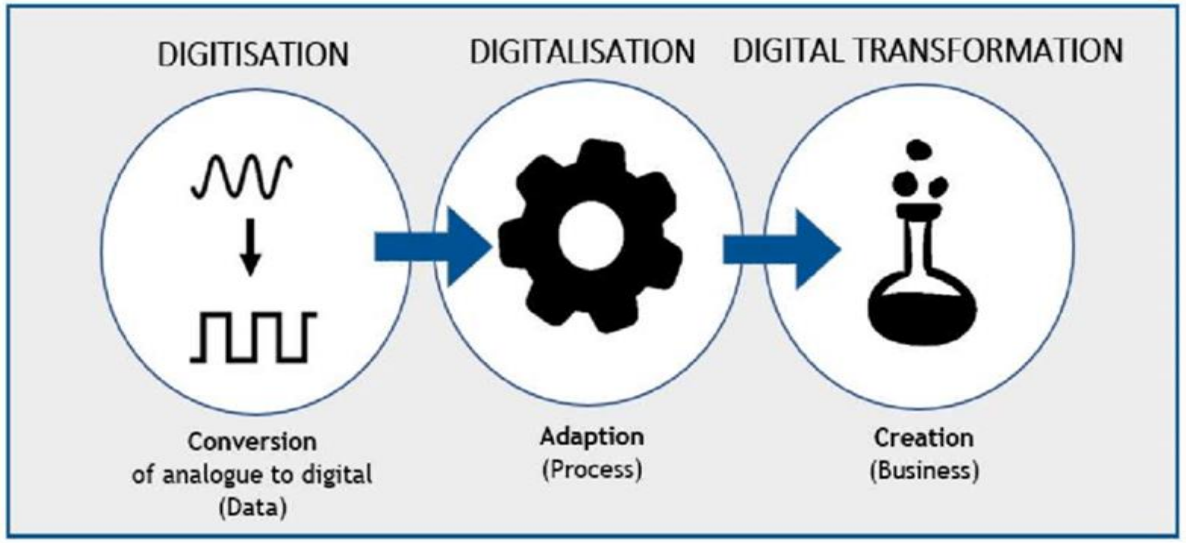

Digitalisation: Challenges and Opportunities in Chemical Industries

25th September,2021

