



# Digital Transformation of Major Accident Hazard Management

Simon Jones, 5th CCPS Global Summit on Process Safety, 22-23 Oct 2019, Singapore

# Digital Transformation of Major Accident Hazard Management – two refinery case studies

## OUTLINE

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### CHALLENGE

Are our facilities getting any safer?

Lessons from 2019 survey of Process Safety professionals

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### OPPORTUNITY

Dynamic frontline risk management

Industry 4.0 and Operational Risk Management Systems

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### CASE STUDIES

Improving operational risk assessment – Offshore Installations in UKCS

Delivering real-time risk view of all activity & critical equipment status for major ME & SEA refineries

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### CONCLUSIONS

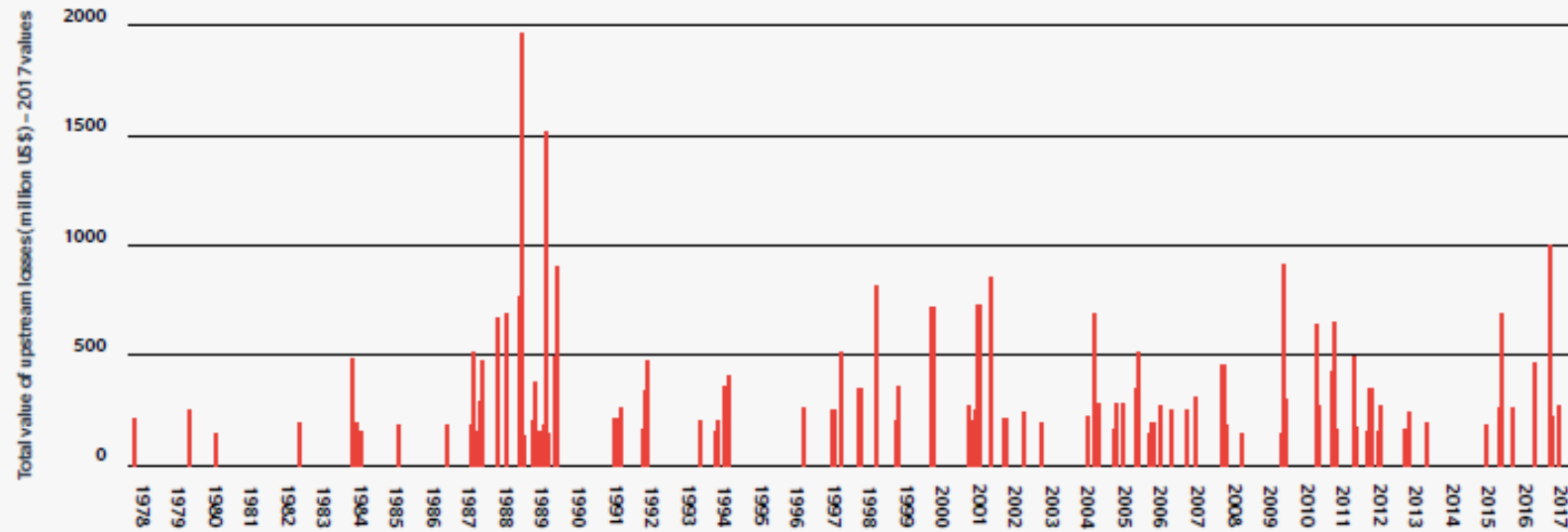
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### Q&A

# Are Our Facilities Getting Any Safer?

**FIGURE 1 DISTRIBUTION OF THE 100 LARGEST LOSSES BY YEAR**

Source: Marsh Research



“mechanical integrity failure” responsible for 57% of human-influenced losses

“operators must maintain high levels of monitoring and vigilance to ensure that asset integrity is being maintained and accidents are eliminated”



Reference: The 100 Largest Losses 1978-2017, 25<sup>th</sup> edition, March 2018

<https://www.marsh.com/uk/insights/research/100-largest-losses-in-the-hydrocarbon-industry.html>

# 2019 Process Safety Survey - Methodology & Demographics

<b>35 Questions</b>  April 3 - June 6 2019  <b>230 total responses</b>	Safety Culture	The Reality of Risk
	PSM/ORM Roles & Responsibilities	Safety-Critical Maintenance & Asset Integrity Inspections
Identify & Manage Risk	System Maturity for Managing Sources of Operational Risk	The Future of Operational Risk Management

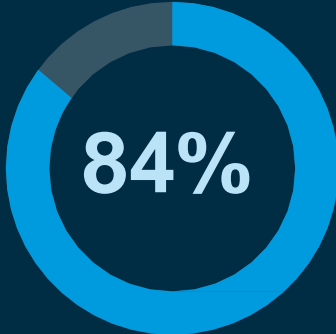
Reference: 2019 Survey on the State of Process Safety and Operational Risk Management – Part One, August 2019  
<https://sphera.com/exclusive/psm-orm-part-one/>

