



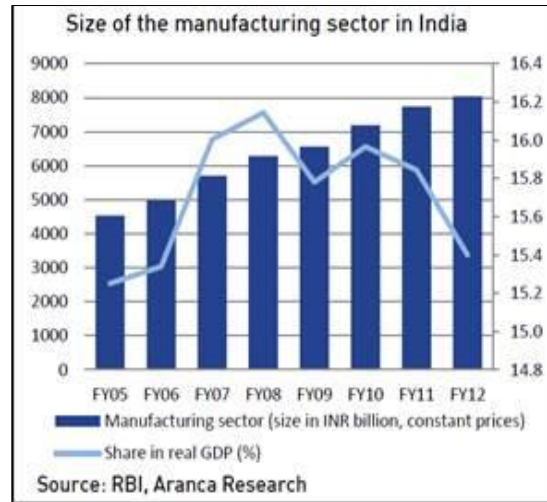
# Digital Manufacturing POV

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12 Feb 2015

# Manufacturing in India.....

## Key trends in the India Manufacturing market

- Indian manufacturing industry is expected to touch US\$ 1 trillion by 2025
- India ranks second in the world as per Global Manufacturing Competitiveness index ( GMCI). It is expected to continue to maintain this position for the next 5 years
- Around 90 million domestic jobs are waiting to be created by that timeframe with the manufacturing segment contributing about 25-30% of India's gross domestic product compared to current share of 16%
- The Government of India has taken several initiatives to promote a healthy environment for the growth of manufacturing sector in the country



- India has become one of the most attractive destinations for investments in the manufacturing sector
- The national manufacturing policy suggests raising the share of manufacturing in GDP to 25% in order to create 100 million jobs in the coming decades
- As per a study by Assocham, India's manufacturing sector is all set to create 3.2 million manufacturing jobs during the period of 2012-17
- The manufacturing sector in India is an attractive hub for foreign investments. Several mobile phone, luxury and automobile brands, among others, have set up or are looking to establish their manufacturing bases in the country

# Manufacturing in India.....

## Five manufacturing trends that will impact the industry in 2015

### SMAC Stack

A manufacturing comeback is being driven by SMAC — social, mobile, analytics and cloud. The SMAC Stack is becoming an essential technology tool kit for enterprises and represents the next wave for driving higher customer engagement and growth opportunities

### Social media to further impact business model innovation

According to an IDC white paper, "[The Future of Manufacturing](#)," sponsored by Infor, social media is forcing manufacturers to become more customer-centric. The traditional business-to-business model is becoming outdated because today's connected consumers are better informed and expect products on-demand

### Internet of Things (IoT) will increase automation and job opportunities

A renewed focus on science and engineering education is cultivating a manufacturing workforce that can manage highly technical systems and allow for greater automation