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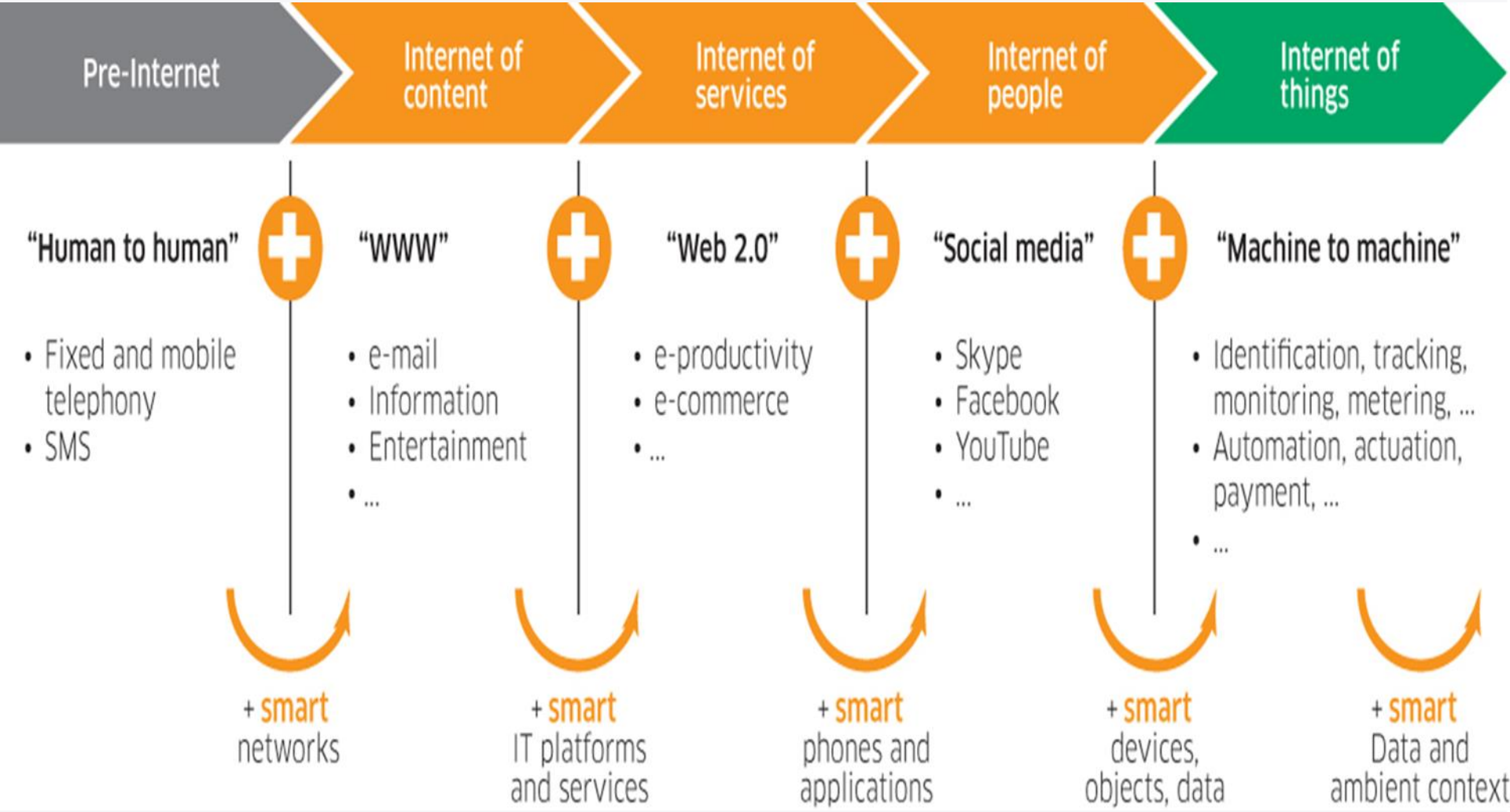
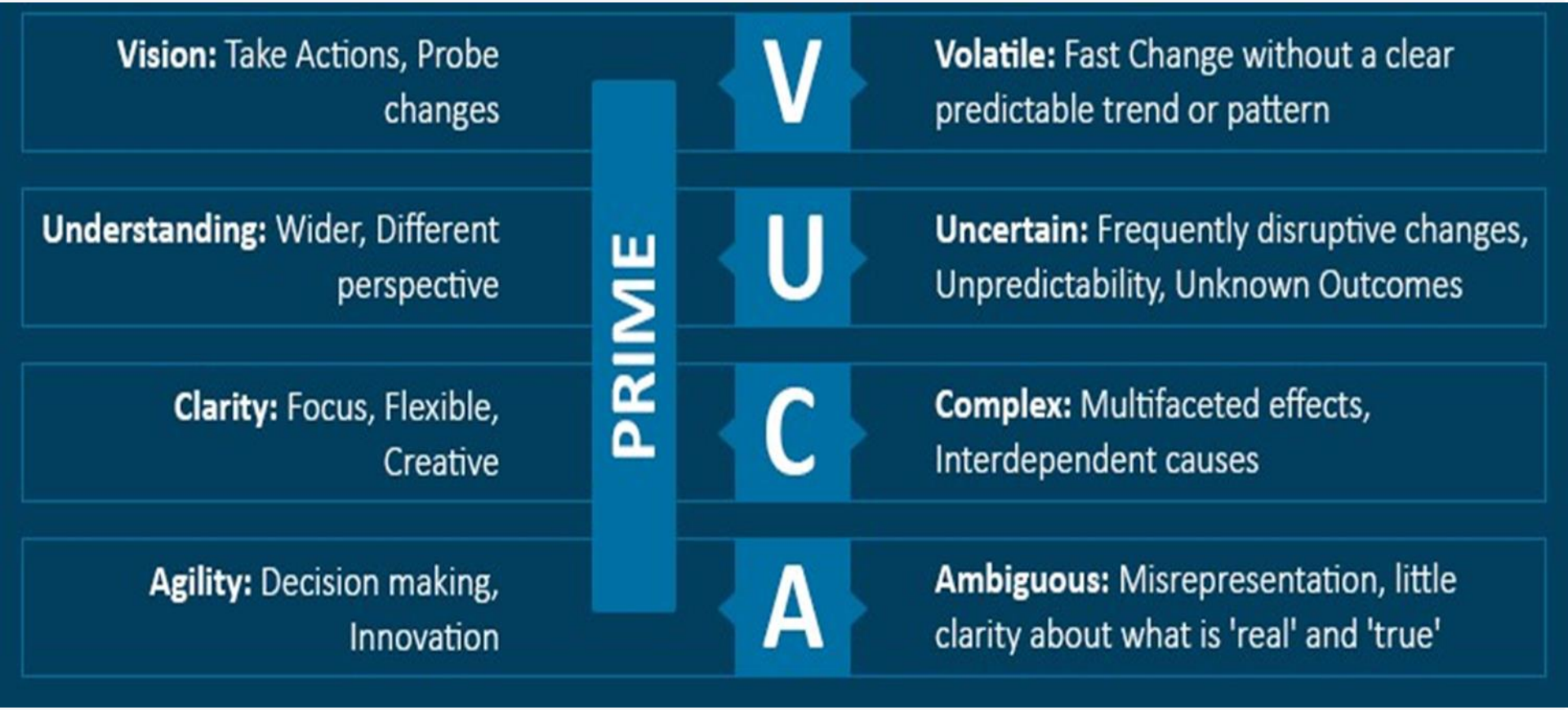