- **31%** have been in process safety, ORM, or asset integrity for > 15 years
- **45%** Oil & Gas, **18%** Chemicals/Petrochemicals, **9%** Manufacturing, **7%** Utilities, **4%** Metals & mining, **7%** Engineering, **10%** Other
- **55%** are focused on corporate and/or regional process safety and operational risk management
- **30%** North America; **23%** Middle East; **18%** Asia; **11%** Europe; **18%** other
- **38%** have > 10,000 employees
- **45%** operate > 25 plants or industrial facilities

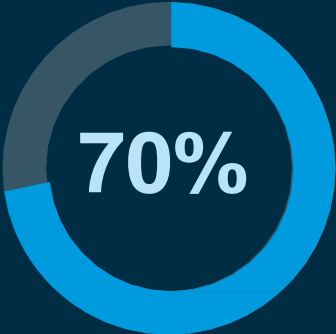


# Key findings

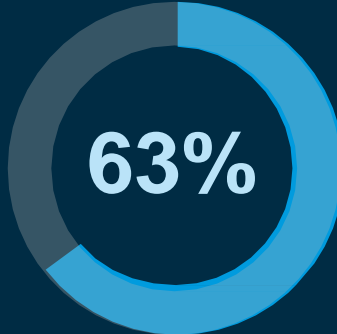
## GOOD INTENTIONS



believe safety is part of corporate value structures and is supported by the highest levels of management, including the company president/ceo



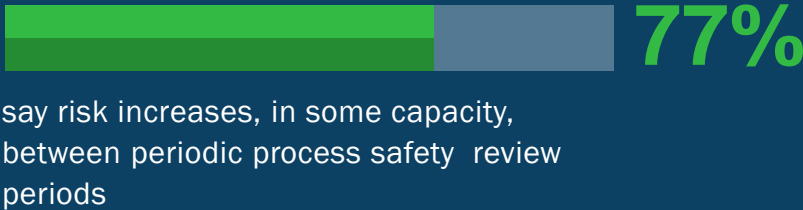
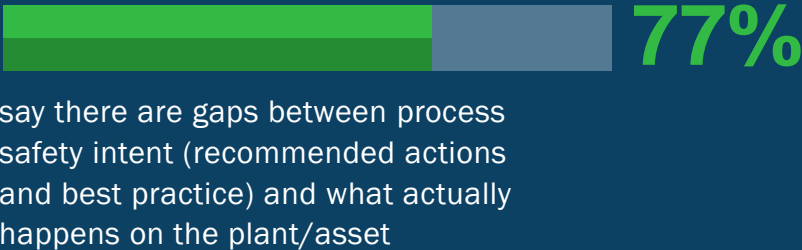
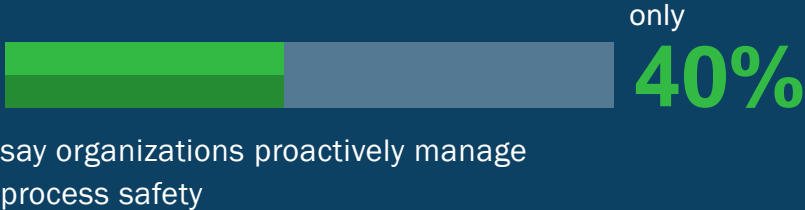
say companies generally have a defined roadmap and goals for advancing safety performance



say companies generally have well-defined leading and lagging safety indicators

# Key findings

## BUT FALLING SHORT ON MEANINGFUL PROGRESS



# Key findings

## FACTORS DRIVING GAPS ON THE GROUND

**69%** In a typical month, on average, only **two-thirds** of scheduled asset integrity inspections are achieved.

**49%** Loss of experienced personnel

**45%** Conflicts between procedures/policy and frontline working practices

**41%** Aging facilities

**39%** Deterioration in the health or effectiveness of designed process safety barriers

# Safety-Critical Maintenance & Asset Integrity Inspections

## Safety-critical maintenance

In a typical month, on average, **66%** of scheduled safety-critical maintenance is achieved

**72%** believe it is possible/practical to achieve 100% of scheduled safety-critical maintenance

Challenges to achieving 100% of safety-critical maintenance



Top (3): limited resources (**64%**), conflicting priorities (**59%**), Limited budget (**45%**)

## Asset integrity inspections

In a typical month, on average, **69%** of scheduled asset integrity inspections are achieved

**76%** believe it is possible/practical to achieve 100% of scheduled safety-critical maintenance

Challenges to achieving 100% of asset integrity inspections



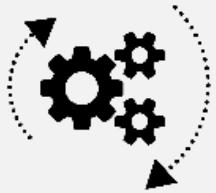
Top (3): Limited resources (**66%**), conflicting priorities (**56%**), Limited budget (**42%**)



# What is Your Operational Risk Reality?

The operational risk landscape changes as fast as the operational reality.

