

# CEMEX Intelligent Asset Management

Digital Transformation in Cement Operations

# Agenda

## Who is CEMEX?

**Coordination of global initiatives**

**Understanding Industry 4.0 trends**

**Definition of our Roadmap**

**Current status and next steps**

# CEMEX COMPANY PROFILE

## Summary

Our Mission is to create sustainable value by providing industry-leading products and solutions to satisfy the construction needs of our customers around the world

- We produce, distribute, and sell **cement, ready-mix, aggregates**, and related **building materials** in more than 50 countries, and we maintain **trade relationships** in approximately 102 nations

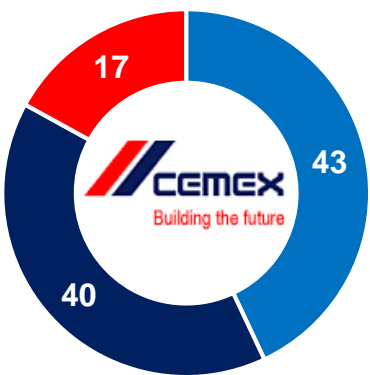
### A global industry leader

- One of the leading cement manufacturers in the world
- World's leading supplier of ready-mix concrete, and one of the world's largest suppliers of aggregates
- One of the world's top traders of cement and clinker

### Key Figures\*

2018 Sales	US \$ 14.38 billion
Operating EBITDA	US \$ 2.56 billion
Employees Worldwide	42,000
Employee Fatalities (Num.)	13
Employee Lost time injuries (Num.)	95
Production Capacity / Yr	Cement 93M tons with 56 plants & 11 mills
	Aggregates 150M tons
	Ready Mix 53 M m3

2018 Sales Distribution by product (%)



- Cement
- Ready-mix concrete
- Aggregates

2018 Sales Geographic Distribution (%)



- MEX
- USA
- EUR
- SCA&C
- AMEA

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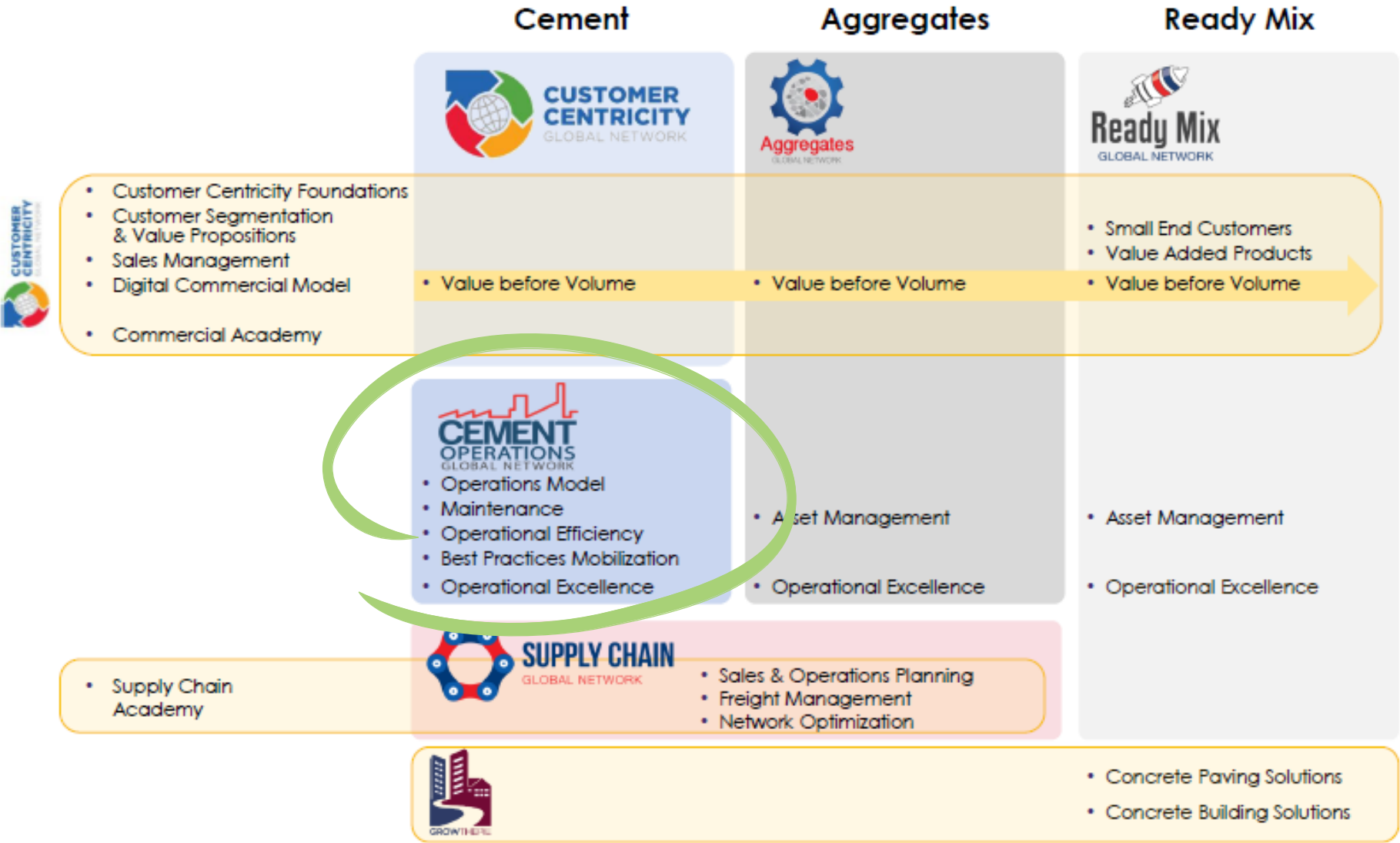
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# In 2014 CEMEX launched the Global Business Networks Covering Our Main Business Lines



# Cement Operations Global Network

## Mission

**“Our mission is to have the best Cement Operations in the world, with the safest, most efficient and low cost operations, offering the best quality, high valued, customer-oriented products and services with the most engaged, well trained, highly motivated, fully committed employees working as a team, across geographies. Acting at all times in a sustainable way, having the best reputation and relations with the community.”**

## Strategy

- **Achieve and sustain at least 90% of operative efficiency in every kiln**
- **Implement CEMEX's Operational Excellence Management approach based on lean six sigma principles to enhance productivity and performance of the plants**
- **Deploy CEMEX's Asset Management Model by enable RCM 2, improve our maintenance processes and tools, optimize preventive maintenance and move towards condition based maintenance to improve reliability of critical equipment in our plants and to optimize maintenance cost**
- **Develop a new Operations Model with up to date processes, tools and work procedures to deploy an evolved philosophy for our strategic, tactic and operative layers to work as One CEMEX**
- **Follow up Clinker Factor, Quality, Fuel mix optimization and electric power optimization initiatives, and engage other audiences to share best practices**

**In order to achieve our strategic objectives the network defined specific tracks and teams to work on the different strategic initiatives...**

# Cement Operations Global Network

Strategic priorities of our Tracks



Multiple initiatives started to leverage from current practices and systems and others to start working on innovative technologies...