Pre-Internet
Internet of content
Internet of services
Internet of people
Internet of things
"Human to human"
• Fixed and mobile telephony
• SMS
"WWW"
• e-mail
• Information
• Entertainment
• ...
"Web 2.0"
• e-productivity
• e-commerce
• ...
"Social media"
• Skype
• Facebook
• YouTube
• ...
"Machine to machine"
• Identification, tracking, monitoring, metering, ...
• Automation, actuation, payment, ...
• ...
+ smart networks
+ smart IT platforms and services
+ smart phones and applications
+ smart devices, objects, data
+ smart Data and ambient context


DIGITALISATION
Environmentally Sustainable
Simplified Operations
Efficient Workflows
Greater Accessibility
Higher Productivity
Lower Operational Costs
Improved Document Security
Reduced Risk

VUCA WORLD


Vision: Take Actions, Probe changes
V
Volatile: Fast Change without a clear predictable trend or pattern
Understanding: Wider, Different perspective
U
Uncertain: Frequently disruptive changes, Unpredictability, Unknown Outcomes
Clarity: Focus, Flexible, Creative
C
Complex: Multifaceted effects, Interdependent causes
Agility: Decision making, Innovation
A
Ambiguous: Misrepresentation, little clarity about what is 'real' and 'true'
PRIME

Why Digitalisation - IIoT

I. Capturing production data.
II. Translating that data into actionable information.
III. Using that actionable information to improve operations.

- What's changed dramatically over the past few years is the way data is acquired, the volume of data, and the way it's used to improve operations
- Speaking specifically about IIoT and Industry 4.0, we often hear feedback like: "Well, that's just the same thing we've been doing for decades." And though that's mostly a valid statement—after all, the end goal of running an efficient organization hasn't changed—how we are doing it has changed significantly.
- IIoT decouples the "things" on the plant floor from the "applications" that make information actionable.
- The old point-to-point data model is replaced by a broadcast-subscribe model.

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Challenges in Chemical plants

Energy reduction

Safety

People enablement

Maintenance cost

Data Analytics

Regulatory compliance

Technology

Standards

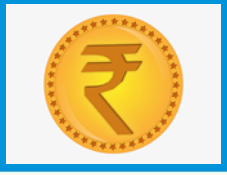

INDIAN INSITITUTE OF CHEMICAL ENGINEERS
ESTD. 1947
Water
Air
Gas
Electricity
Steam

Energy – Challenges and Opportunities

Components	Challenges	Opportunities
Water	Partial/no metering of outlet, leakages in pipes	Install digital flow meters and monitoring on DCS
Air (Compressed)	Leakages in pipes/fittings/tubing	Regular check of leakages
Gas	Leakages – CO2, NG, Ammonia, PRV	Gas detectors with centralized monitoring on DCS
Electricity	Manual meter readings, lack of sub metering	Install energy management information system
Steam	Leakages from steam traps, orifice, pipes	Area wise monitoring through digital meters

- Energy accounting and sub metering, detailed reporting and dash boards with indication of deviations , over consumption detection and energy balancing shall help in optimizing energy.