Since the day the asset became operational or the last PHA was completed, its process safety risk exposure began to change.



Management of Change (MoC)



Impairments



Deviations



Operations Activity



Inspections



Permitted Activity



Overdue Maintenance



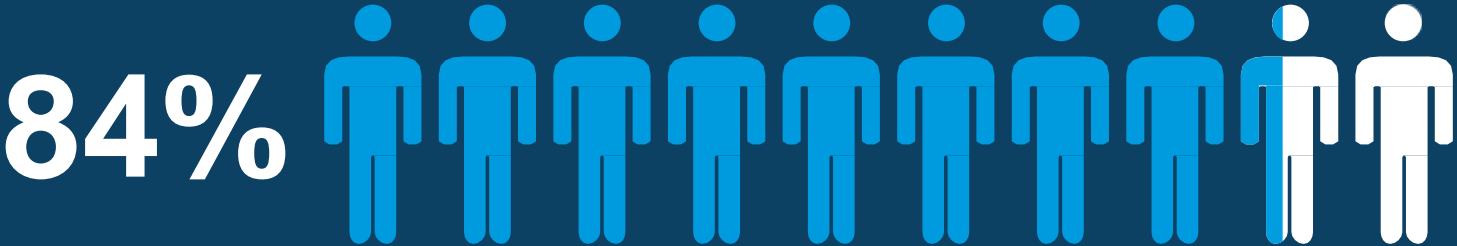
Inhibits

And unavoidably, risks are often managed in different parts of the organisation. Information is siloed. Dots are not connected.

