



Are You Ready?

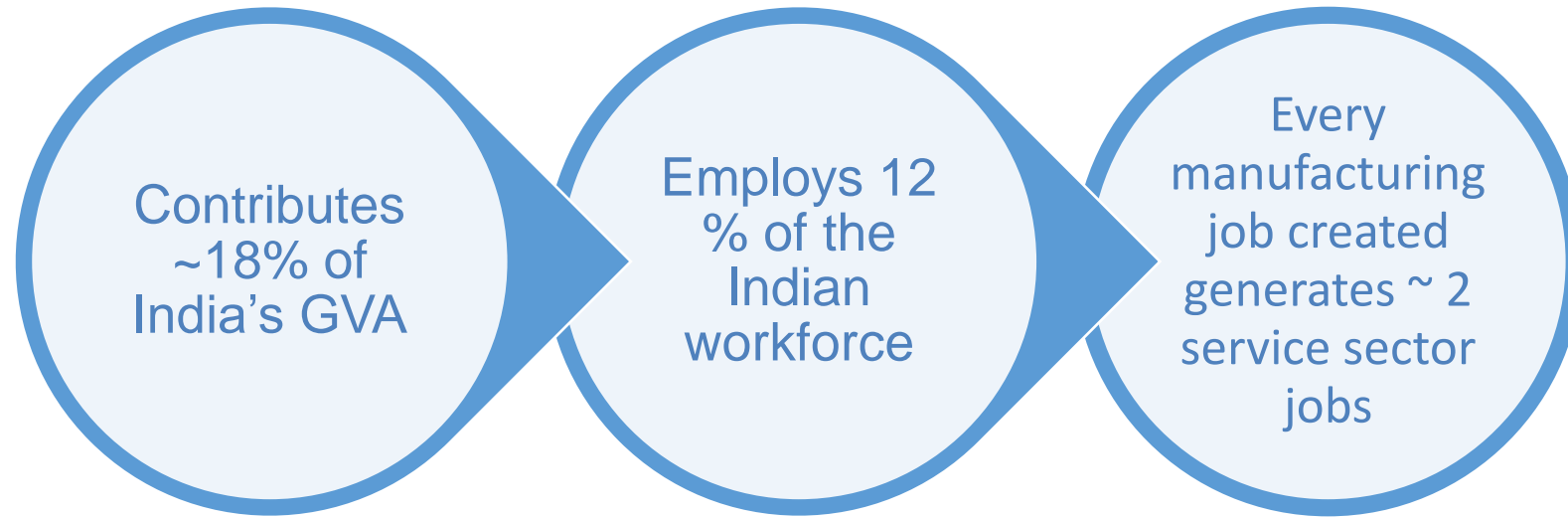
Shripad Ranade

16TH NIQR Global Quality Convention, 10-11 August 2018, Chennai



ikigai Discoveries

MANUFACTURING IS IMPORTANT TO INDIA



Government envisages manufacturing share of GVA to grow to 25% but it is currently declining

WHAT ARE WE FREQUENTLY FAILING AT ?