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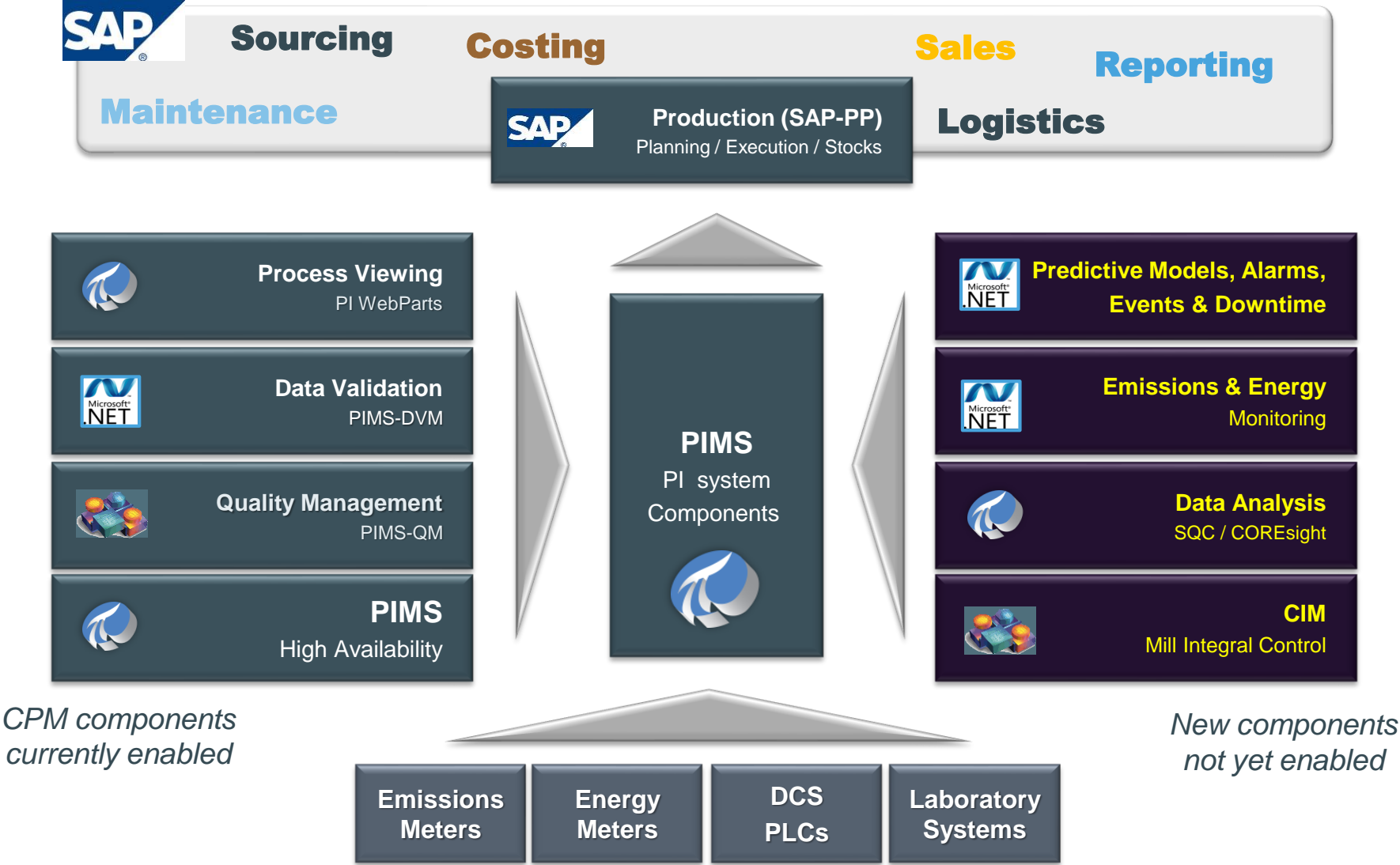
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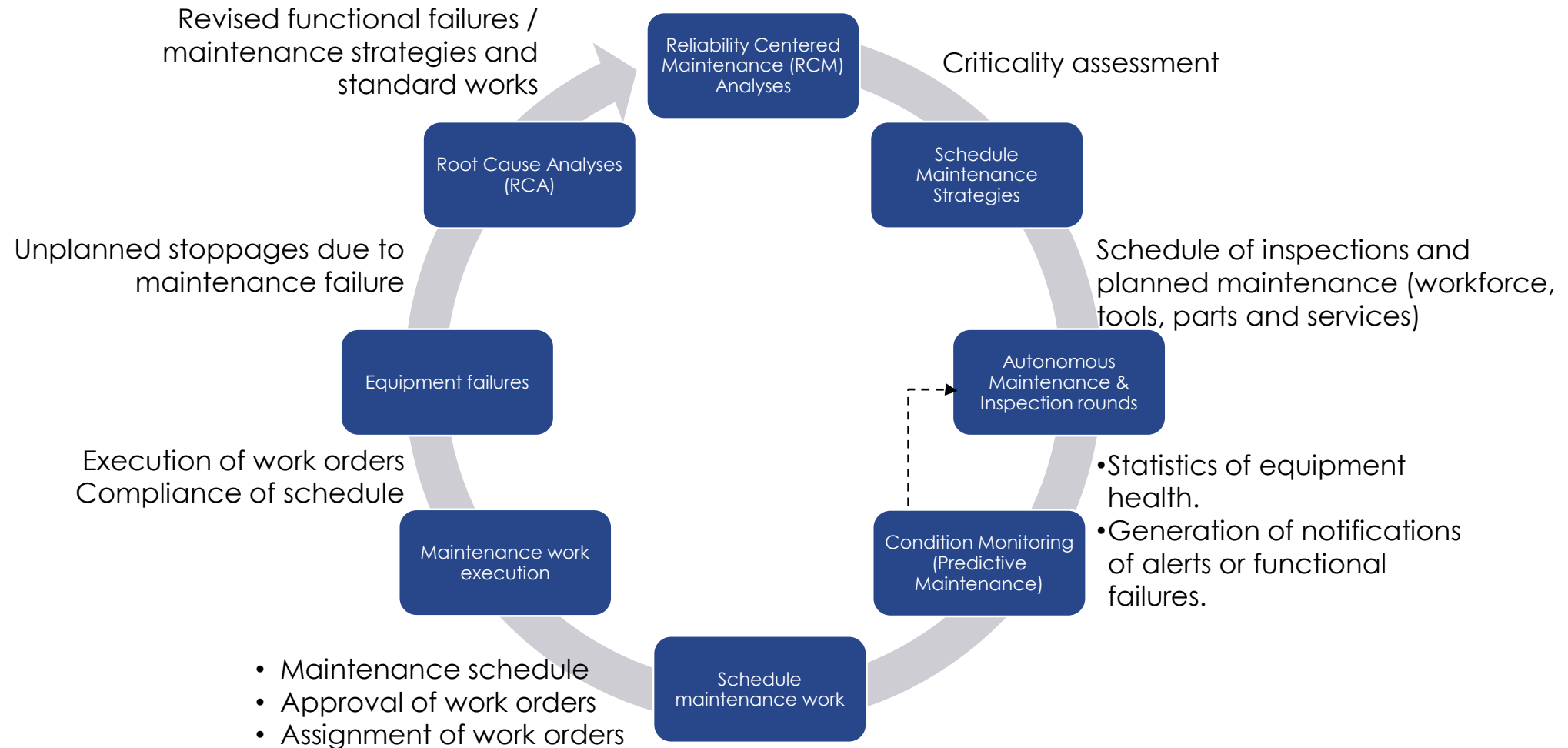
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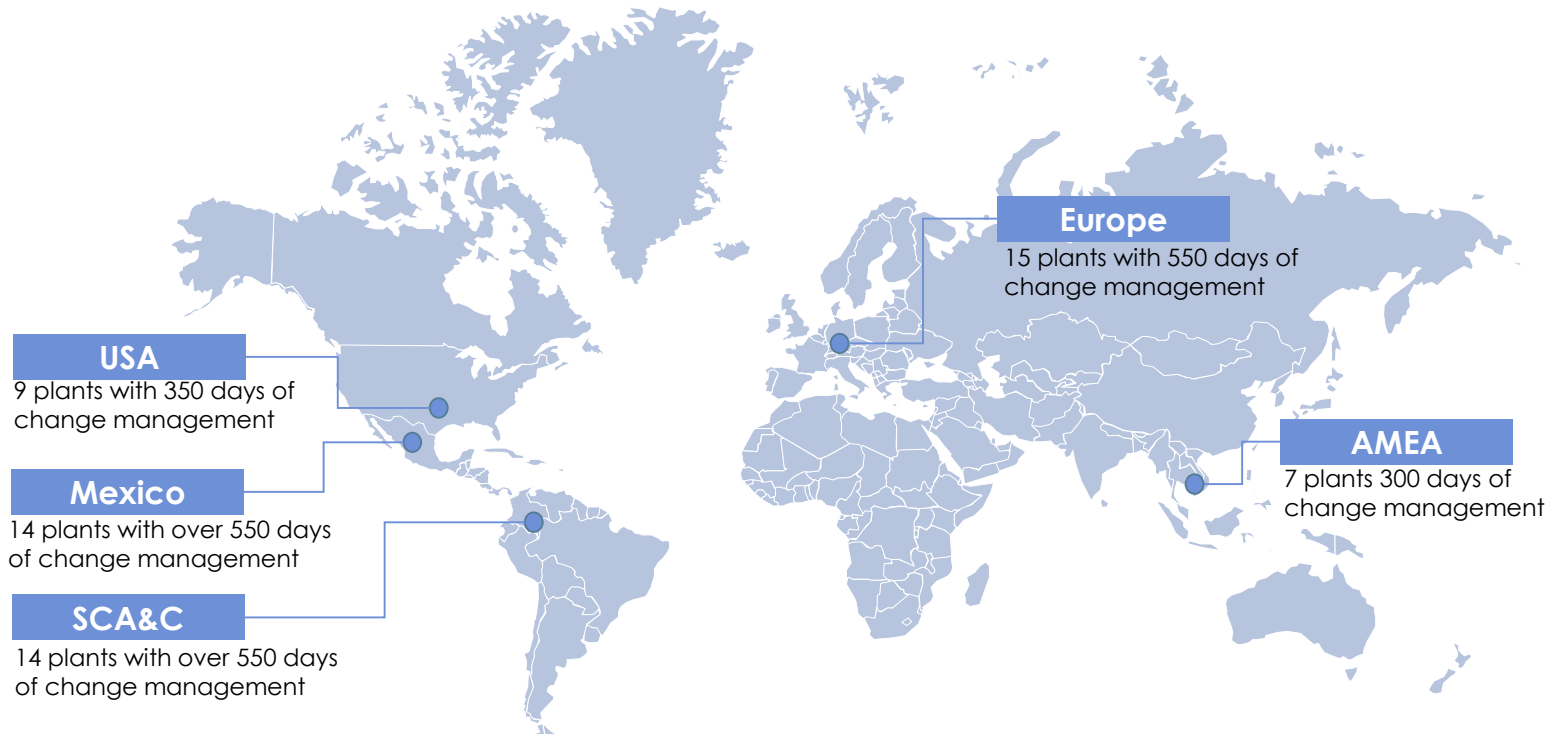
# But before we needed to level the production process with “Cement Production Model” in our cement plants...