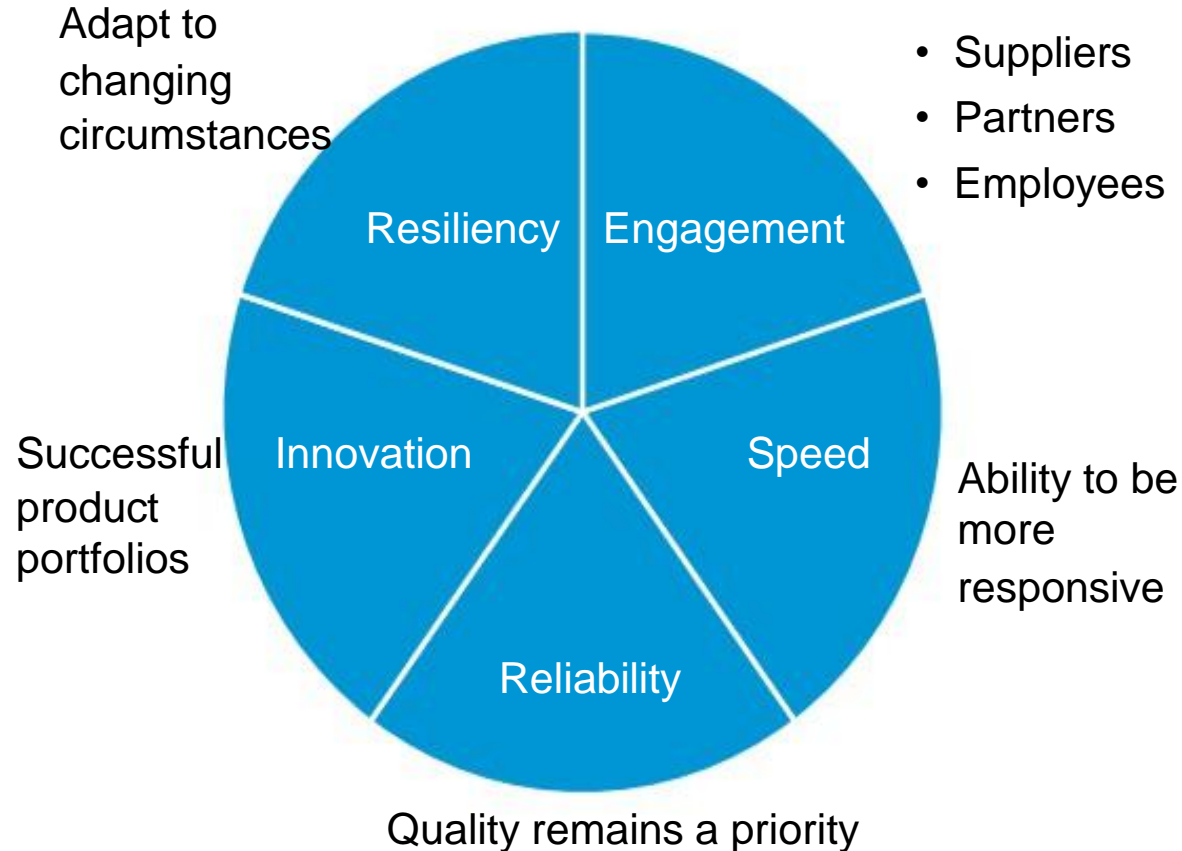
### Greater capital investment

Though the slow economic recovery continues to hinder expansion and growth opportunities, recent government and industry reports show an uptick in capital investment funding

### The emergence of "Next-Shoring."

The rise of a more technical labor force to manage supply chain operations — combined with rising wages in Asia, higher shipping costs and the need to accelerate time to market to meet retailer and consumer demands — has led to more companies shifting their manufacturing strategies from outsourcing overseas to developing products closer to where they will be sold. "Next-shoring," as this tactic has been dubbed, allows manufacturers to increase the speed at which product is replenished on store shelves. The faster inventory can be moved to the consumer, the sooner the costs to warehouse, ship and dock goods can be freed up

# Manufacturing Industry: Five Critical Capabilities



# Manufacturing 2015 Top 10 Predictions

- Manufactures Will Begin to Build **3D Value Chains** (Demand oriented, Data driven, Digitally executed)
- Operational Resiliency Will Be the Focus of **Supply Chain** Strategies in 2014 and Beyond
- **Supply Chain** Technology Investment Will Involve Modernizing Existing Systems While also Trying New Approaches
- The Modernization of the Underlying B2B Commerce Backbone Will Become an Investment Priority for IT
- **Product Life-Cycle Management** Strategies Will Become Increasingly Global, Multidisciplinary, Innovation Based, and Customer Focused
- **PLM** Initiatives Will Focus on Value Realization
- On Its Way Toward the **Factory of the Future**, 2015 Will Set the Stage for a New Manufacturing Renaissance
- **Plant Floor IT** Investments Will Continue to Become a Higher Share of the Overall Technology Investment Portfolio

Source: IDC Manufacturing Insights (December 2



# What is Digital Manufacturing?

**Digital Manufacturing (CIM) is the approach of using computers to control the entire production process.**

Systems that support definition of the processes used to produce a product, simulation and analysis of those processes and the manufacturing environments used to produce the product including production equipment and lines.

## Future Intelligence Factories

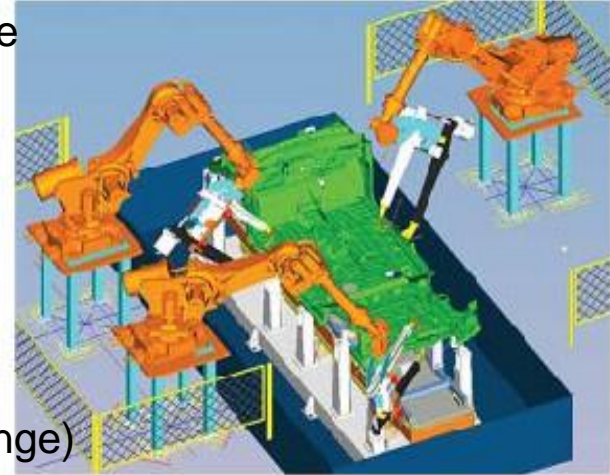
CAD/CAM/CAPP Interfaces & Collaboration

Line Configuration (Mass Production / Dynamic Production Change)