Not winning on product cost

- **Low labour productivity – about one third of China**

Not winning a price premium

- **Need for technical superiority and innovation**

Not winning on speed

- **Insufficient agility – in product, operations, and supply chain**

Not leading the customer

- **Need to evolve products into solutions – and into services**

YOU ARE HANDLING SEVERAL DISRUPTIONS

Manufacturing Environment

- Tides of Globalisation
- Changing Workforce
- Regulation, Recalls, Litigation

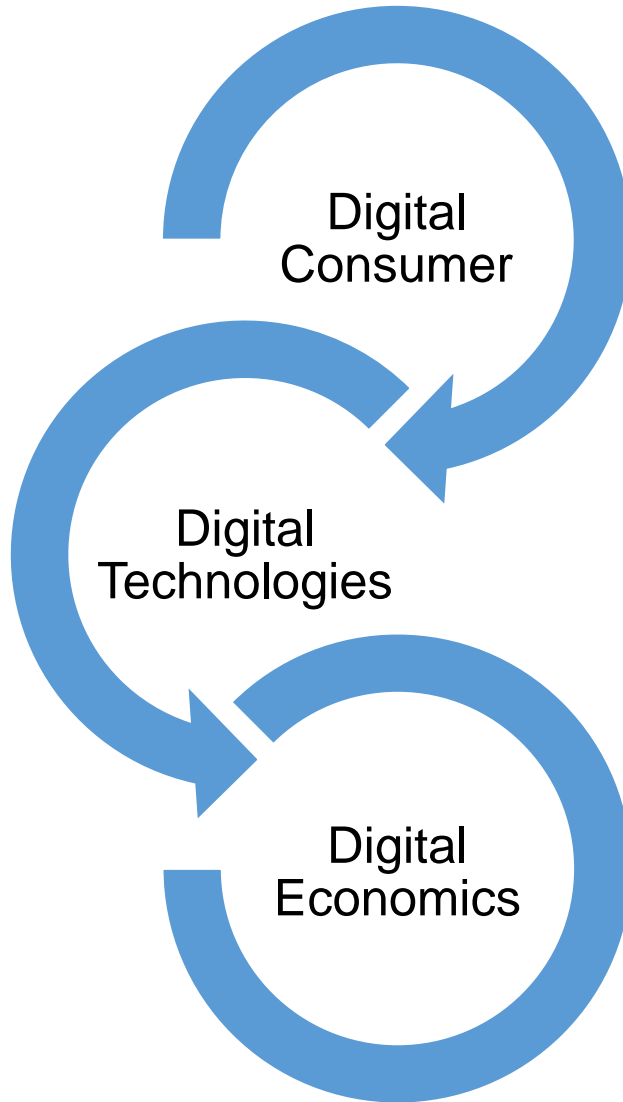
Manufacturing Markets

- Fragmentation offline
- Aggregation online
- Pricing pressures

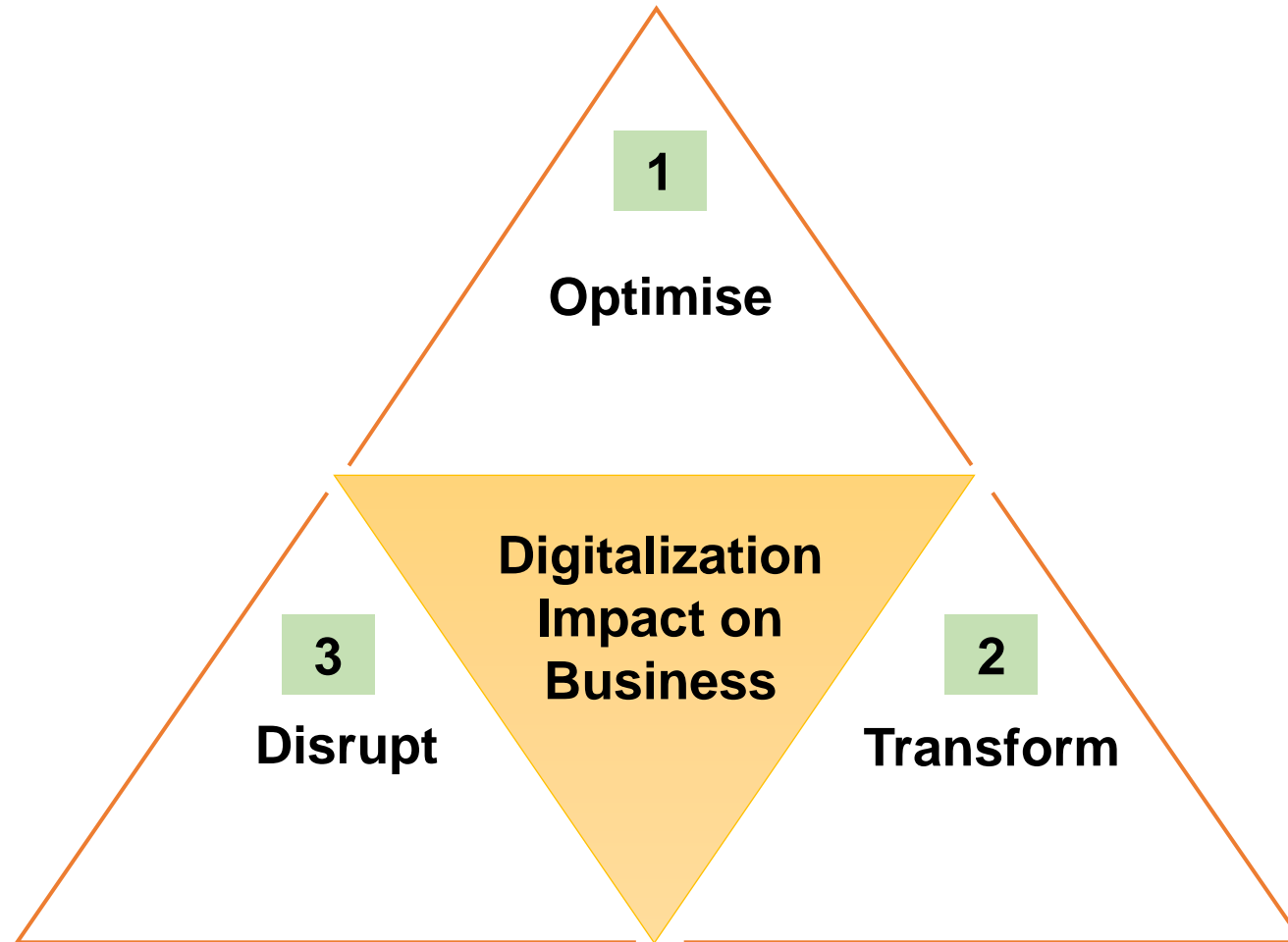
Manufacturing Customers

- More informed and sophisticated
- More assertive and individual
- More unpredictable despite more data

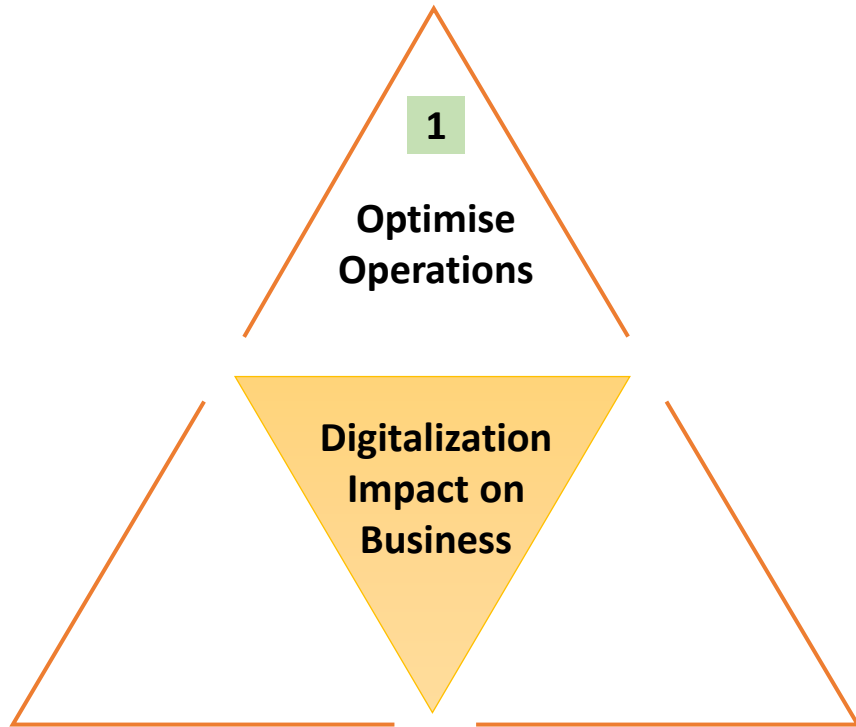
THE MARCH OF DIGITALISATION EXPLAINS MANY OF THESE TRENDS



DIGITALISATION WILL OPTIMISE, TRANSFORM, AND FINALLY DISRUPT !



TODAY, DIGITALISATION WILL OPTIMISE OPERATIONS



Giving the factory manager what s/he wants

- Maximize **throughput**
- Reduce product and service **delivery time**
- Control critical process & prevent cost escalation through better **visibility of operations**

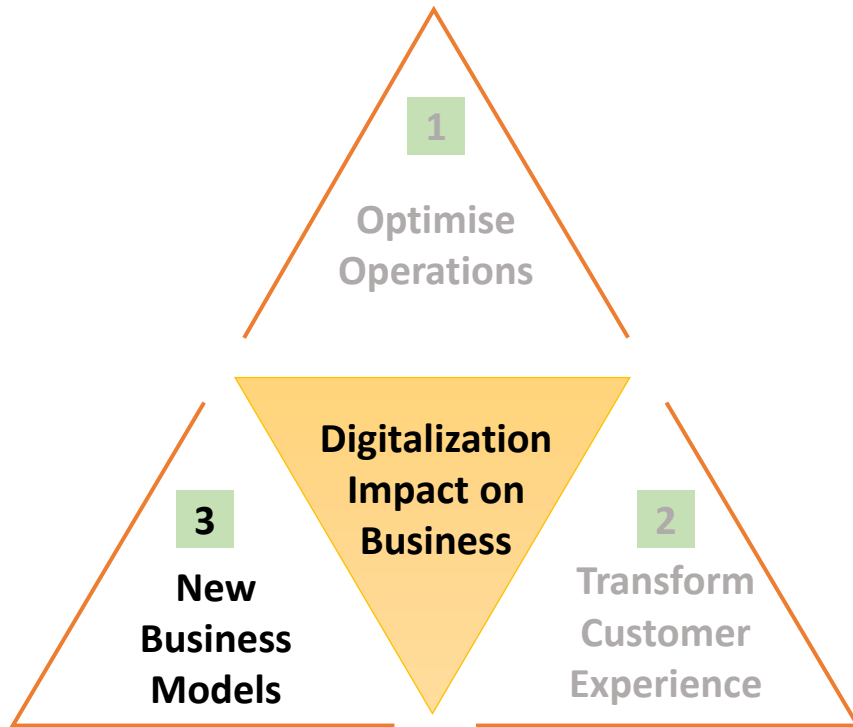
NEXT, THE CUSTOMER EXPERIENCE WILL TRANSFORM