# Digitalization provides opportunities

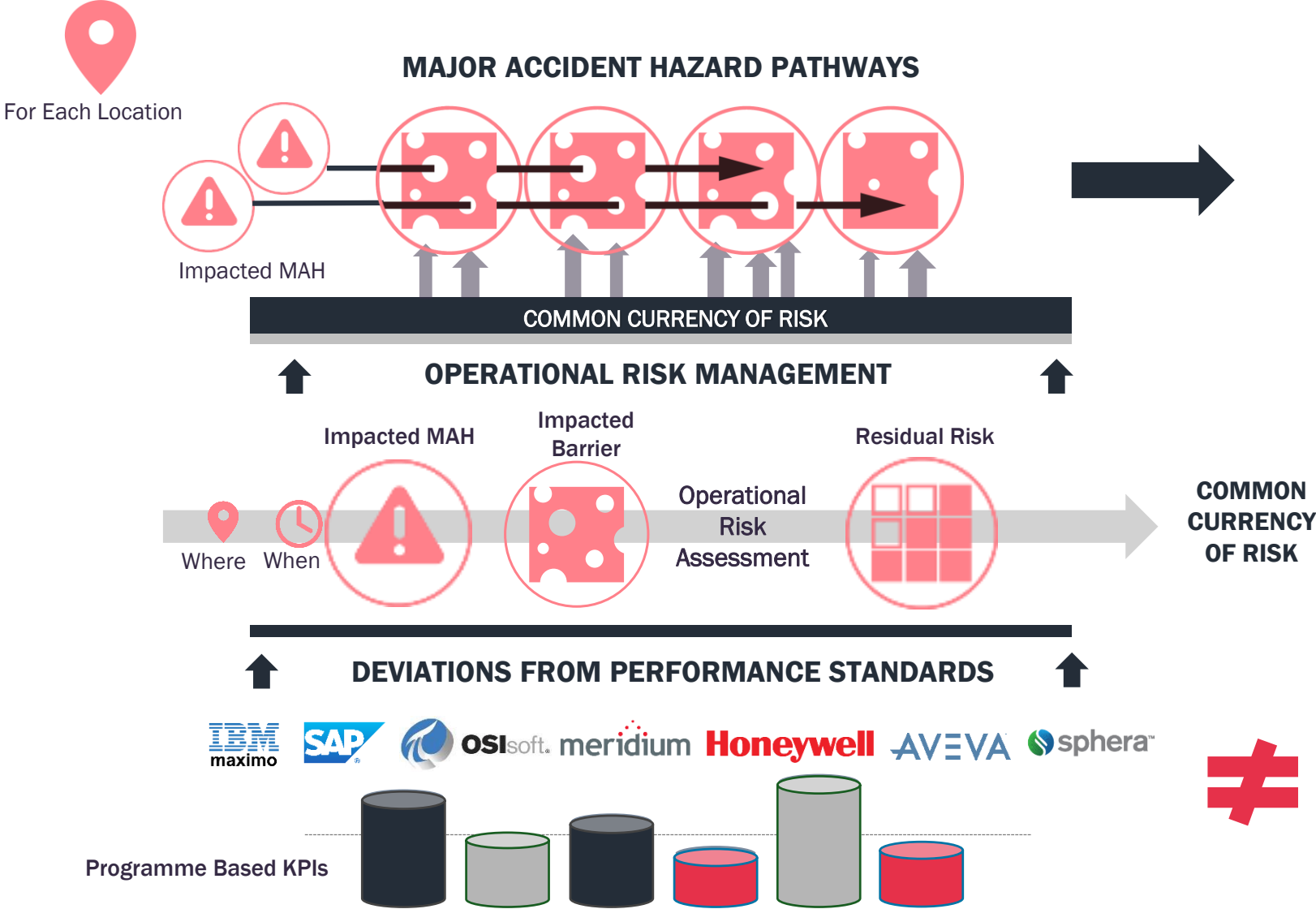
## DIGITALLY TRANSFORMING PROCESS SAFETY AND OPERATIONAL RISK MANAGEMENT IS KEY

Integrating sources of risk and accessing real-time data streams can improve decision-making and unlock operational excellence.



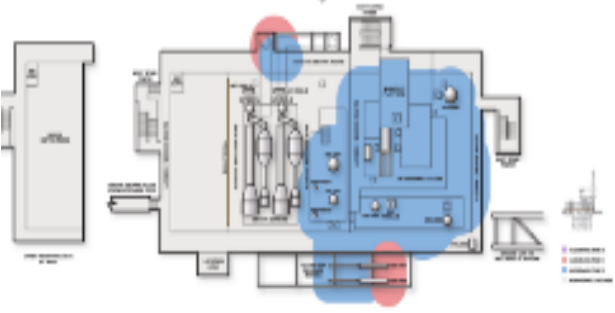
said risk awareness and safety would be improved if the workforce and management had access to real-time process safety risk indicators on the plant in the next report we'll dig deeper into the specifics of how respondents see to address many of the specific challenges

# Operational Risk Management Models



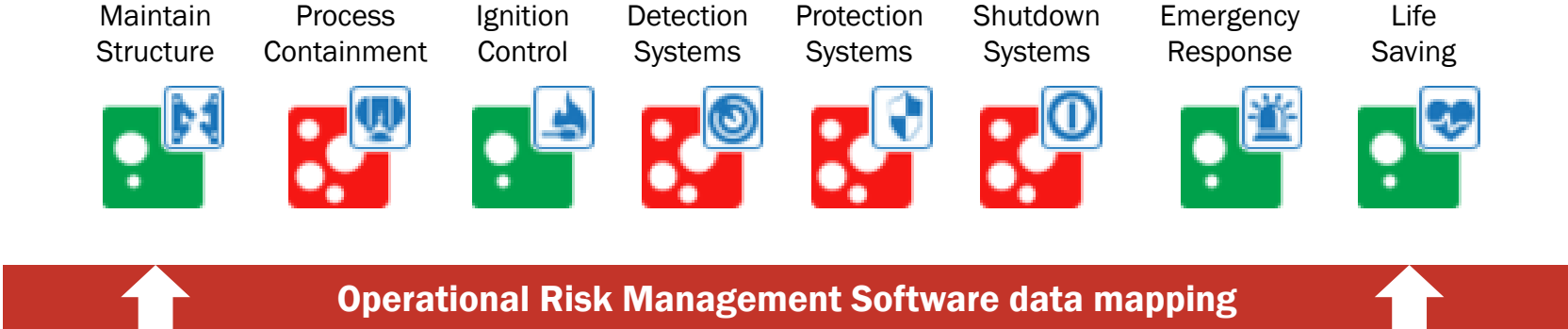
HIGHLIGHTED MAH RISK PATHWAYS

	MAH 1	MAH 2	MAH 3	MAH 4	MAH 5	MAH 6	MAH 7	MAH 8	MAH 9	MAH 10	MAH 11	MAH 12
	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk
Process Area 1	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk
Process Area 2	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk
Process Area 3	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk
Waste Tank Area	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk



# Operational Risk Management Models

## Fundamental Barrier Grouping Model

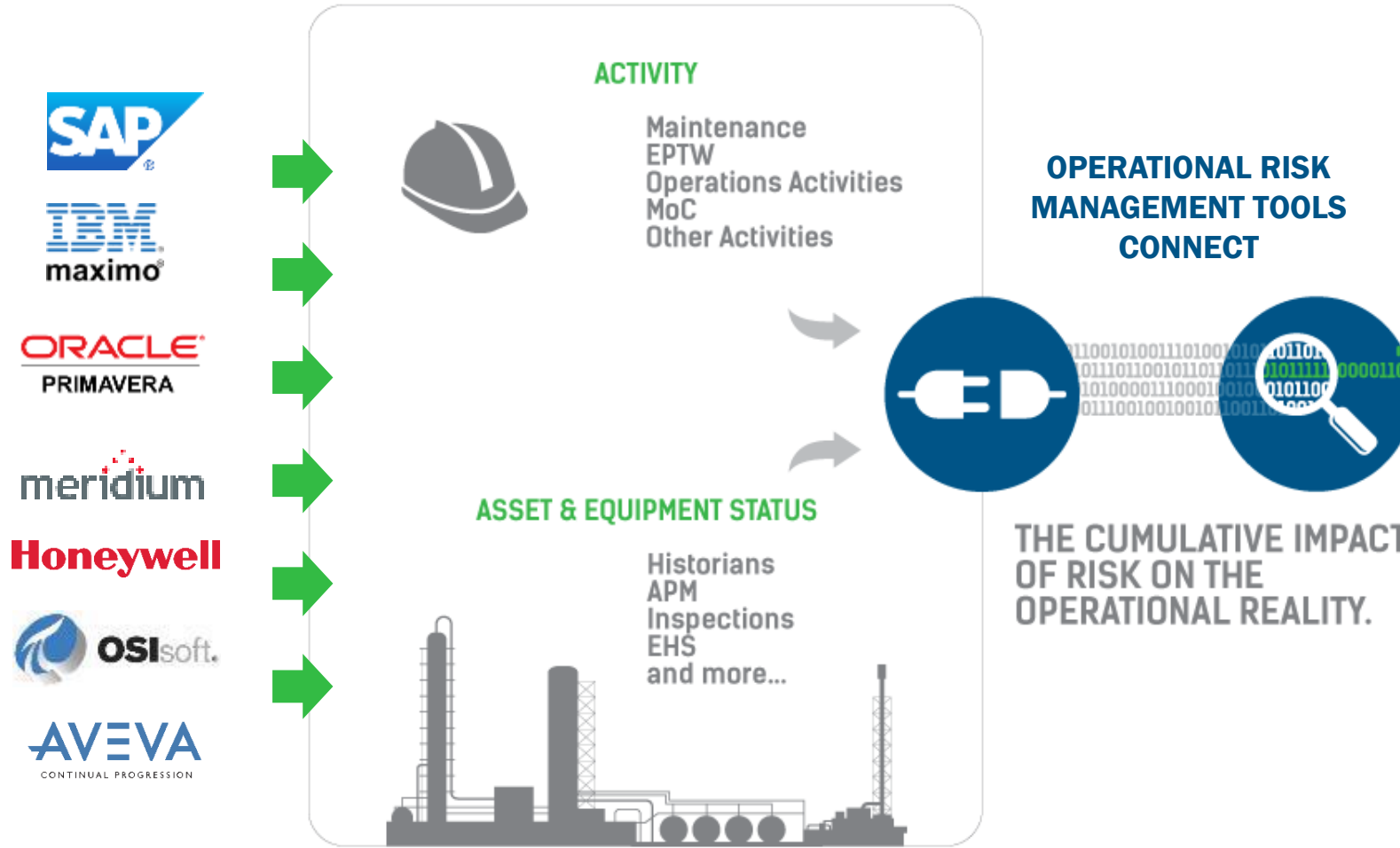


### *Data generated by vertical, functional silos and systems*

- Overdue Maintenance
- Overdue Inspections
- Planned Maintenance
- High Risk Jobs
- Failed Inspections
- Field Observations
- Management of Change
- Emergency Critical Equipment Status
- PSM Critical Equipment Status
- IOW Deviations

# Predict, Understand & Mitigate Risk

Everyone Can Make Better, Safer Operational Decisions



\*One of many integration use cases



# Improving Operational Risk Assessment

- Inspection
- Operator Rounds
- Maintenance
- Audit

- SCE – types / classes:
- True hazard
  - Mitigating measure
  - Qs / checklists
  - Criticality guidance
- All from Operators SCE Performance Standards