# ... while the maintenance practice was globally strengthened with reliability centered maintenance...



# ... a program that was deployed worldwide during 2015-2016 with the services of the Aladon Network...



## RCM benefits

- **Attractive payback on a global basis**
  - Cost of maintenance potentially could be reduced from 5% to 20%
  - Relevant savings estimated to start 2 years after beginning implementation
- **Benefits to plants include**
  - Maintenance cost stability and better equipment reliability
  - The increased reliability enables additional volume of production
  - Workforce and working capital optimization

Scope of works included per site; plant assessment, 3 days general training, 10 day training for power users and coaching sessions to generate the new maintenance strategies for the critical equipment in the plants

# ... So in parallel we then could understand what Industry 4.0 could offer us...

## WHY INDUSTRY 4.0?

5

*Today's digital technologies can enable CEMEX to disrupt the building materials industry*



Technologies **enabling** Industry 4.0 "are **ripe to disrupt** the manufacturing value chain...**now is the time** for manufacturing companies to decide how to respond"

NEORIS  
Practical Visionaries

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Sources: McKinsey & Company – Industry 4.0 How to navigate digitalization of the manufacturing sector

## Establishing the Vision

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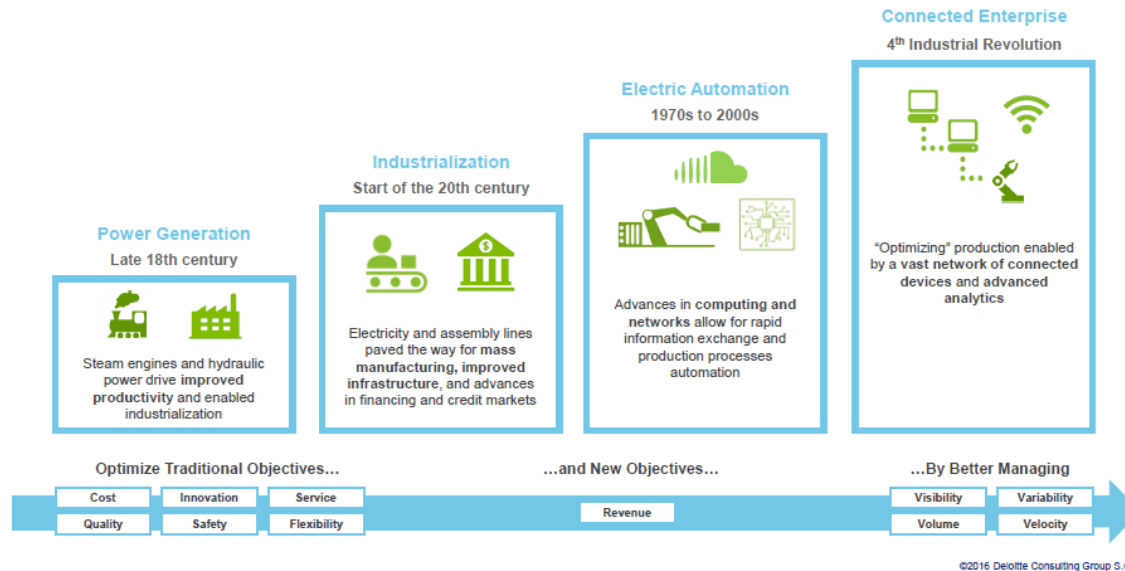


