Augmented human intelligence to drive actionable safety insights

Jye Yng Voon

TNChE Asia 2023 - CPSS

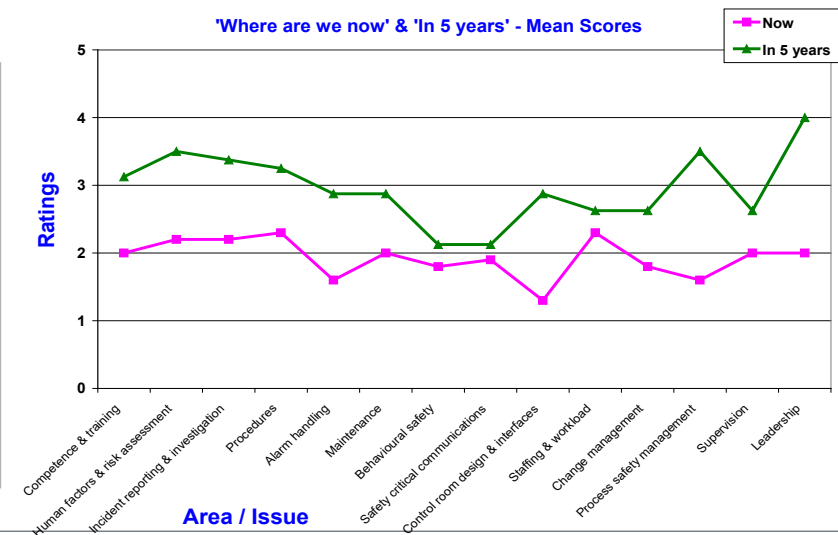**22 June, 2023**
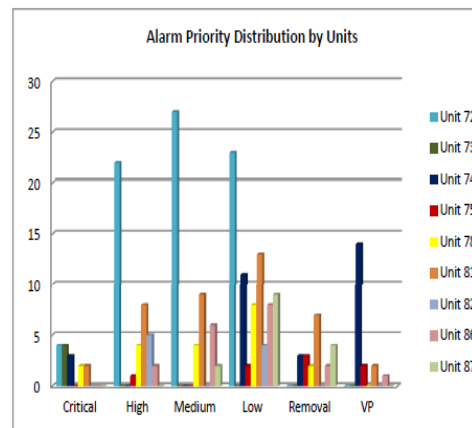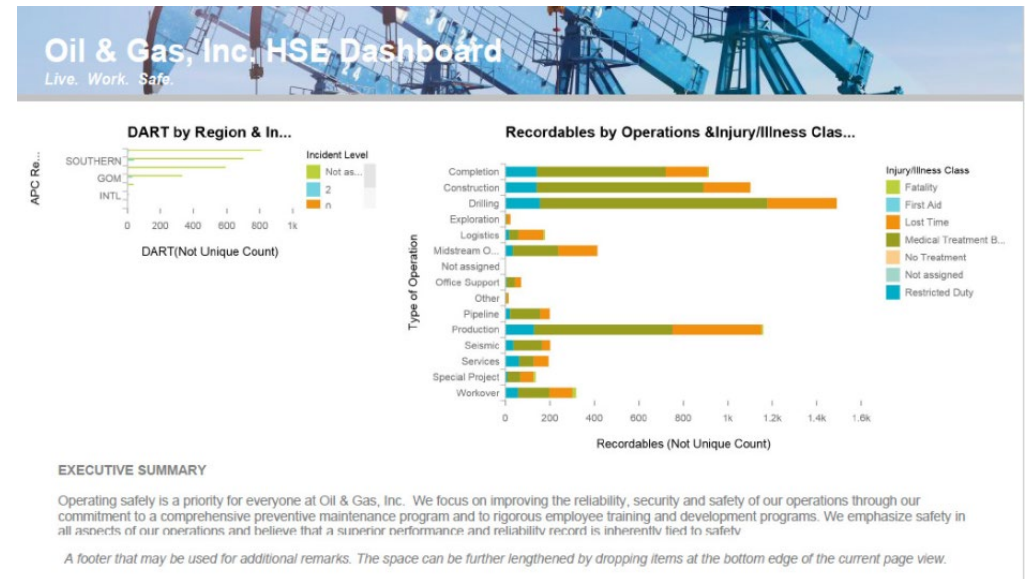
The business of sustainability