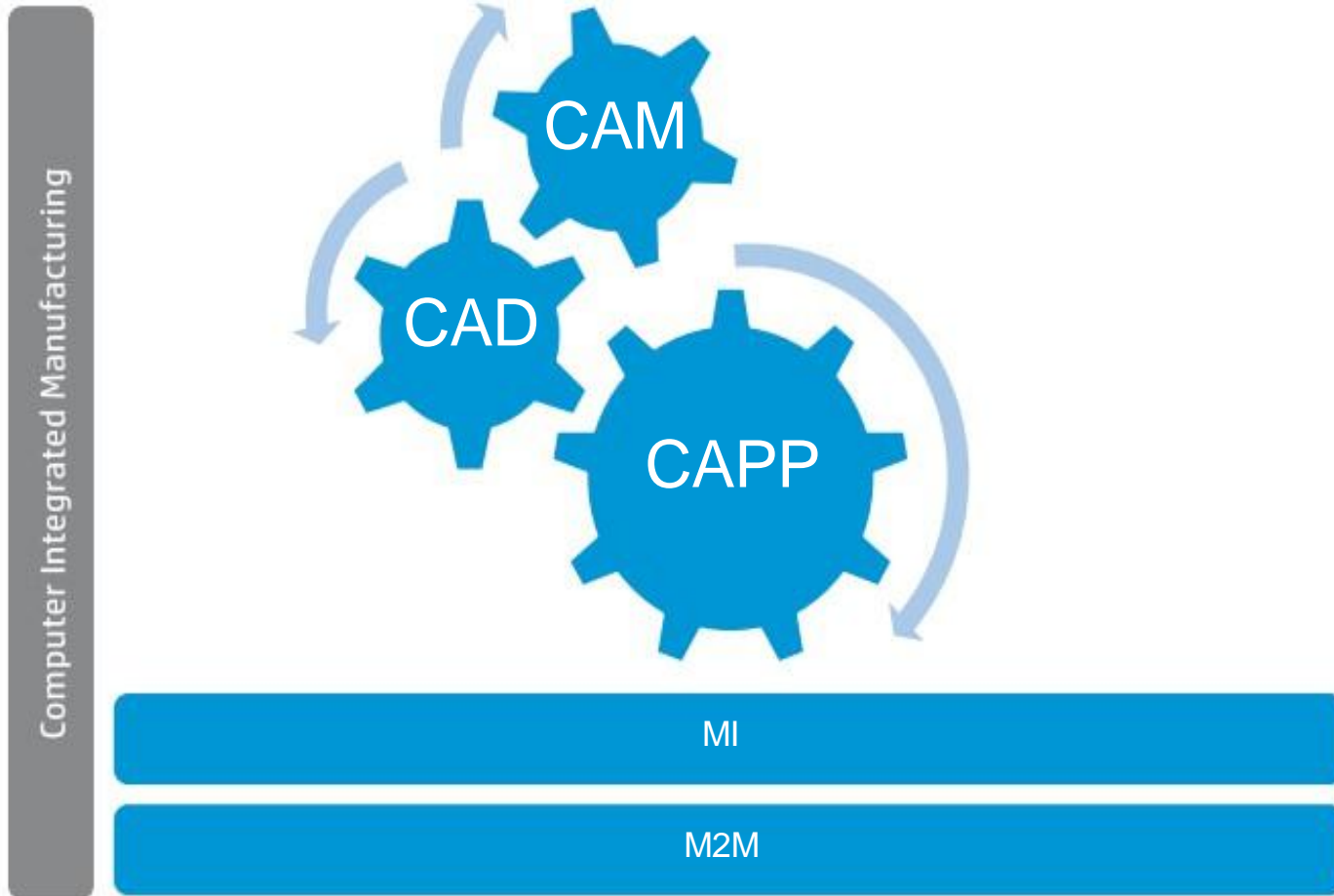
## Predictive Manufacturing

Cyber Physical Models (Software, Sensors, Processors & Communication Technology)

Line Feedback/Data Analytics



# What is Digital Manufacturing at the heart?



# Digital Manufacturing, why?

Disrupt and transform manufacturing of the future

**Goal Statement:** Revolutionize the manufacturing value chain to boost competitiveness by leveraging the convergence of digital and physical production capabilities. Manufacturing value chain includes design, production, processes and supply chain management.

