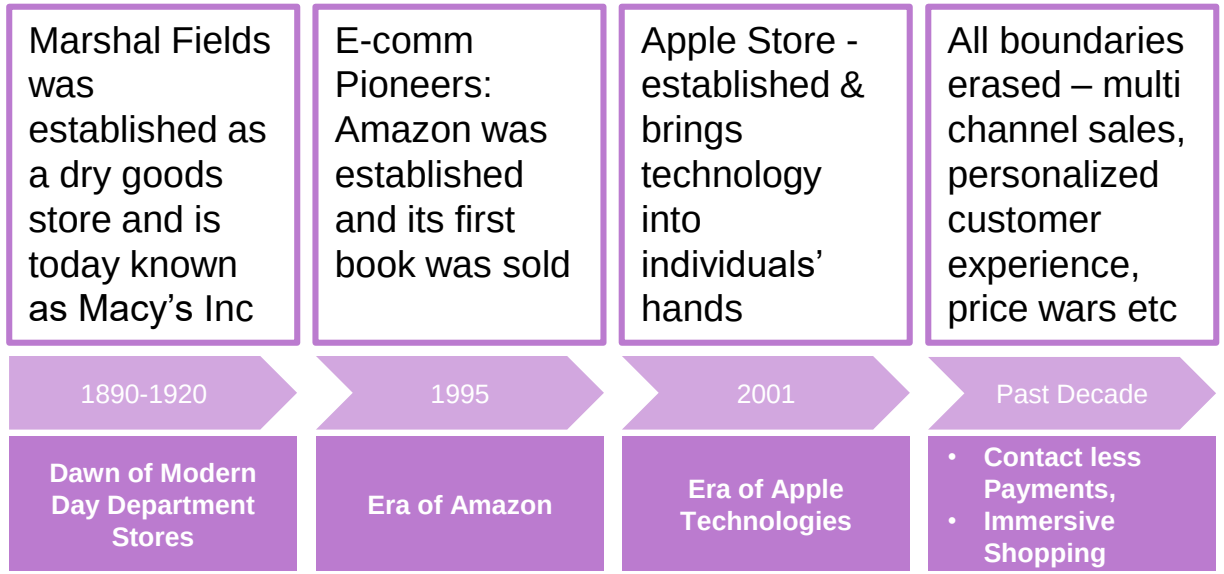
- How can IoT help in taking a stock assessment within a DC (DC - Distribution Center.) ?
- How can you establish communication between associates spread across the DC?
- How can you auto assign orders to associates based on their location within the DC?
- Can you think of ways to split one order to assign to multiple associates within the DC to bring them back all together to one packaging line/ to one single order?
- How can you reduce the order completion time using IoT technologies? While fulfilling the order can you assess the quality of items (automatic checking of shelf life, freshness / damaged goods etc)

Consumer Experience based Retail strategy

Re-Imagine Retail: Today Retailing includes immersive shopping experience for customers with personalized offers, alert them when items needs to be purchased (Amazon Dash) etc. With e-commerce taking the lead over Brick and Motor stores in terms of sales, how can you bring the customers back to the physical stores?

Global Retailers are fighting tooth and nail with E-Retailers for locking-in customers with them. How will you bring the ease of access of a E-Store into the experience of a store?

Read perspective and thoughts of TCS leaders who are helping customers in this exciting journey
http://sites.tcs.com/blogs/digital-reimagination/digital-shopper-meets-digital-merchant/



- When it comes to store experience – there can be multiple ways to ensure a great experience to the customer. Some of them could be availability of the right SKU's, store associate's knowledge of products, visual merchandising, payment methods, trial room etc. With this as the background suggest a few ways to improve customer experience
- Smart Fridge, AC are in the in-thing now. How can we have customized Smart Clothes and Performance Wear?
- How can you recognize the customer once she walks into the stores? Not just recognize, but also alert the store manager or associate, on her buying patterns and thus make personalized offers? Basically, how can you read the customers mind (almost)
- So far, the thoughts have been around connecting the stores associates with the customers for a better shopping experience to the customer. Now to think on the other extreme – How can an unmanned store like a driverless car give the same experience to the customer as she walks into the store?
- Everyday hundreds and thousands of customers walk into the stores. They pick some items but leave them somewhere when they decide not to buy them. But these items need to be put back in the right shelves. Currently this is a huge manual work. How can you help the store associates to identify the missing items, find them and place them back in the right shelves?

Architecture Guideline

"Thing"

Connect & Configure

Configure IoT solution with chosen sensor, gateway & communication protocols

Gather & Process

Gather relevant data from sensors attached to chosen "thing" and store in a cloud based IoT platform

Analyze & Report

Analyze data for realization of use case goals and produce visualization and reports

Alerts & Notifications

Automated Notifications & Alerts to stakeholders via e-mail or system message to other applications

Software	• IoT Platform (Leverage)
	  • IBM Watson IoT
	  • Microsoft Azure IoT
	  • PTC Thingsworks
	  • Thingspeak.com
		• edge Programming
		  • NodeJS
		  • Python
		  • ..
		  • Stream Analytics
		• IoT Platform
		  • Industry specific Data Model
		  • Big Data Processing
			• Analytics
			  • Python
			  • R
			  • Matlab
			• Report
			  • Tableau, Qlikview, PowerBI
			• Text/Image API
			  • Api.ai
			  • Luis.ai
			  • Kairos
				• Integration based on Standard
				  • openconnectivity.org
				  • Thread
				• IT Systems
				  • Institution Email
				  • Another Cloud/Things
				  • Social Media

Hardware	• Gateway
	  • CISCO
	  • Intel
	  • Microsoft
	  • Raspberry PI
	• Sensor/ Field Device
	• …			

These are indicative suggestions for reference.
Students are free to choose technology components best suited for desired solution and outcome
Students are also free to select machines and equipment that have access
Students may explore the advance technology such as Gaming Engine Unity, NLP tools - Image/Voice api & Blockchain Security
Need to focus on Business value of Solution and realize using available ready use software components