ERM

1

Outline for this presentation

- **Data Analytics & Maturity Framework**

- **Digital Application in Process Safety**

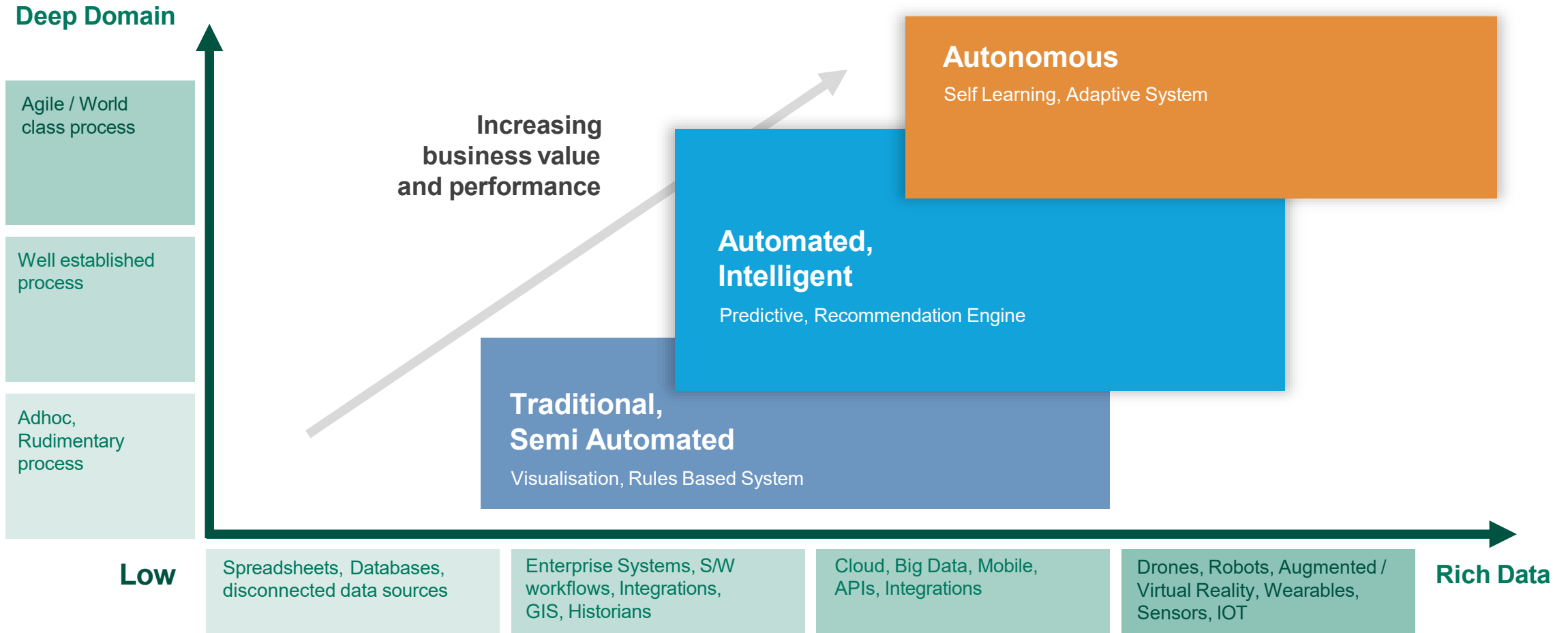- **Sharing of experience – Case Studies**