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Practical Visionaries

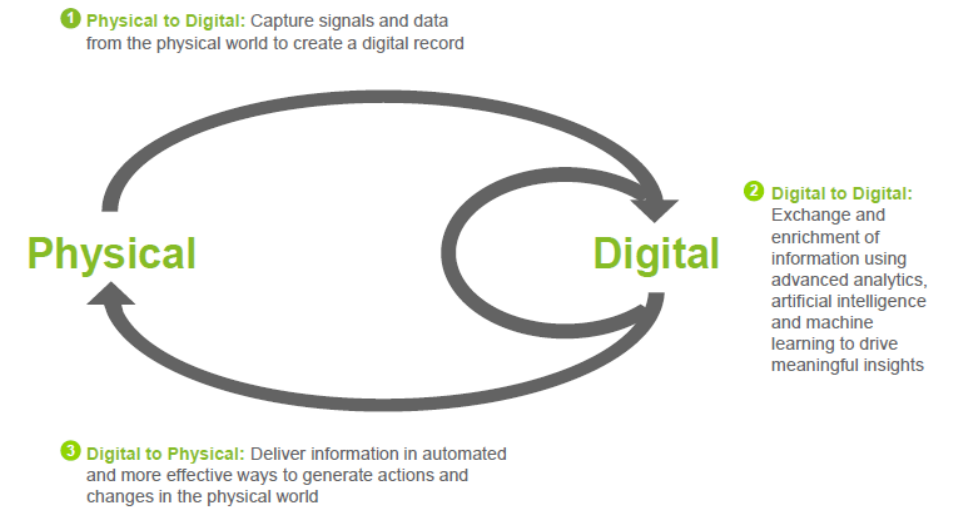
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# ... So then we could understand what Industry 4.0 could offer us...

A new phase of manufacturing has arrived: the connected enterprise

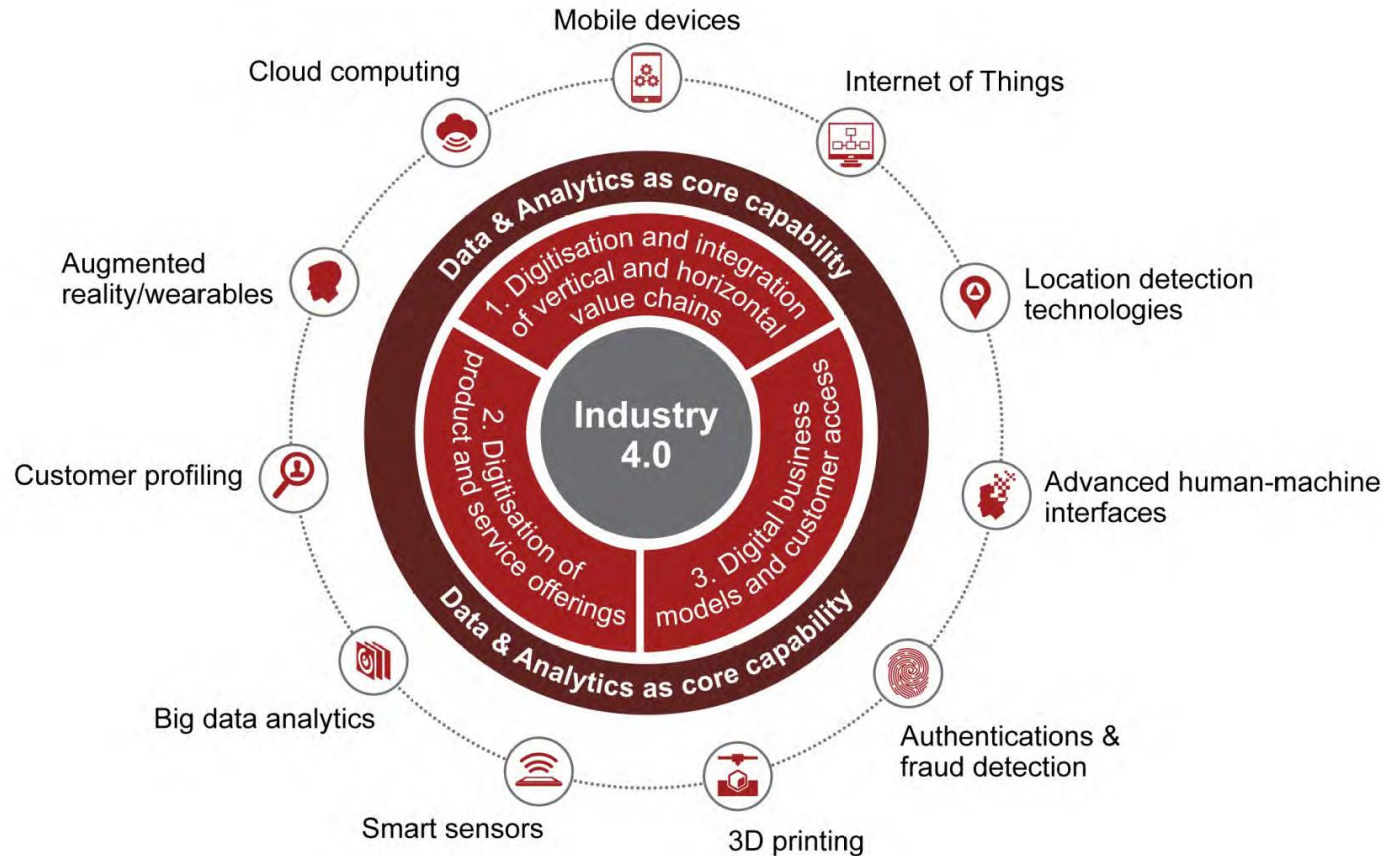


Applying innovative capabilities to digitize supply networks involves a continuous flow of information, goods and services between the physical and digital worlds