Novel Design  
Paradigms &  
Innovations

Cyber-Physical  
Systems & Intelligent  
Factories

Digital  
Manufacturing  
Processes

Data Drive Urban  
Logistics & SCM

Big Data Analytics for Manufacturing



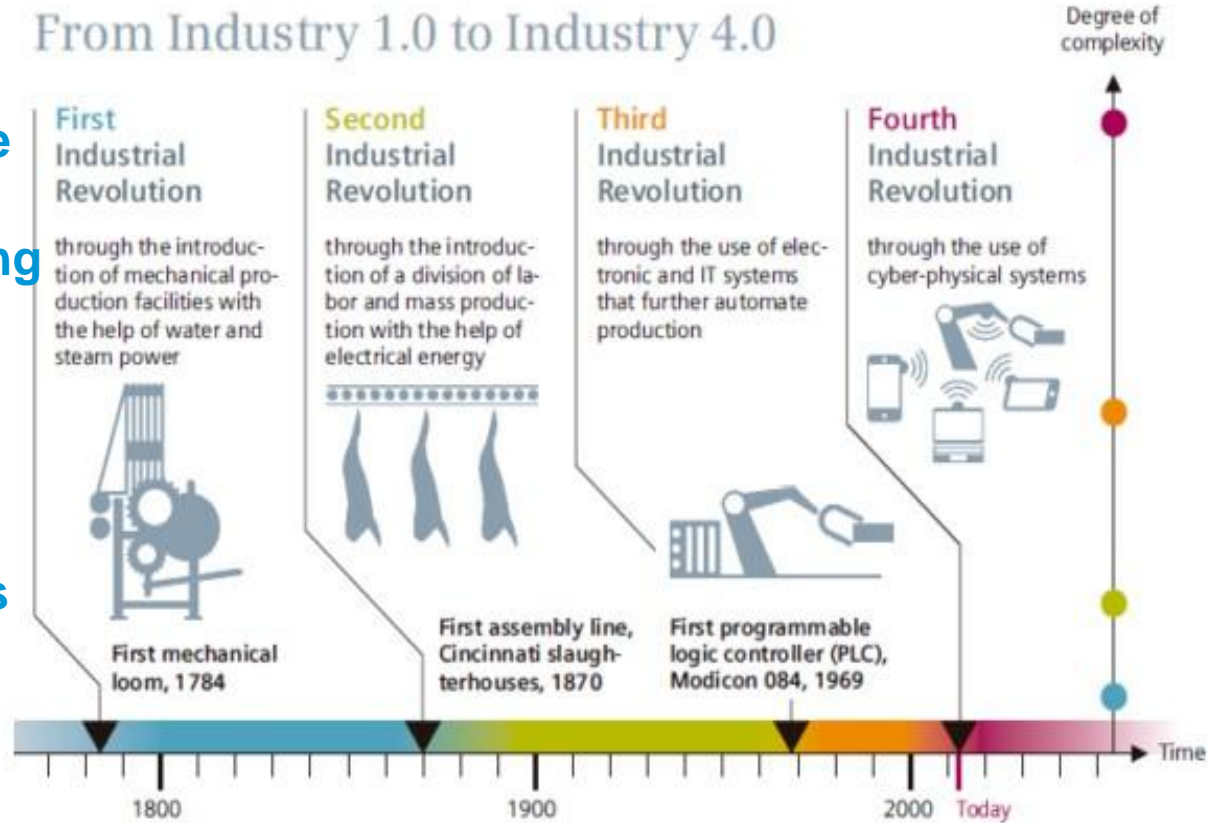


# Industry 4.0 - Siemens

From the computer to the production line, new technologies are shrinking the time between virtual planning and manufacturing.

Self Organizing Factories

## From Industry 1.0 to Industry 4.0

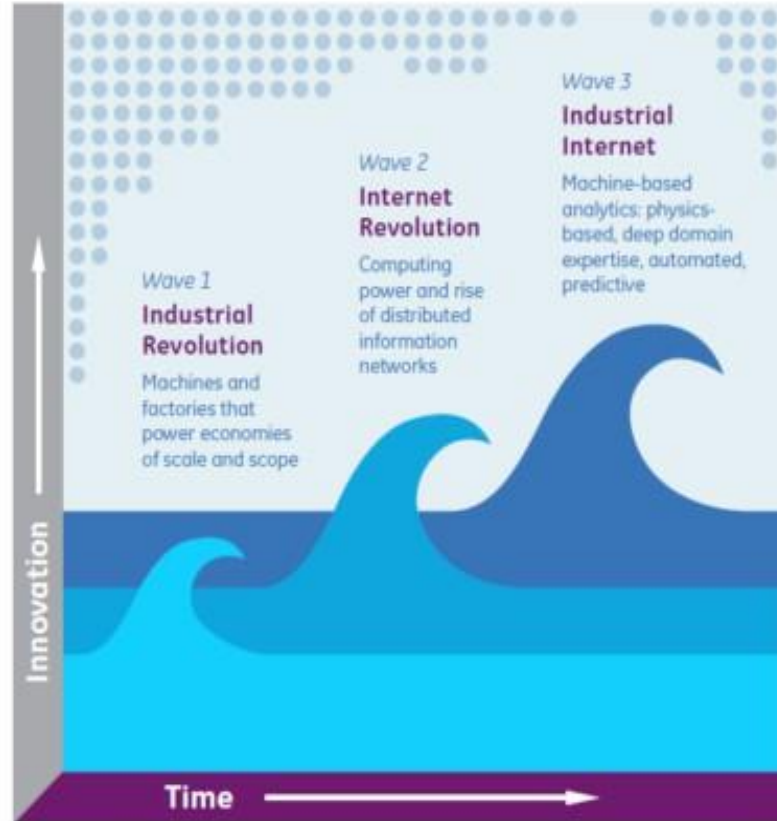
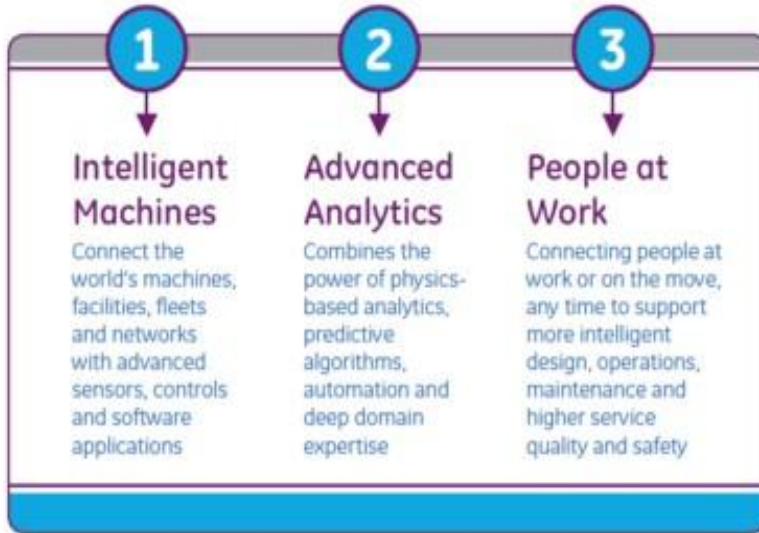