Giving the customer what s/he wants

- Offer **customized** products and services based **on customer buying patterns** with enhanced quality
- Channelize insights into product development to **meet un-addressed** needs

AND WHILE YOU AREN'T LOOKING, NEW BUSINESS MODELS WILL EMERGE



Giving the CEO what s/he wants

- **Innovative** business models to grow the business
- New channels, **access** to new customers and geographies

THE FUTURE IS HERE – WHETHER WE LIKE IT OR NOT!



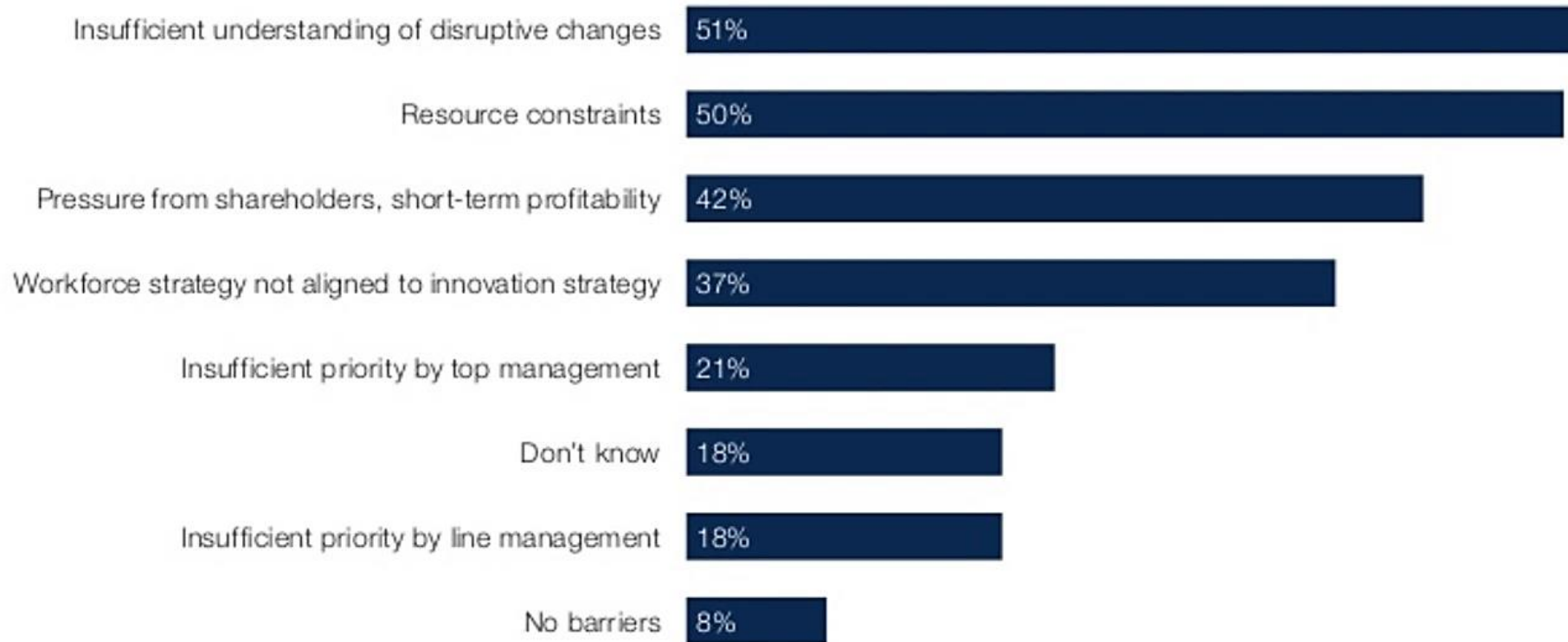
Dwight D. Eisenhower
(1890 – 1969)

*“Neither a wise man
nor a brave man
lies down on the track of history
to wait for the train of the future
to run over him.”*