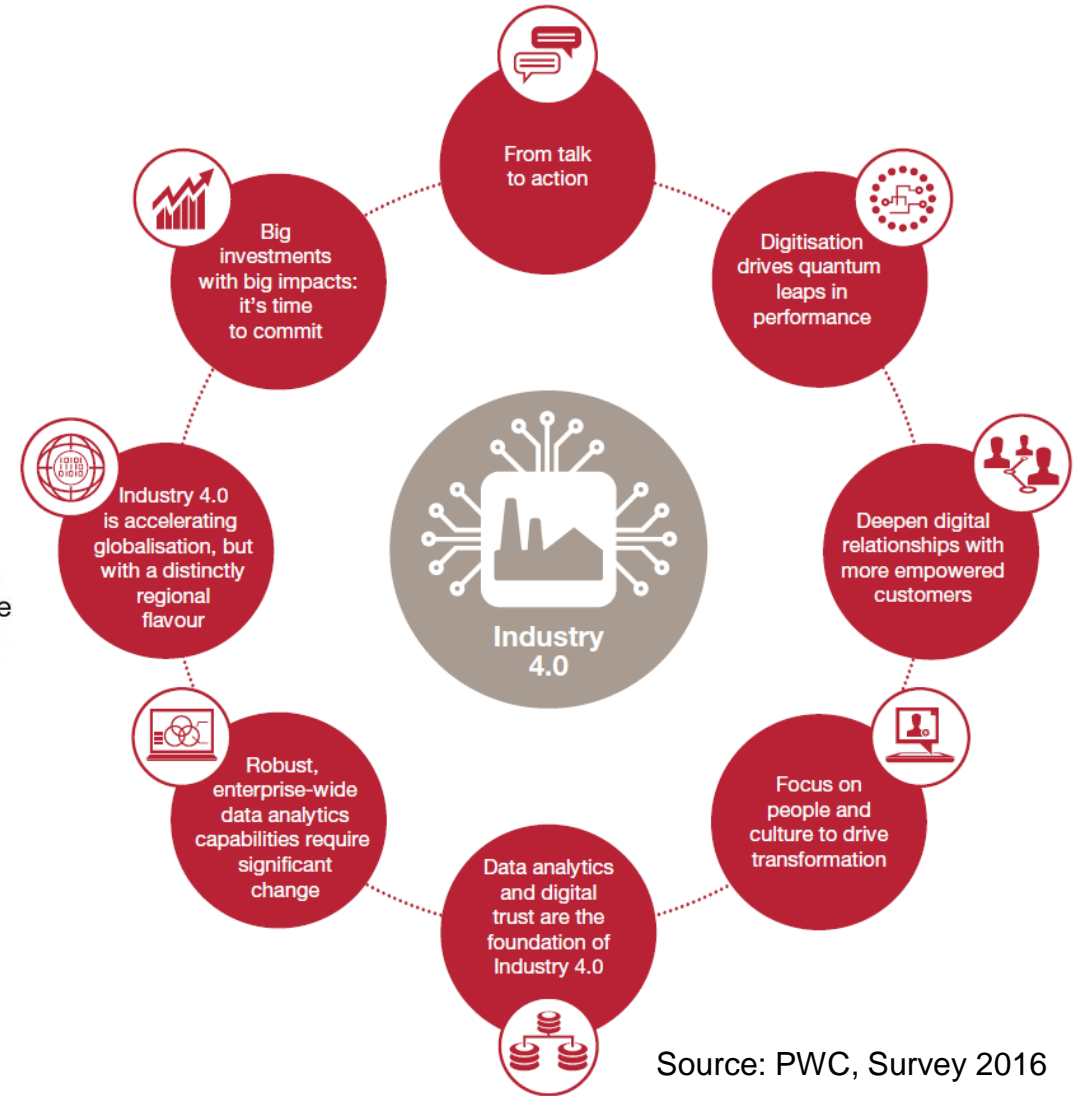


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# ... So then we could understand what Industry 4.0 could offer us...



Source: PWC, 2014



Source: PWC, Survey 2016



... So then we could understand what Industry 4.0 could offer us...

## What is the first wave of implementation?



Source: McKinsey and Co.

- “Predictive maintenance is the killer app for the IIoT” – Tom Siebel (C3IoT)
- There is a tremendous opportunity for IIoT to amplify the company’s current problem solving culture:
  - Define
  - Measure
  - Analyze
  - Implement
  - Control

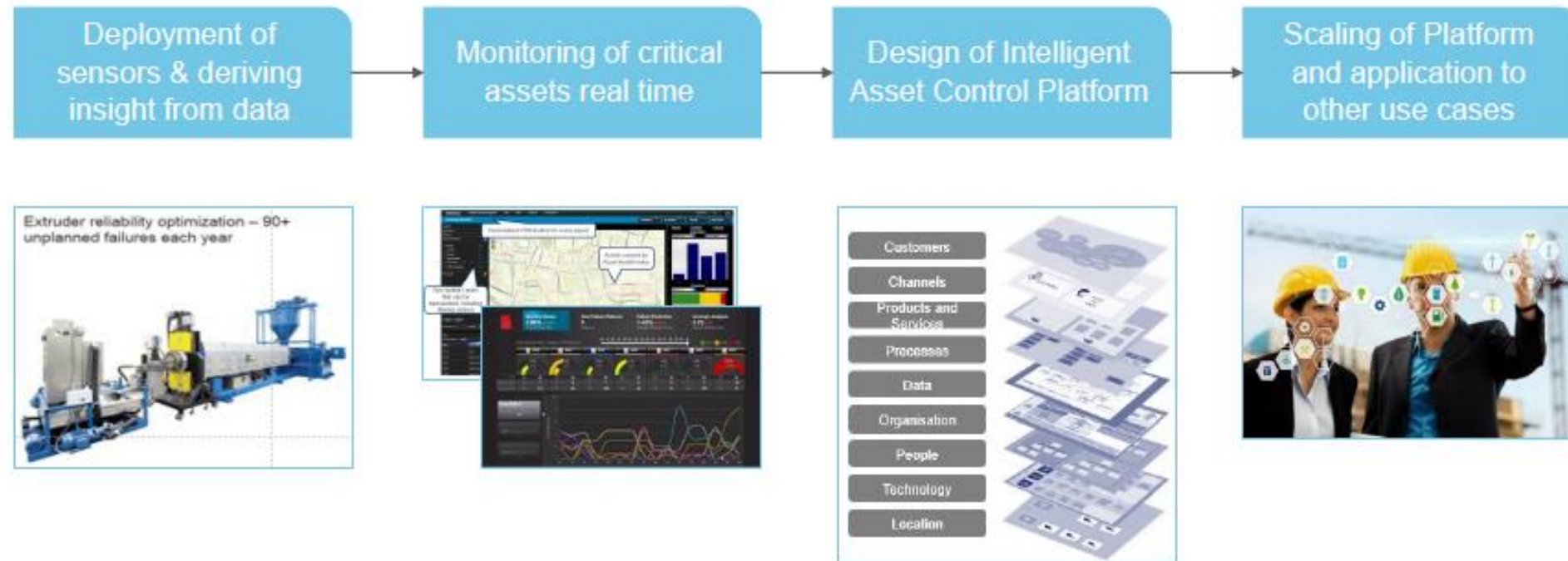
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# ... So then we could understand what Industry 4.0 could offer us...

## Predictive maintenance enabled by sensors

Sensor deployment led to 80 percent reduction in unplanned downtime at a leading Chemicals company



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... So then we could understand what Industry 4.0 could offer us...

MINING: DIGITAL ENABLEMENT OF  
CONTRACTORS FOR TURN  
AROUNDS

## CONNECTED MINE CLIENT #3

Accenture is helping the client to track over 1800 contractors with RFID tags during an industrial shutdown

Tracking is helping to improve management of workforce time on tools, better management of fatigue, management of density alerts, and improved financial reconciliation. Data captured wirelessly from workers is also being used to determine how future shutdowns can be better managed.