Traditional Safety Data & Analysis

- Lagging Indicator Analysis

  - Leak data

  - Near misses

  - Injury data

  - Fatality data

- Basis for risk assessments

- Goal Setting

Analytics maturity framework – Augmenting Intelligence

Deep Domain

Agile / World class process

Well established process

Adhoc, Rudimentary process

Increasing business value and performance

Autonomous
Self Learning, Adaptive System

Automated, Intelligent
Predictive, Recommendation Engine

Traditional, Semi Automated
Visualisation, Rules Based System

Low

Rich Data

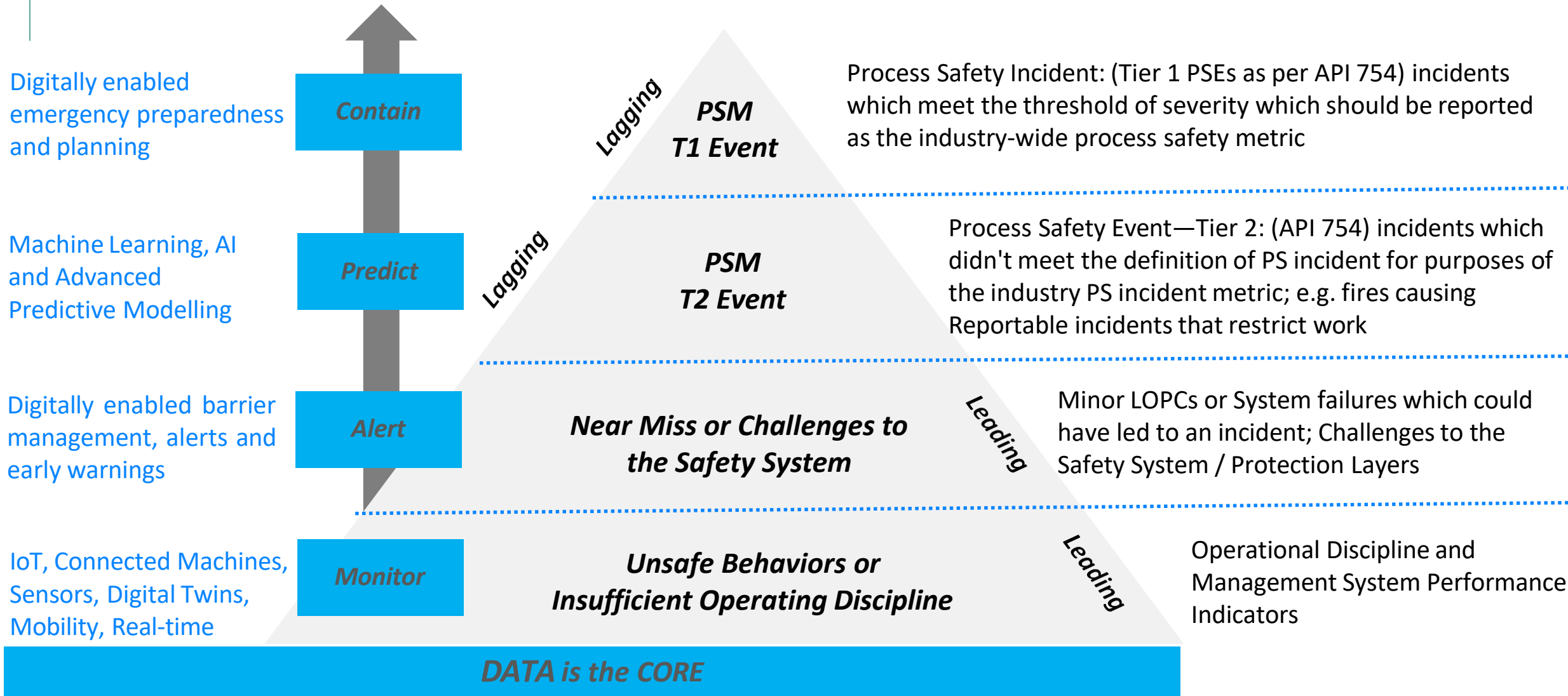| Spreadsheets, Databases, disconnected data sources | Enterprise Systems, S/W workflows, Integrations, GIS, Historians | Cloud, Big Data, Mobile, APIs, Integrations | Drones, Robots, Augmented / Virtual Reality, Wearables, Sensors, IOT |