Maintenance cost



Components	Challenges	Opportunities
Rotating equipment	Insufficient monitoring of vibration, temperature, seal pot. Preventive maintenance is currently followed	Install AI sensors with monitoring on dash board and there by performing Predictive maintenance
Spare parts	Costly long delivery spare parts and Inventory Management	Install Inventory Management System on SAP showing status of spare parts
Obsolescence	Non – availability of 1:1 components	Timely upgradation with Open System Architecture
Pain points	Right problem statement	Right information to the right people at right time
Assets	Mostly old assets are dumb	Make important ones smart

Regulatory compliance

Components	Challenges	Opportunities
Discharge water	Insufficient/ no monitoring	Install digital flow meters and monitoring on DCS
Air Emissions	Suitable measurement device	Online monitoring on dashboard with deviation alarms
Water quality	Suitable measurement devices	Online monitoring on dashboard with deviation alarms
Visual Monitoring of Air Emissions	No monitoring	Install CCTV cameras with online monitoring. Possibility of exploring visual analytics
Fuel for Power Generation	Mostly coal based power plants for energy and there by control on Air Emissions (SPM, SO2, NOx)	Latest ESPs and centralized monitoring along with suitable techniques

Technology

Components	Challenges	Opportunities
Network connectivity	Unreliable connectivity	Reliable communication
Interoperability	Lack of seamless interoperability	Suitable interfaces
Sensor data	Reliable data with suitable update rate	Use AI Sensors with alerts on deviations
Privacy	Privacy of data sensors and software	Suitable systems
Cost	High price from big players	Optimized cost with single point of contact for hardware, software and connectivity
Historian	No historian/limited capability	DCS with OPC connectivity and suitable historian

Technology

Components	Challenges	Opportunities
Data Analytics	Excel/ Spreadsheet	Suitable data analytics software for root cause analysis
Visual Analytics	No such system in operation in most of the plants	CCTV based AI Algorithms to give alerts
Access control system	Mostly no such online systems	Suitable sensor based systems
Time synchronization for fault analysis	Mostly no systems/assets connected through GPS	Connect GPS on DCS and Electrical SCADA systems etc.
Use cases	Lack of use cases	Do pilot projects with small introduction of advanced technologies and then scale up roll out
Budget	Ambiguous ROI	Management buy – in with benefits, not necessarily monetary

Technology

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Components	Challenges	Opportunities
Availability of required parameters	Non availability of basic parameters/outputs to interface digitally	Installation of AI Sensors with suitable outputs and connectivity
Internet connection	DCS is not connected on internet	DCS historian to be connected to third party systems through cloud
IT and OT Convergence	IT and OT work independently	IT and OT teams to converge for digital transformation journey
Sensors	Non availability of suitable sensors for fertilizer plant environment	Sensors with suitable MOC and Protection/Ex-proof class
Wind direction	Wind socks to be seen in case gas leakage	Digital mapping of wind direction on DCS

People enablement

Components	Challenges	Opportunities
Legacy systems	Manpower trained in such systems	Re-skill and induct suitable persons, if required
Mindset / Culture Change	Reluctance to shift on new technologies	Training and benefits display by way of reduced site visits
Ownership	Digital systems become instrumentation baby	Ownership by cross functional teams
Digital Transformation group	Mostly being done by maintenance engineers	Have a Chief Digital Officer (CDO) with cross functional team
Display of KPIs	Restricted to HOD/ Section In-Charges	Large Screen display in Control rooms to increase participation


87.9 177.7 4
152.8 949
59.4 3.78 7.173

Data Analytics

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5 Questions to ask when selecting a process analytics solution -

Is the data analytics solution designed specifically for process manufacturing, and can it handle time-series data and solve intricate process manufacturing problems?

Does the analytics solution rely on your experts or its experts?

Is the analytics vendor more focused on the problems being solved or the technologies involved?

Does the analytics solution require you to move, duplicate, or transform your data?

Can the solution help your engineers work as fast as they can think?

Data Analytics - Opportunities

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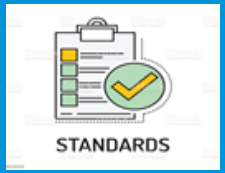
- Providing data to the right people at the right time in place of Silos
- Methodological conclusion of issues using data analytics and there by taking corrective actions to avoid future breakdowns
- Predictive maintenance in place of preventive maintenance
- Increase in employee productivity

Standards



Components	Challenges	Opportunities
Security	Lack of uniform Security Standards.	Introduction of uniform new Security Standards
Architecture and Reference models	Lack of the same.	Introduction of suitable models.
Applications	Lack of standards in application.	Introduction of Standards in applications

Safety

❖ **Safety – Protect People, Assets and Process**

- Improve Emergency Response
- Reduce Human Error
- Reduce Equipment Failures
- Maintain Stable Control