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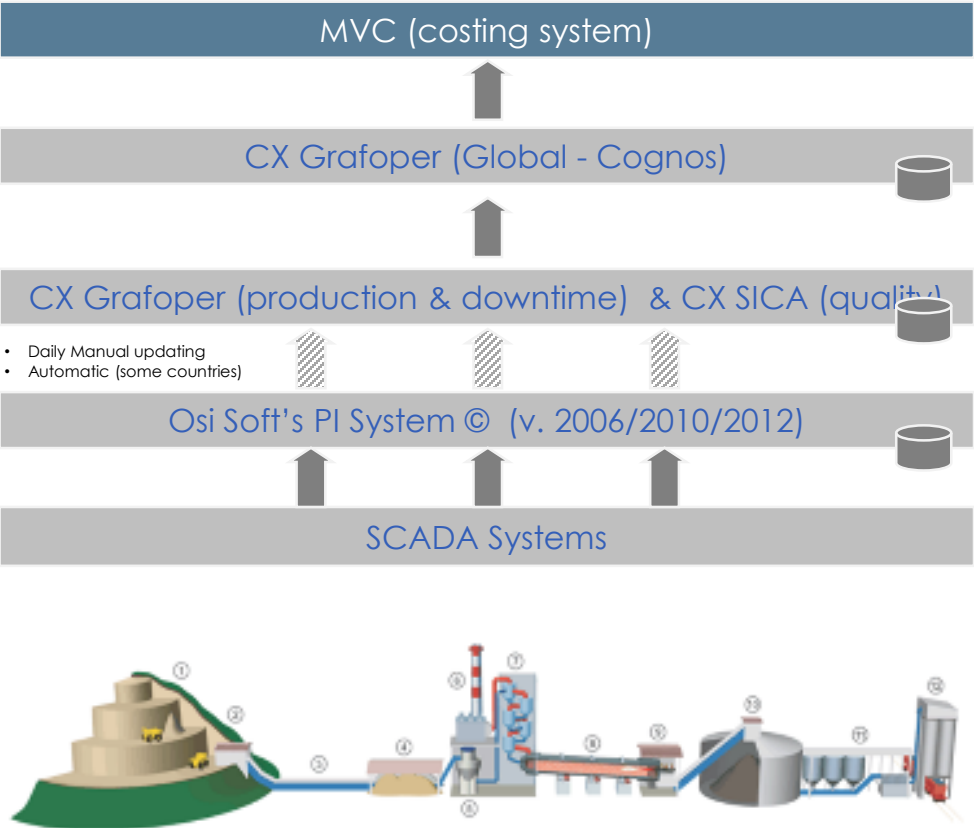
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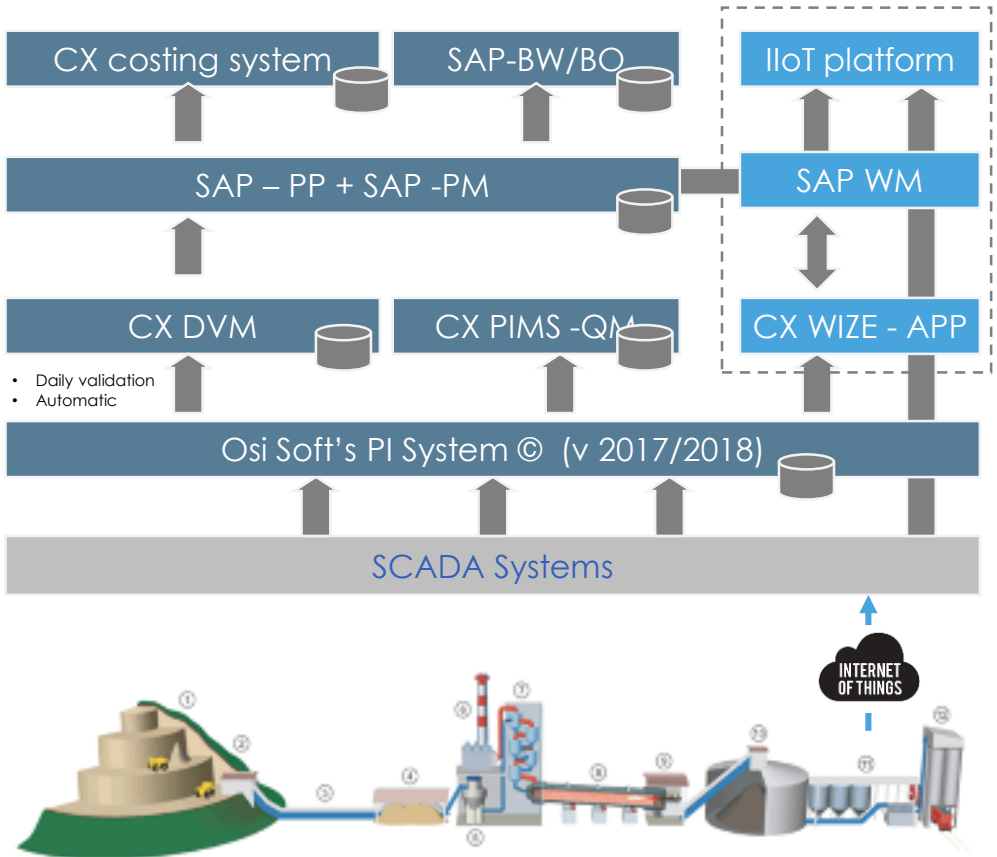
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# And based on the analyses to start with some quick wins...