MANY OF US ARE HOLDING BACK FROM THIS CHANGE

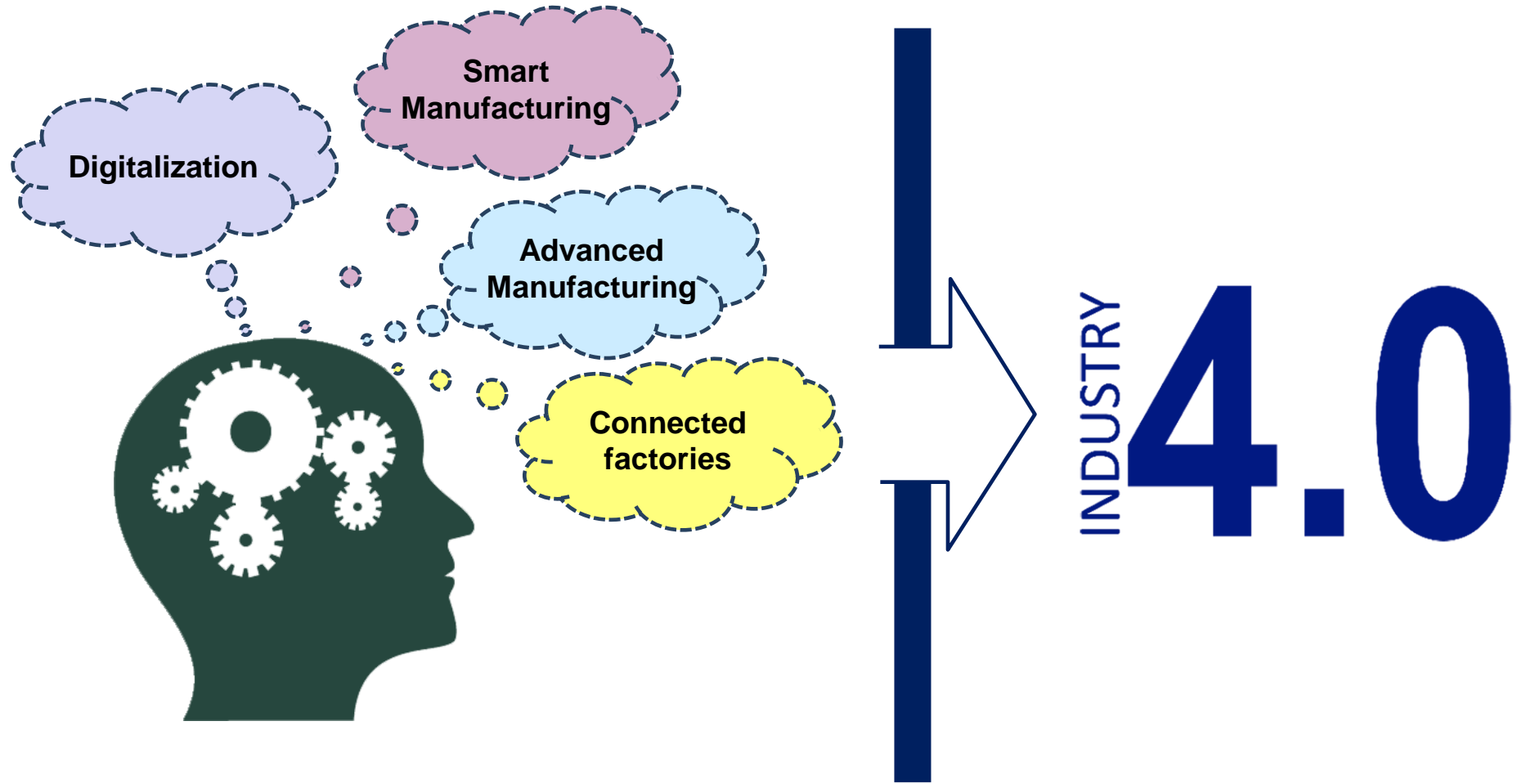
Significance of barriers to change, industries overall

Share of respondents reporting barrier, %

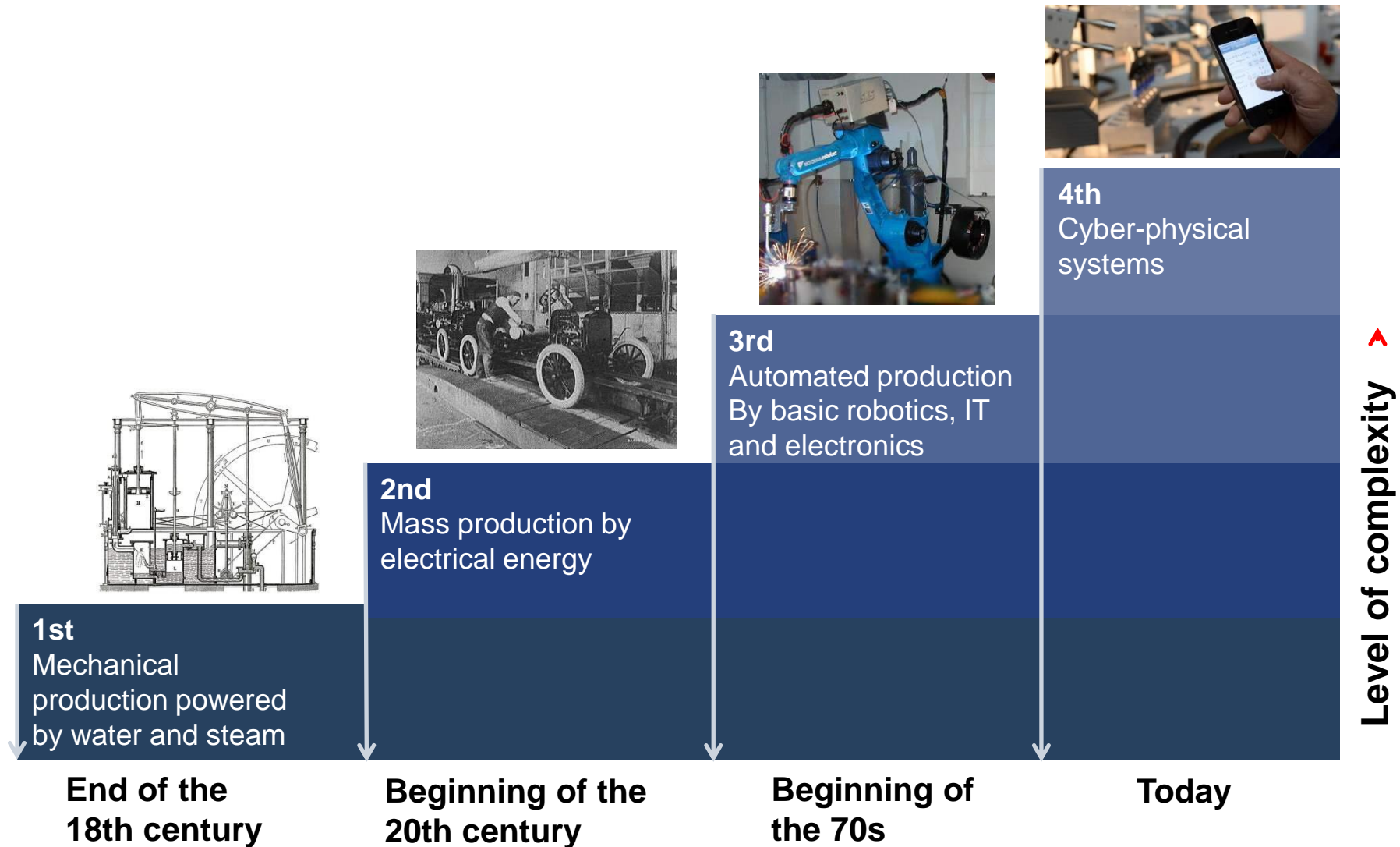


Source: Future of Jobs Survey, World Economic Forum.