Analytics to Action Framework

Our **Analytics to Action** framework comprises of a 6-Step process for solving business challenges using data analytics and insights

Analytics to Action

Insights to Actions

Models to Correlations

Data Transformation

Hypothesis to Data

Lagging to Leading

Business to Domain Context
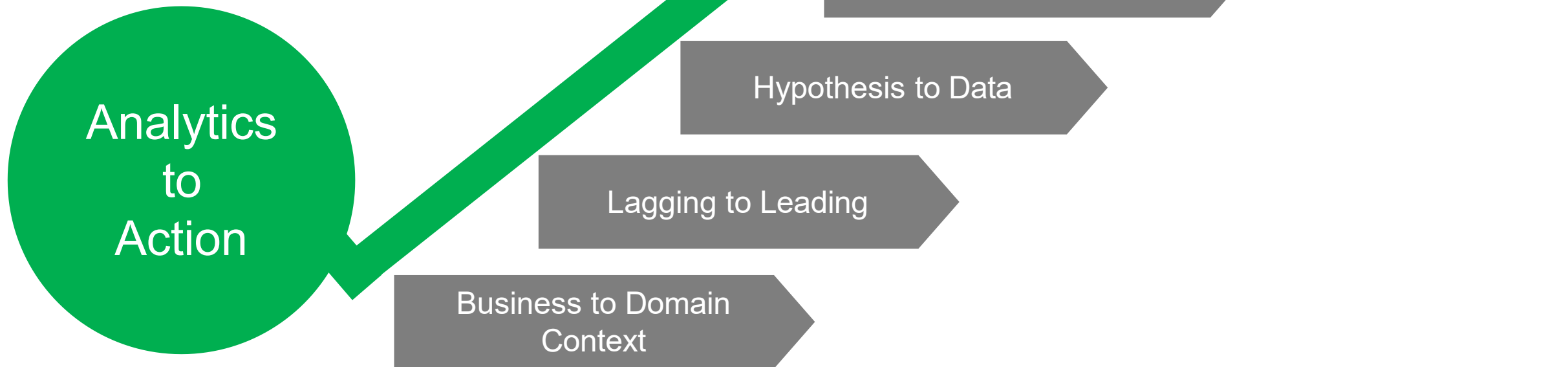
Digital Process Safety Pyramid
Intervention Levels

Digitally enabled emergency preparedness and planning

Contain

Lagging

PSM T1 Event

Process Safety Incident: (Tier 1 PSEs as per API 754) incidents which meet the threshold of severity which should be reported as the industry-wide process safety metric

Machine Learning, AI and Advanced Predictive Modelling

Predict

Lagging

PSM T2 Event

Process Safety Event—Tier 2: (API 754) incidents which didn't meet the definition of PS incident for purposes of the industry PS incident metric; e.g. fires causing Reportable incidents that restrict work

Digitally enabled barrier management, alerts and early warnings

Alert

Leading

Near Miss or Challenges to the Safety System

Minor LOPCs or System failures which could have led to an incident; Challenges to the Safety System / Protection Layers

IoT, Connected Machines, Sensors, Digital Twins, Mobility, Real-time

Monitor

Leading

Unsafe Behaviors or Insufficient Operating Discipline

Operational Discipline and Management System Performance Indicators

DATA is the CORE

Look at some examples and case studies….