**BARRIER HEALTH & MAJOR ACCIDENT PATHWAYS**

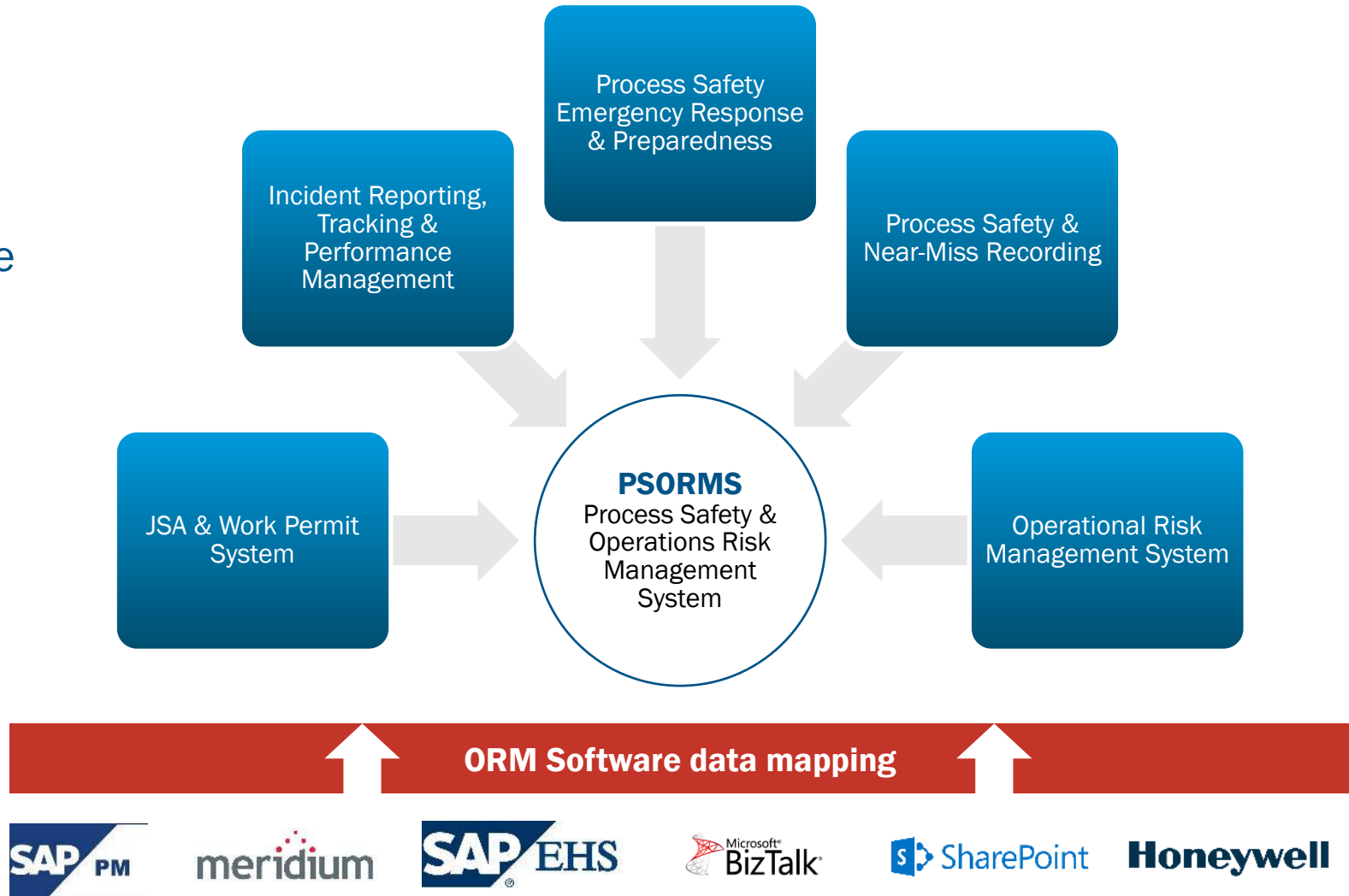
**IMPACT BY LOCATION**

**IMPACT ON THE SCHEDULE**

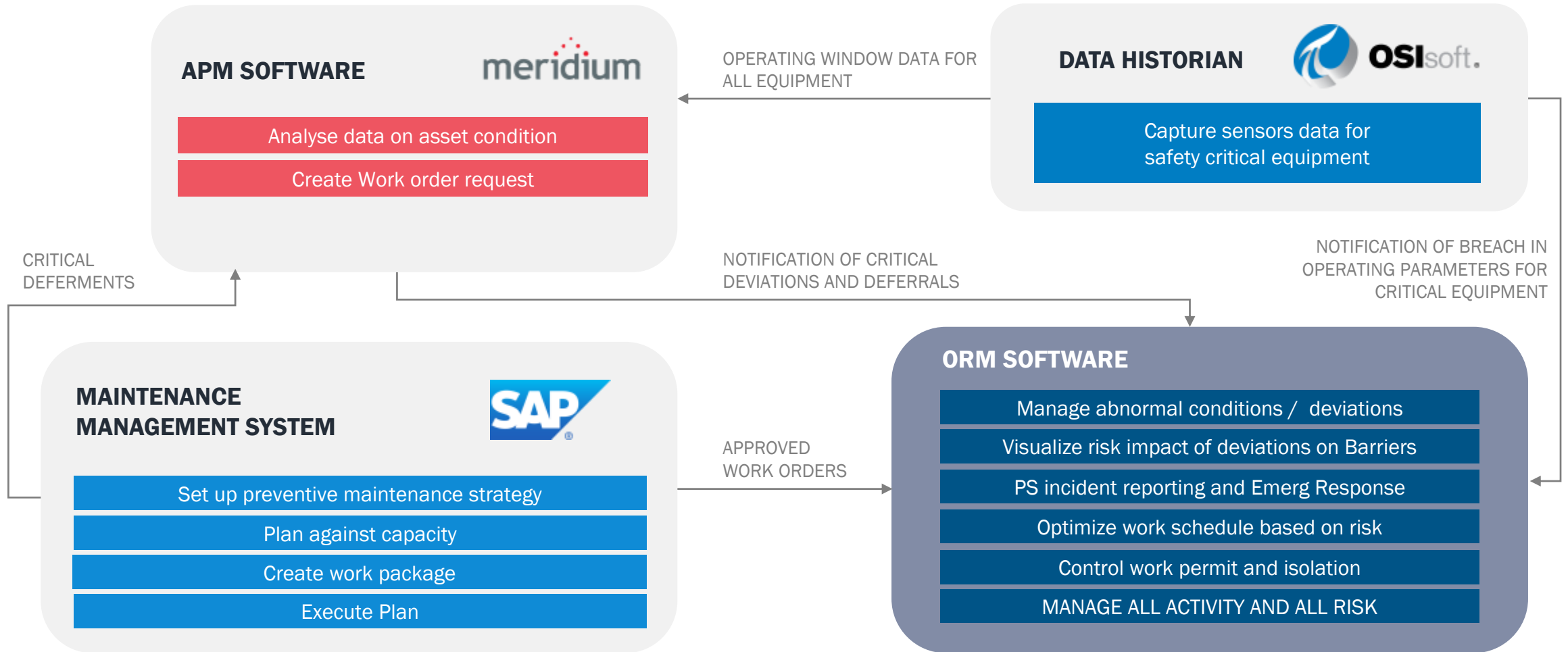


# Delivering a Real-time Risk View

“Close-the-loop between operations, maintenance and engineering to reduce risk, improve productivity and lower costs.”