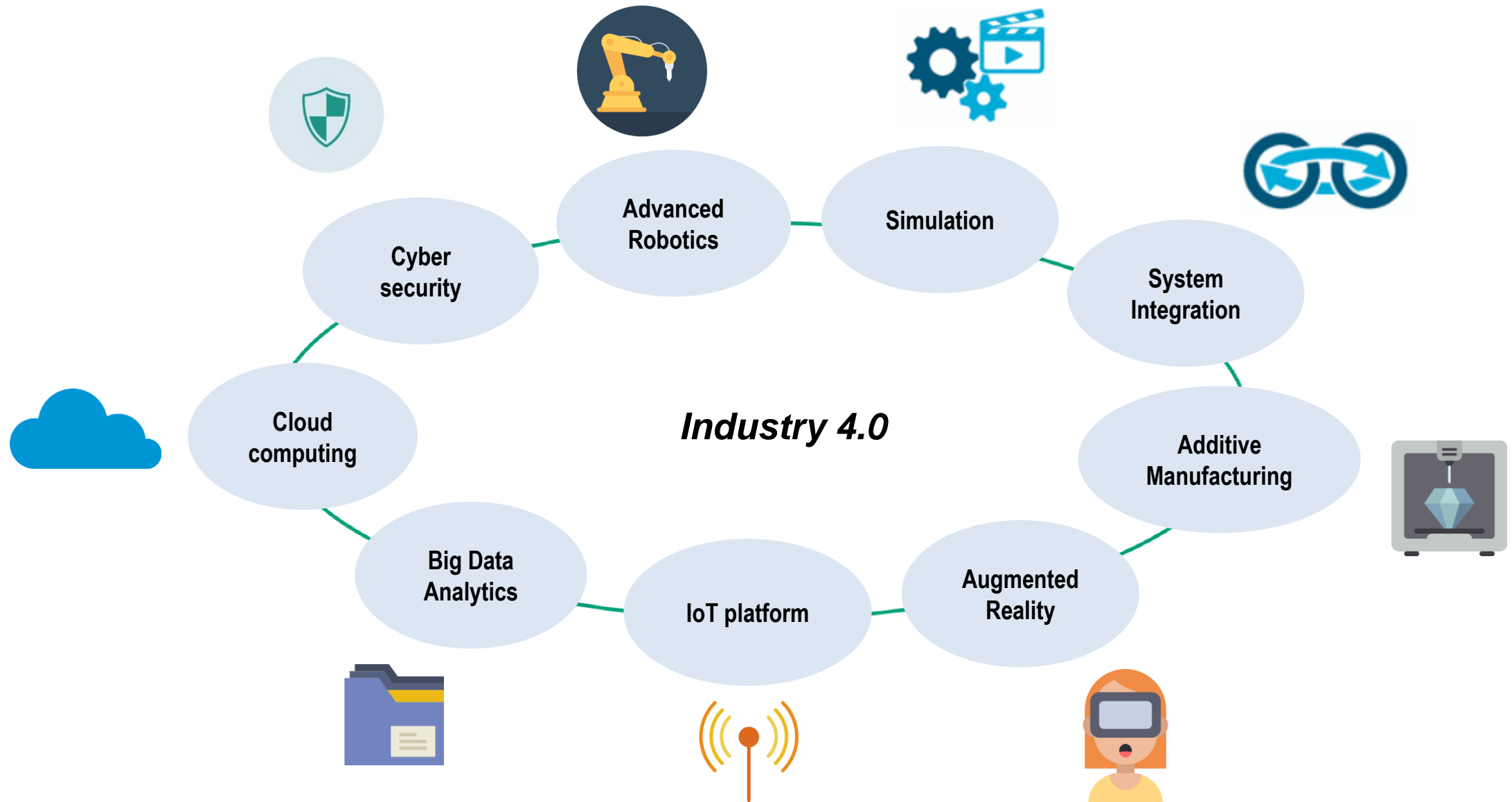
DIGITALISATION IN MANUFACTURING TAKES MANY AVATARS



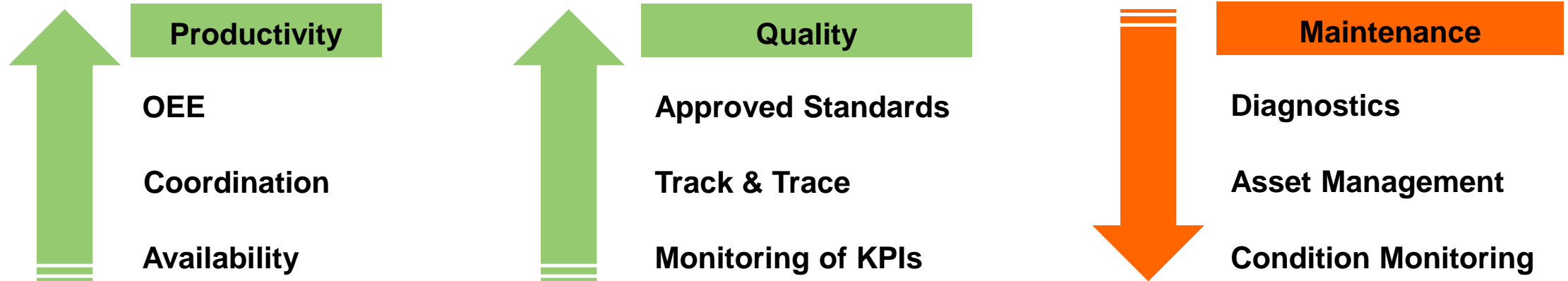
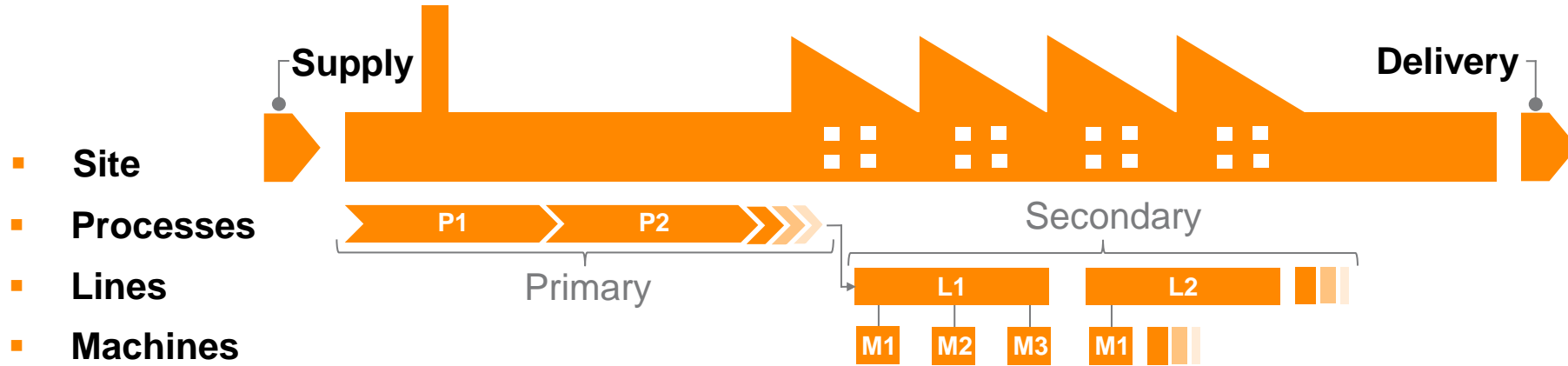
WHY IS IT CALLED THE 4th INDUSTRIAL REVOLUTION?