Source: DFKI (2011)



# Industrial Internet - GE

## Key Elements



# Information System mapping to ISA-95



Level 4

## Business Planning and Logistics

Plant Production Scheduling, Shipping, Receiving, Inventory etc.

4. Establishing the basic plant schedule-production, material use, delivery and shipping. Determining inventory levels  
**Timeframe**-months, weeks, days



Level 3

## Manufacturing Operations Management

Dispatching, Detailed Production Scheduling, Reliability assurance.

3. Work Flow/recipe control to produce the desired end products. Maintaining records and optimizing the production process  
**Timeframe**-days, shifts, hours, minutes, seconds



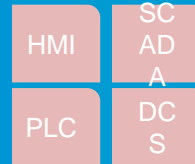
Level 2

Batch Control

Continuous Control

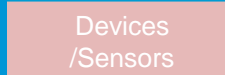
Discrete Control

2. Monitoring, supervisory control and automated control of the production process  
**Timeframe**-minutes, seconds, milliseconds, microseconds

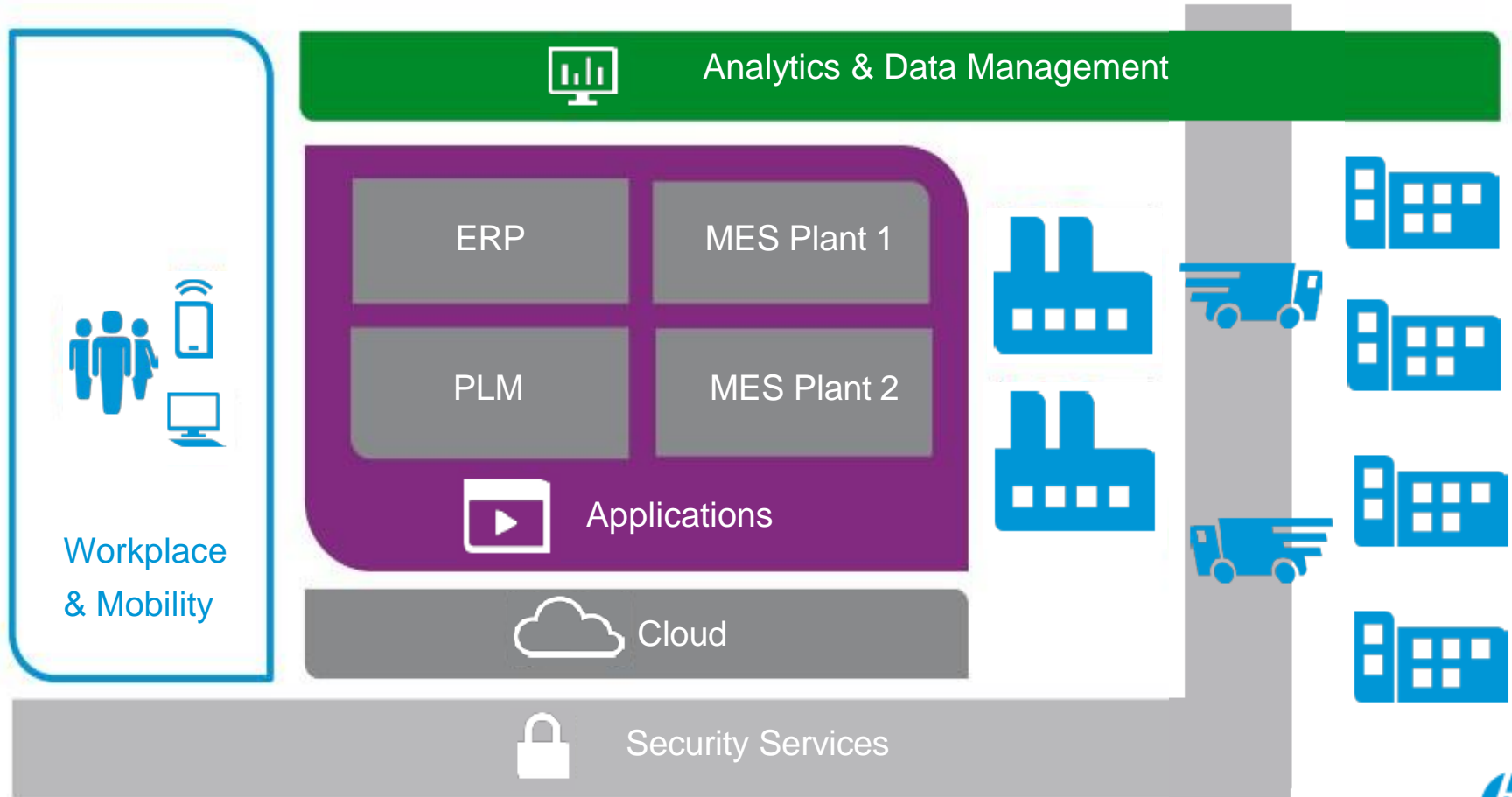


Level 1

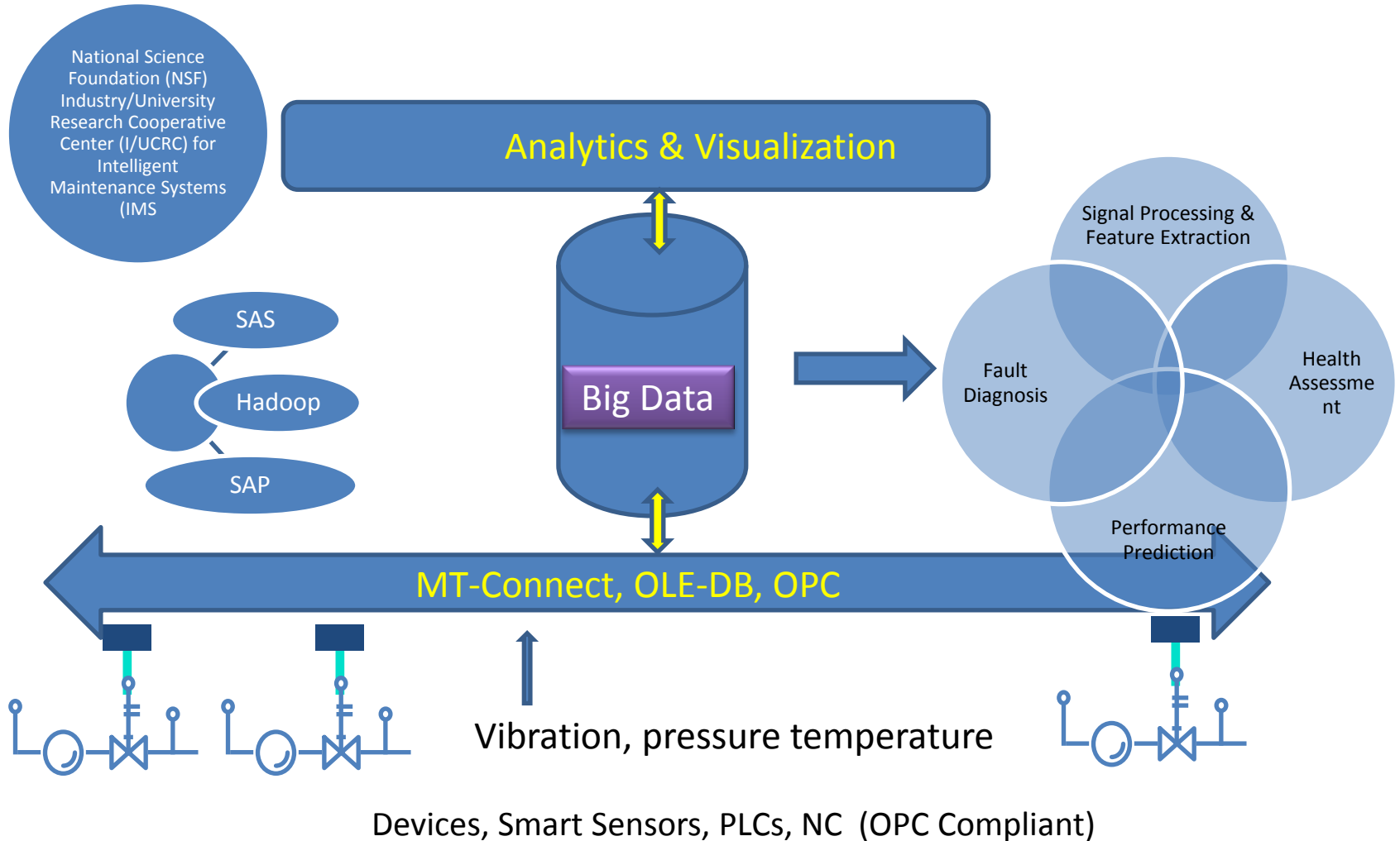
1. Sensing the production process, manipulating the production process