TNChE CPSS - Augmented human intelligence to drive actionable safety insights, JY Voon

Connected Safety

Augmenting human intelligence to drive actionable safety insights

Actionable insights

Multi-layered datasets

MAINTENANCE DATA

PERSONNEL DATA

WEATHER DATA

SAFETY DATA

Safety Algorithms

High fidelity data sets

Legacy disparate data sets

Analogue and digital safety and non-safety data are processed by advanced safety algorithms to identify emerging risk patterns specific to your business.
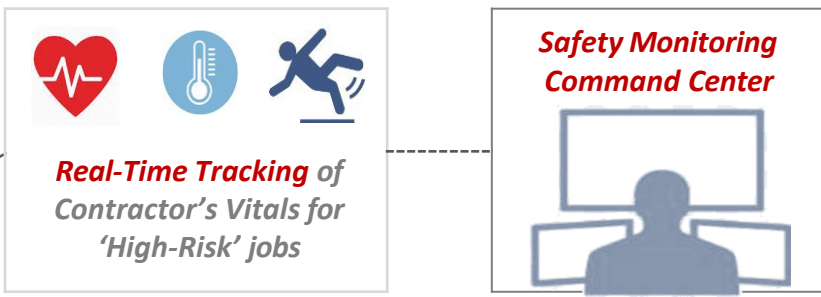
Workplace SafeT

Road SafeT

Process SafeT

Feedback to drive operational excellence and **safety performance**

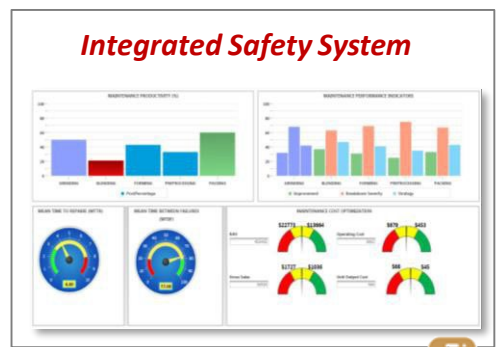# Use Case: Connected Safety
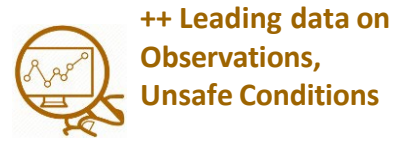*making safety smarter, agile & pro-active with data….*

A Leading Safety

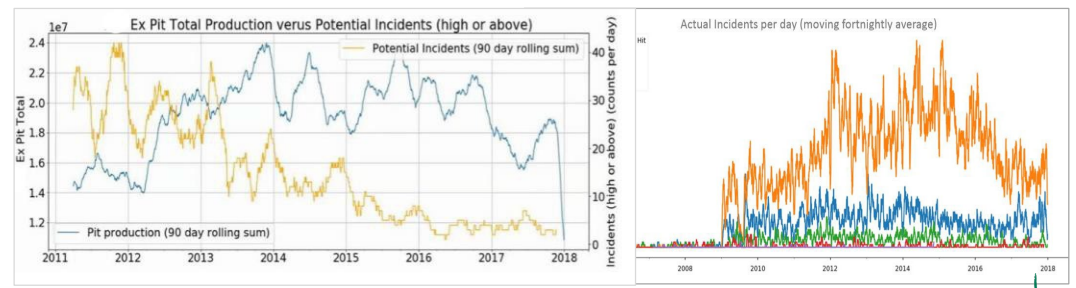**Real-Time Tracking** of Contractor's Vitals for 'High-Risk' jobs

Safety Monitoring Command Center

IoT, Wearables, Geo-sensing, Connected Safety

Alerts and Triggers

Safety Supervisor

Stop Work!

Work at Height

Confined Space

B Lagging Safety

Integrated Safety System

Operational integrated with mobility

Safety Incidents & Investigations

Operational Database & Historians

++ Leading data on Observations, Unsafe Conditions

C Connected Safety

Safety Insights, Predictive Models, Pro-active Decision Making

Ex Pit Total Production verus Potential Incidents (high or above)

Actual Incidents per day (moving fortnightly average)

Helping a leading oil & gas company undergo a HSSE transformation underpinned by technology

Vision of a Next Generation Event Management System

Empowering the frontline to achieve Goal Zero with an easy to use digitally enabled end-to-end process that makes it simple to learn from events and understand our HSSE&SP performance.