AN INTERPLAY OF NEW AGE TECHNOLOGIES



WHAT EVERY FACTORY MANAGER WANTS



WHICH ARE THE MOST IMPORTANT / RELEVANT CONCEPTS FOR THE FACTORY?

1

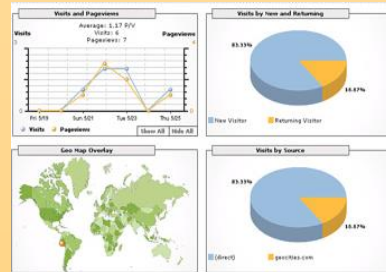
Industrial Internet of Things (IIOT)



Connected network of hardware with sensors

2

Big Data and Analytics



Insights from large volume of data for better decision making

3

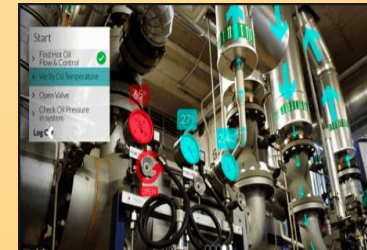
Additive Manufacturing



Process 3D objects from digital models

4

Augmented Reality



Real-time integration of digital info & user environs

INDUSTRIAL INTERNET OF THINGS (IIoT)



- **Networks of sensors and actuators**
- **Data collection, monitoring, decision making, and process optimization**

| Aspect | Internet | Internet of things |
|------------------------------|---------------------------------------|--|
| Who creates content? | Human | Machines connected with sensors |
| How is the content consumed? | By request | By pushing info and triggering actions |
| What is the value? | Answer questions | Action and timely information |
| What is done so far? | Both content creation and consumption | Mainly content creation |

Challenges

- x Return on investment
- x **Integration** across machines
- x Capture and analyse **huge volumes of data**
- x **Security** breach

PRACTICAL APPLICATIONS OF IIOT

Energy Monitoring

- For all energy types
- Integrated consumption and cost analysis
- Load management



Condition monitoring

- Condition-based predictive maintenance



Advanced Process Control

- Optimized plant performance
- Improved control

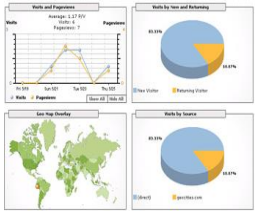


Process Data Acquisition

- Seamless acquisition of process data
- Exploratory data analysis



BIG DATA AND ANALYTICS



- Analyse large volume of data generated across operations
- Identify patterns and draw actionable insights

| Aspect | Traditional Analysis | Big Data & Analytics |
|----------------|------------------------------|--|
| Data Condition | Structured | Unstructured |
| Data source | Centralized; Internal | Highly distributed Internal and External |
| Data volume | Limited - Gigabyte, terabyte | Large - Petabytes, Exabytes |
| Analytics | Offline | Real-Time |
| Response time | Hours/ days | Minutes |

Advantages

- ✓ **Data-driven** decision making
- ✓ Improves productivity
- ✓ **Interdependency** between plant processes
- ✓ **Predictive analysis**
- ✓ Quality improvement

Challenges

- × Integration of Legacy systems
- × **Quality of data** captured
- × **Distributed data set**
- × Skilled personnel
- × Data security

ADDITIVE MANUFACTURING



- Create objects by printing layers of material based on digital models
- Production system to support the core 3 D printing process

3D Printers
Responsiveness
& user-friendliness

**Technology
maturing in 3
dimensions**

Software

- 3D scanning
- Designing
- Optimization

Materials

- Multi-material
Fabrication
beyond plastics
- Higher resolution

Advantages

- ✓ High responsiveness
- ✓ Intricate shapes
- ✓ Lower scrap
- ✓ Reduced inventory & logistics cost
- ✓ Reduction in switch over or setup cost

Challenges

- × Smaller volumes
- × Not suitable for larger geometries
- × Build speed
- × Choice of material
- × Availability of trained personnel
- × IP protection

AUGMENTED REALITY



- **Special form of virtual reality**
- **An immersive, interactive computer generated environment is blended with the real world**
- **Can be experienced through normal human vision or a video link**

AR Viewers

Place life size objects in your environment



Augmented reality Tools



AR Training

Immersive training experiences that utilize your actual surroundings



AR Browsers

Enrich your camera display with contextual information

Advantages

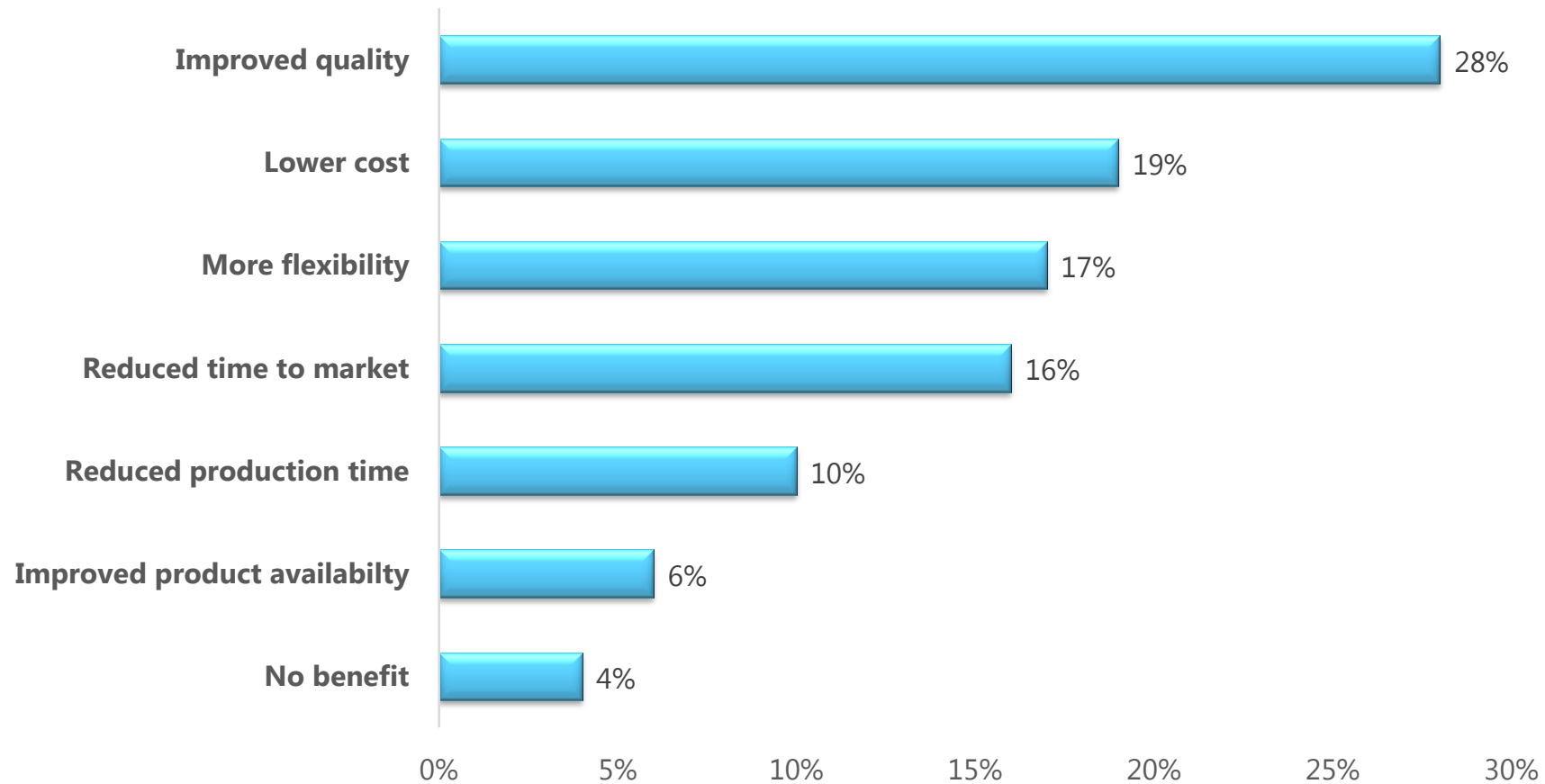
- ✓ **First-time-right**
- ✓ In-house maintenance
- ✓ **Servicing customer assets**
- ✓ Component assembly
- ✓ **Interactive training**
- ✓ Mistake proofing
- ✓ Rapid design cycles