# New Style of IT Manufacturing Reference Architecture



# Internet of Things (IOT) for Factory-wide OEE

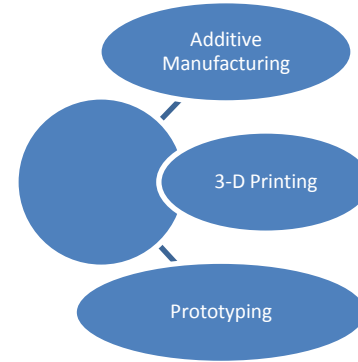


# Product Lifecycle Management (PLM)

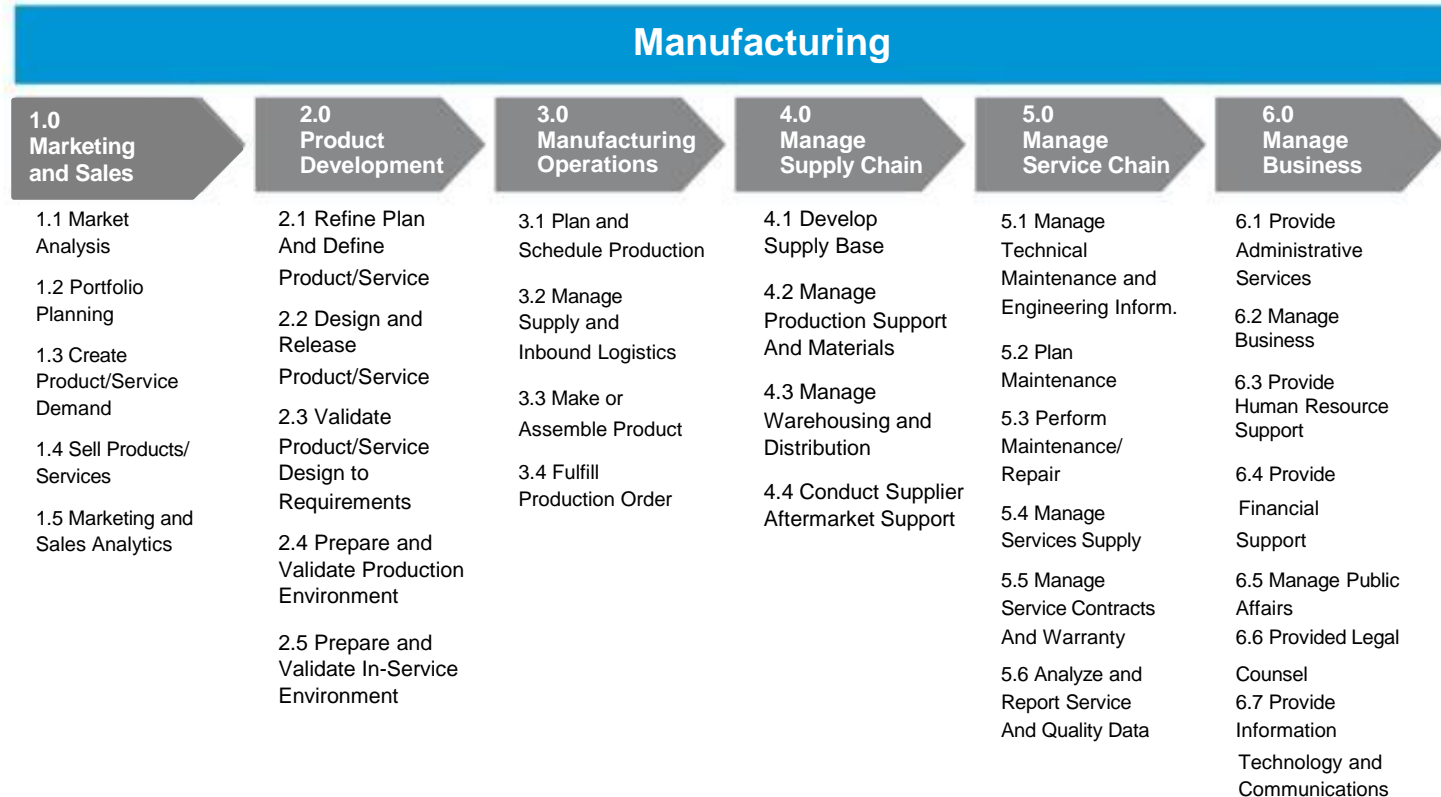
Innovation and productivity by integrating product information from concept to recycling