❖ **Introduction of Safety Instrumented Systems (SIS).**

Safety – Possible Digital Solutions

- Digital Video Training of employees and contract labor
- Mustering solutions
- Perimeter Monitoring and Fence Line Detection (Real time location solution)
- Automation of Work Permit and its closing on SAP
- Use of Drones for Online Monitoring of critical jobs
- CCTV based Visual analytics
- Digital Safety Board for increasing awareness

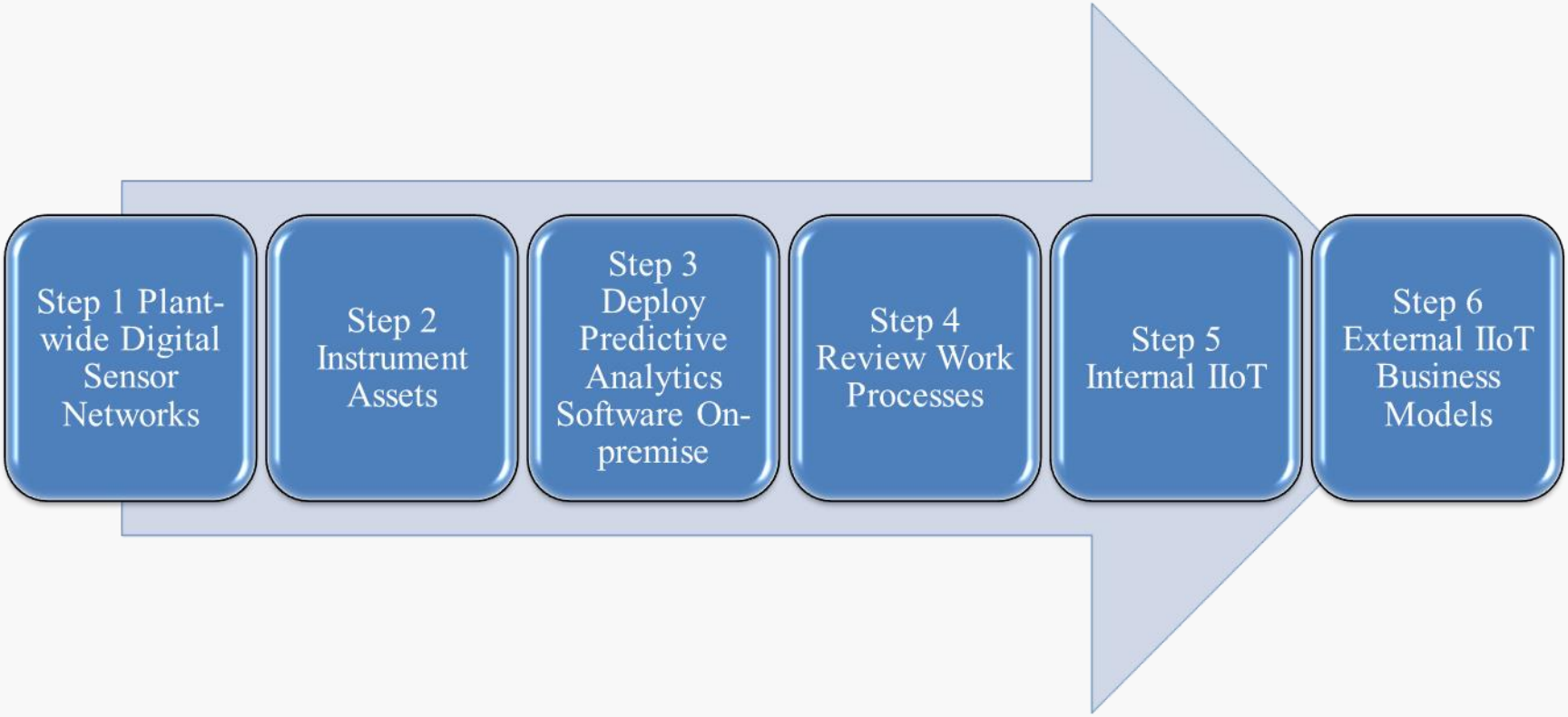
More Possible Digitalisation Opportunities