Challenges

- x **Compatible** devices
- x **Placement** of virtual images
- x Trained personnel
- x Expensive for lower volumes
- x Change management

PERCEIVED BENEFITS OF INDUSTRY 4.0

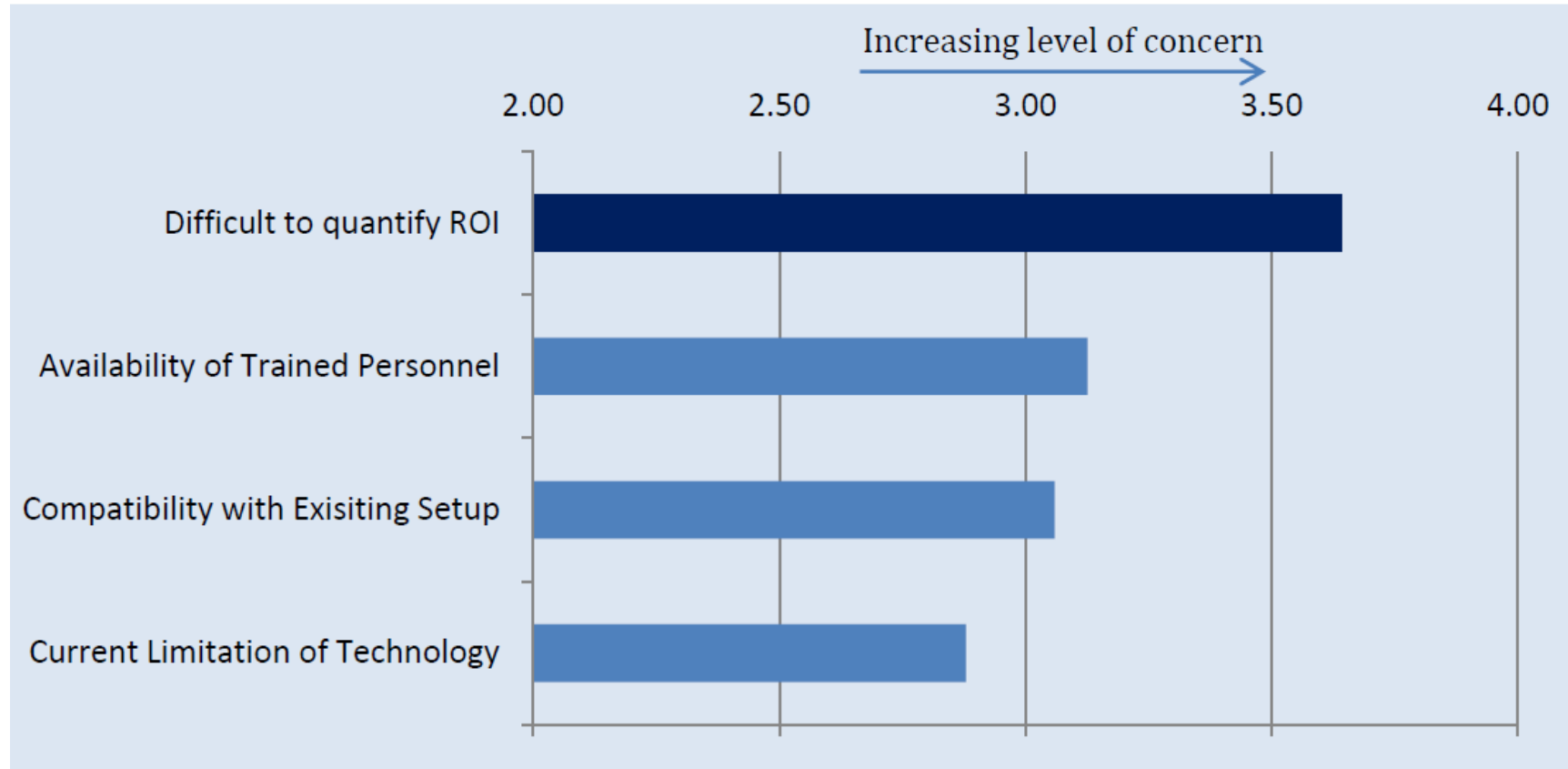
Question: What are the benefits that you see resulting from Industry 4.0 advancement?



Source: CII – BCG Manufacturing Leadership Survey 2016

CHALLENGES TO ADOPTION OF INDUSTRY 4.0

Question: How concerned are you about challenges for adoption of Industry 4.0 technologies ?