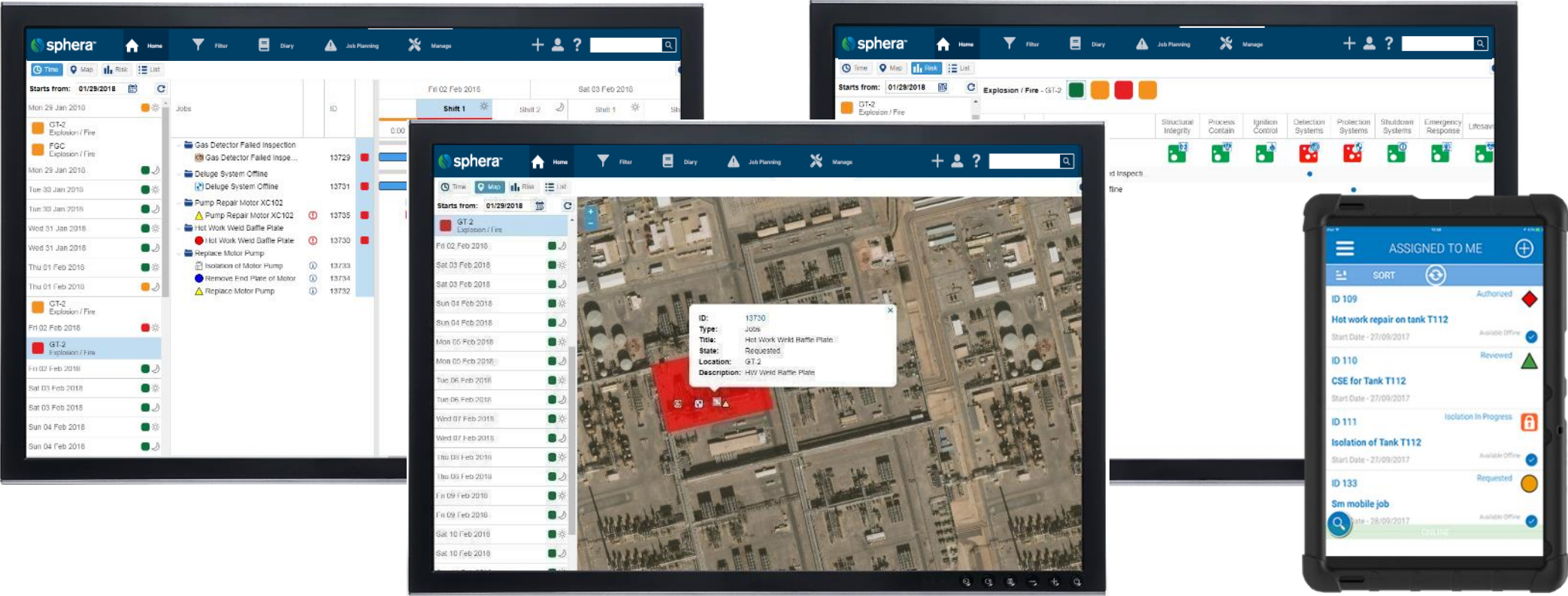


# Delivering a Real-time Risk View of Critical Equipment



# The ORM Digital Twin

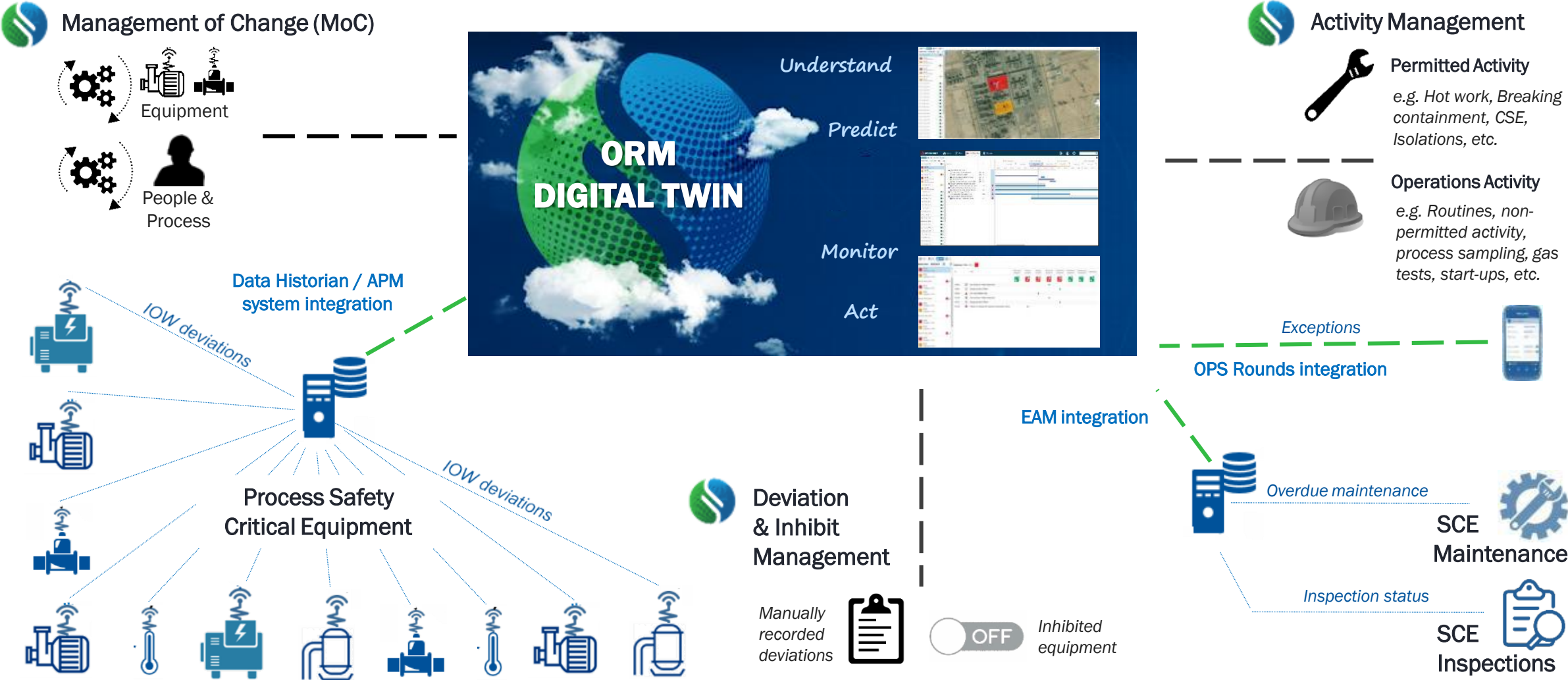
A single, shared view of the operational reality.



By looking at three simple screens, everyone from the boardroom to the frontline can see what's happening, where it's happening, and what's driving the risk – in real-time.

# The ORM Digital Twin

Everyone needs to understand and assess risk by the same criteria.





# Conclusion

The dynamic nature of frontline operations is a challenge for the prevention of major accidents

No.	Task Activity	Job No.	Location
1.	Deviation Offshore	12034	Main Deck
1.	Clean Vessel - 213	21022	Collar Deck
1.	Flange Replacement	22080	Main Deck
1.	Test Deviation Offshore	43221	Main Deck
1.	Test Deviation Offshore	05432	Weather Deck

An emerging category of enterprise Operational Risk Management system seeks to address this gap by applying barrier-based risk models to better support operational decision-making through:

**Showing the real-time status based on all activity risk and all deviation and non-conformance risks**

# QUESTIONS?

## LET'S STAY CONNECTED



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**ARE YOU READY TO MAKE DIGITAL OPERATIONAL?**