## Current state

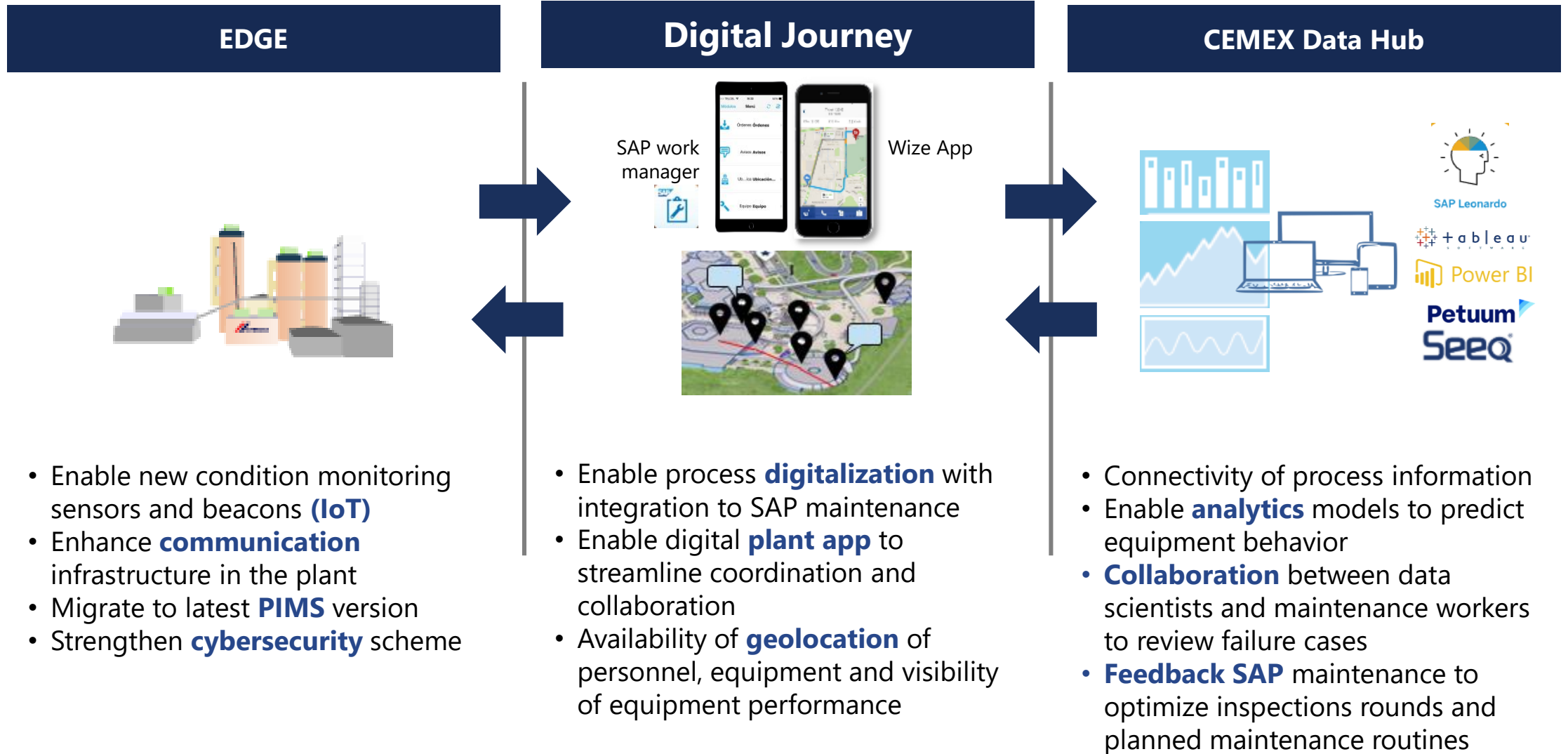


## Future state

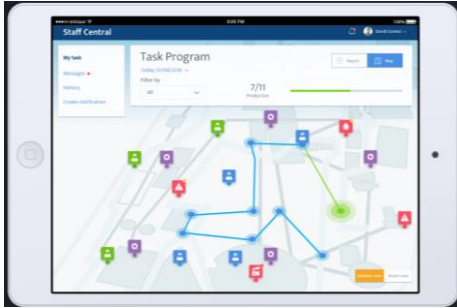


- Obsolete (Elderly) platform
- Mature platform
- Early / Adult technology

# Future state scope for digital transformation of cement operations



# CX WIZE – FUNCTIONAL SCOPE



## Persona

Maintenance field worker

Production field worker

Maintenance planner

Maintenance manager

Production manager

Control room operator

Remote monitoring operator

Plant director

Operative support

Application administrator

## Capabilities

Alarms

Chat

IP Cameras

Location of assets

Location of people

Map

Offline mode

Integration with PI  
Coresight

Roles

Single sign on

Status of assets

Integration with SAP  
Work manager

Integration with AI &  
Predictive analytics

## Connectivity with Systems of records

Analytics tool

Plant historian - OsiSoft

GIS – Google maps / ESRI

SAP Work manager

## IoT - Sensors

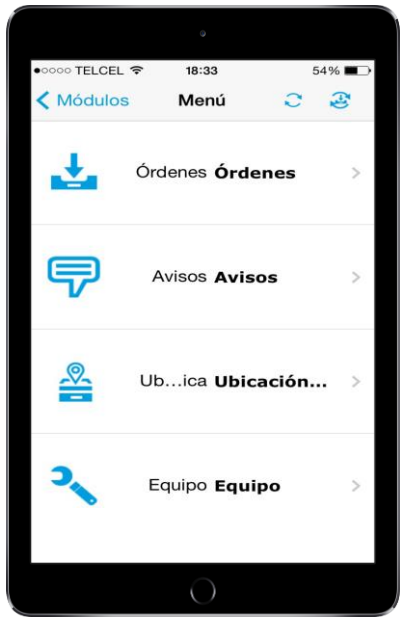
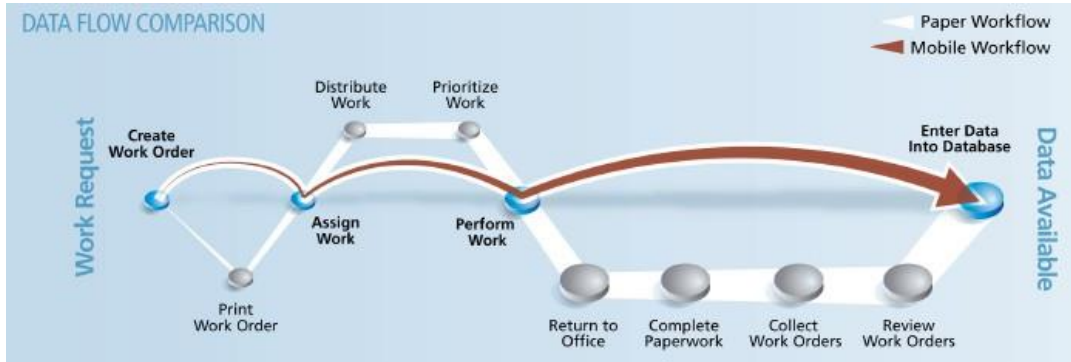
Geolocation of app users (lat, long)

Beacons – geolocation of external crews

Condition monitoring sensors

# SAP MM + SAP WM v6.5

## FUNCTIONAL SCOPE



SAM WM Demo

Personas		
	Field technician	Work coordinator
Management of Work Orders	<ul style="list-style-type: none"><li>• Manage assigned work orders</li><li>• Execute work orders</li><li>• Consult attached documentation (PDF's, Pictures, etc.)</li><li>• Add time and notify closure of work order</li></ul>	<ul style="list-style-type: none"><li>• Assign and transfer work orders to field technicians</li><li>• Receive push notifications for authorized work orders</li></ul>
Management of Notifications	<ul style="list-style-type: none"><li>• Identify equipment (barcode)</li><li>• Create notifications to equipment</li><li>• Add attachments (pictures / videos)</li></ul>	<ul style="list-style-type: none"><li>• Review notifications coming from the field technicians</li><li>• Consolidate notifications into work orders</li></ul>
Management of Inspection Rounds	<ul style="list-style-type: none"><li>• View assigned inspection rounds</li><li>• View resources and tools for the rounds</li><li>• Execute rounds and record readings for defined equipment in the round (pressure, temperature, vibration, etc.)</li></ul>	<ul style="list-style-type: none"><li>• Create inspection rounds</li><li>• Define measurement points and limits</li><li>• Assign and transfer inspection work orders to field technicians</li><li>• Monitor work execution and trends of process variables</li></ul>