# 3-D Printing in Product Design

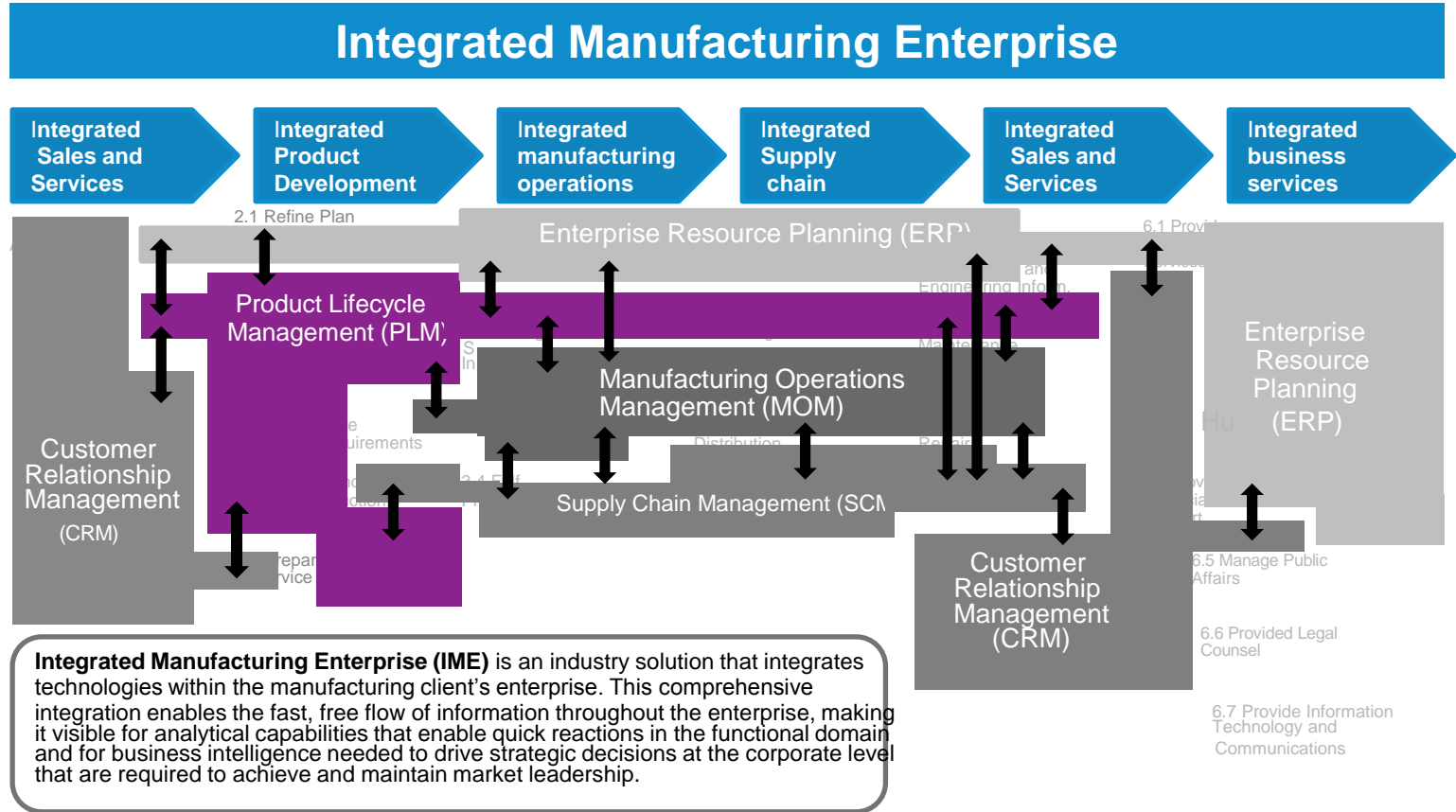


# HP's framework for manufacturing business & IT





# HP's framework for manufacturing business & IT



# Q&A



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# Thank you