Source: TSMG-FICCI Advanced Manufacturing Survey 2016

CHALLENGES – LEADERS SPEAK

*“ Though we **understand the benefits** of industry 4.0, we find it difficult to **identify the starting point** for implementation”*

*“To serve the need to explore new business models, we find it **challenging to identify and leverage appropriate technology** ”*

-Managing Director of a multinational tools and construction equipment manufacturing company

*“In the process of adopting industry 4.0, it is difficult for us to **visualize the big picture** and select the right technology”*

*“ **Many suppliers approach us** for implementation of techniques corresponding to industry 4.0. However we are unable to evaluate them w.r.t to our business”*

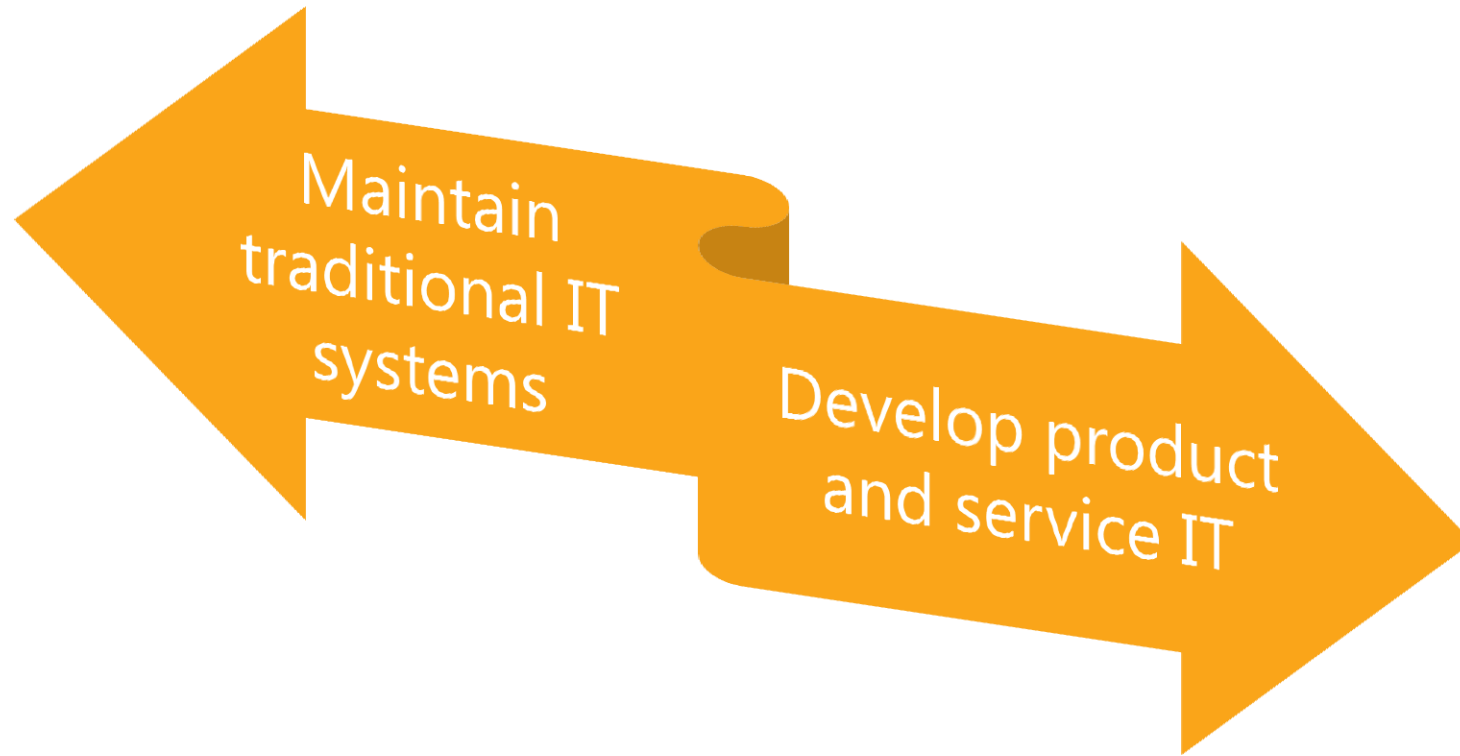
- Managing Director of a leading engineering technology manufacturing company

*“Though certain units or businesses of companies have adopted technologies from industry 4.0, they are **unable to replicate the same across businesses**”*

- Managing Director of a precision manufacturing company

Source: TSMG-FICCI Advanced Manufacturing Survey 2016

THE CHALLENGE FOR THE IT FUNCTION





Your Starting Point

A STEP WISE APPROACH IS NECESSARY

1 Identify business imperatives & current level of digitalization

2 Map relevant techniques

3 Conduct feasibility studies

4 Prioritize technologies

5 Create a roadmap & select partners

THE FIRST STEP IS TO UNDERSTAND WHERE YOU STAND

Identify business imperatives & current level of digitalization

- Brainstorm with senior management on strategy, future plans & prioritise imperatives
- Conduct a Digital workshop to analyse current level of digitization
- Align the organization for adoption through top management driven approach

LEADERS NEED TO ASK A SERIES OF QUESTIONS

Strategic

- *What are your **future plans**?*
- *What is the current **maturity level of digitalization** in the organisation?*
- *Which digital technologies are **relevant** for your business?*
- *Which considerations will drive **selection of partners**?*

Operations

- *What **benchmarks** are available globally and in India ?*
- *How can your company create a phase wise **implementation roadmap**?*
- *How will you **ensure** initiatives get implemented as per defined manner?*

Organization

- *How can you **align** your employees and stakeholders ?*
- *Who are the **key personnel to drive** implementation ?*
- *How are the **targets** and **KPIs** to be defined?*

C4i4 Lab, Pune



Nation building initiative, devised to transform India into a global design and manufacturing hub

DHI has set up Four Common Engineering Facility Centres Across India to Promote Faster Adoption of Industry 4.0



Department of Heavy Industry,
Govt. of India Launches

SAMARTH Udyog

**Smart & Advanced Manufacturing &
Rapid Transformation Hubs**

- IIT Delhi AIA Foundation For Smart Manufacturing
- I4.0 India at Indian Institute of Science Bangalore
- Smart Manufacturing Demo Centre at Central Machine Tool Institute Bangalore
- **C4i4 Lab (Centre For Industry 4.0) Pune**

OUR VISION

To be recognized as a World Class Centre for promoting innovation & adoption of Industry 4.0 solutions to enhance global competitiveness of Indian industry

Strategic Objectives

- Accelerate and drive the adoption of Industry 4.0
- Provide a platform for making SMEs globally competitive
- Develop an ecosystem of Industry 4.0 solution providers
- Incubation Support to start-ups
- Promote development of relevant skills
- Be an authority on Industry 4.0 and the 'Go-To Entity' for all Industry 4.0 related topics



Thank you!

**C4i4
LAB** CENTRE FOR
INDUSTRY 4.0

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