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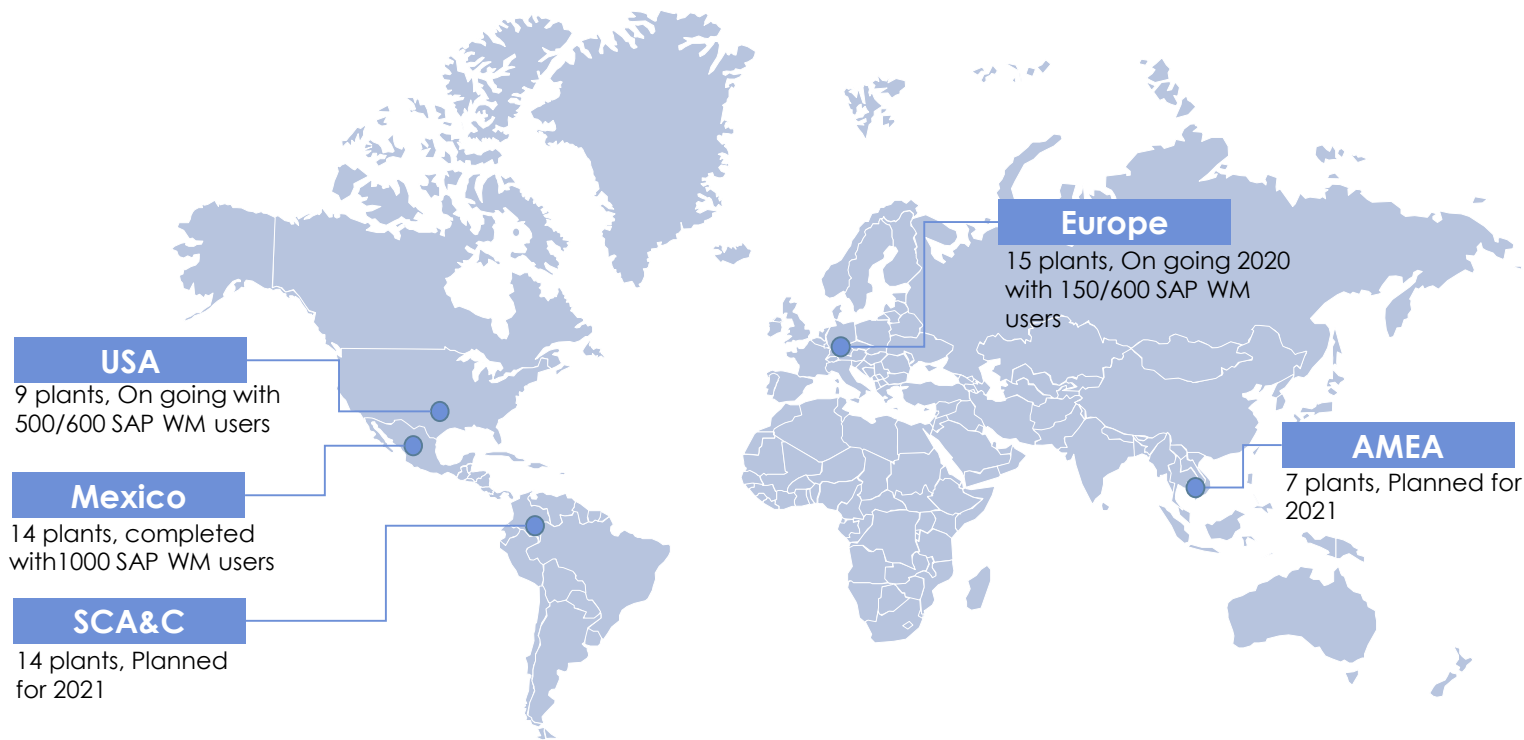
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# SAP MM + SAP WM

## DEPLOYMENT SCOPE

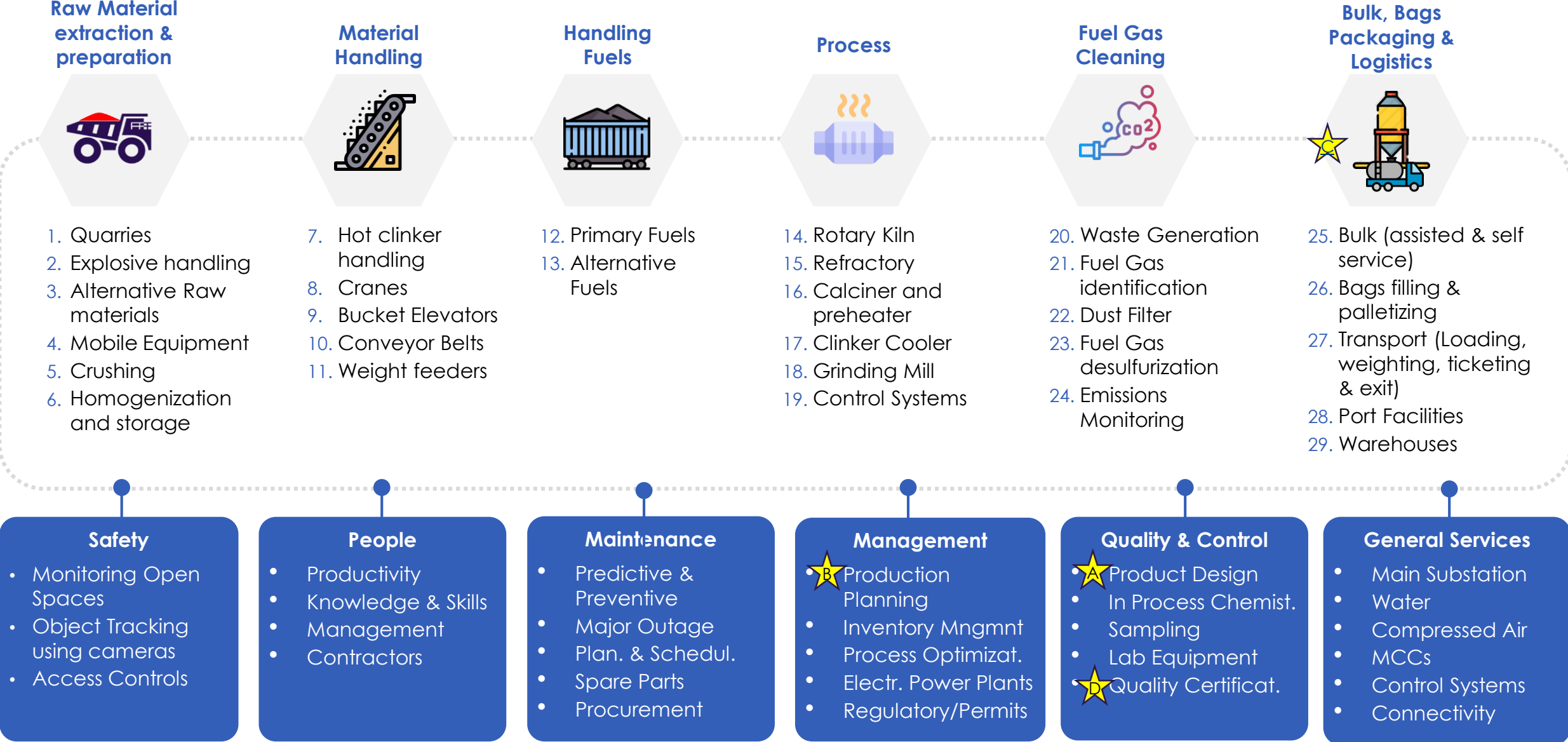


Key Benefits	2015	2019
Indicators (Kilns)		
Operational efficiency	85%	89%
Equipment availability	96%	97%
Mean time between failures (Hrs)	420 hrs.	1,000 hrs
Mean time to repair (Hrs)	11.1	14.2

Multiple efforts are combined to increase equipment reliability and operational efficiency



# Cement Operations Journey with Customer Journey touch-points (★)



# THANK YOU