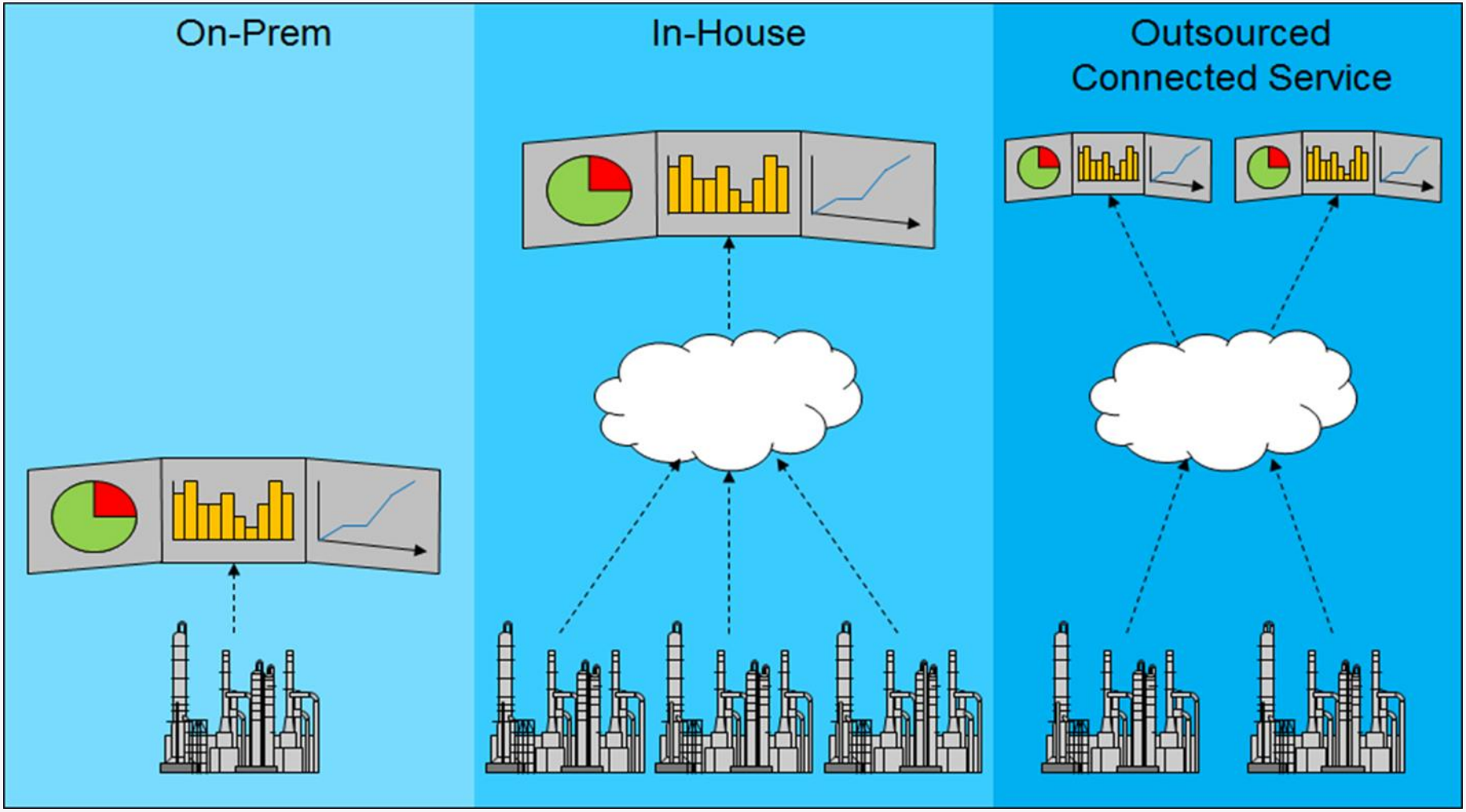
- Mechanical valves position monitoring
- Wireless Pressure Gauges
- Pressure Relief Valve (PRV) release monitoring
- RFID Tracking of Asset
- CO2 monitoring in Control rooms for ambient condition monitoring
- UPS & back up battery monitoring
- HT Cable joints wireless temperature monitoring
- Control valves performance monitoring
- Eye shower wireless monitoring

More Possible Digitalisation Opportunities

- AI/ ML based process KPI prediction
- Corrosion monitoring
- Critical alarms with specific audio in control room
- Heat Exchange monitoring
- Clamp on type flow meters
- Smart cooling towers
- Leak detection system
- Circuit breakers contacts wireless temperature monitoring

Vision to reality: roadmap to IIoT in 6 steps




On-Prem
In-House
Outsourced
Connected Service

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