Workers easily entering incidents and accessing information at the work site.

Improved data collection and flexible reporting tools improve our understanding of our HSSE performance.

Process and data excellence as core foundations.

Artificial Intelligence analyzes events, helping draw connections.

Incident information delivered when and where its most impactful

Frontline Operator - 'I can easily and quickly record an event, even touchlessly, and learning is pushed to me when and where I need it.'

Reporting Focal Point - 'I have time to analyze what the data is telling us. I have the tools and knowledge to easily answer leaders questions on our performance.'

Asset Manager - 'Real-time reporting and high focus on collecting the right data for my asset lets me easily understand our performance.'

Business/HSSE Leader - 'I have deep understanding of our HSSE performance, with actionable insights'
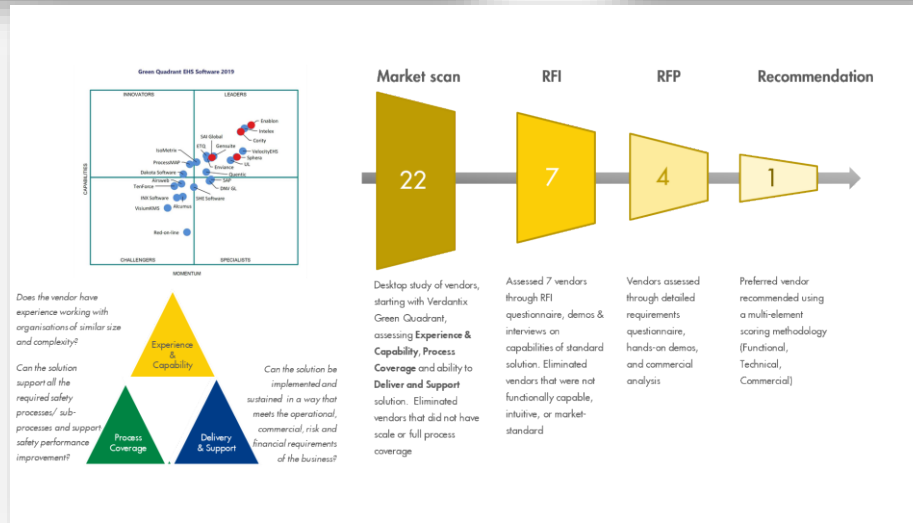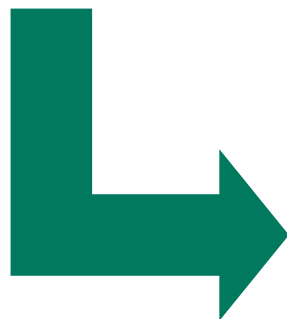
HSSE Portfolio: 267 Applications
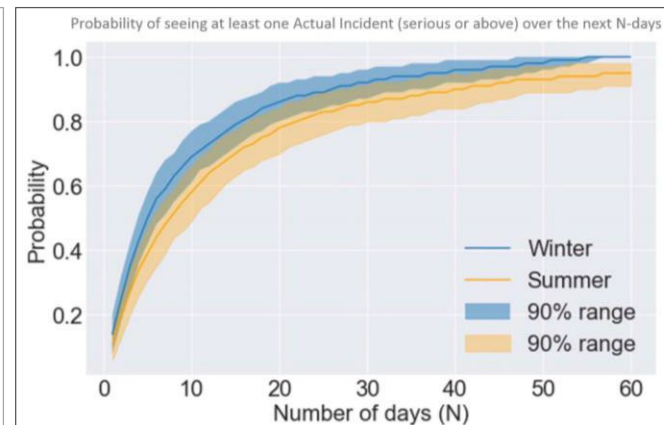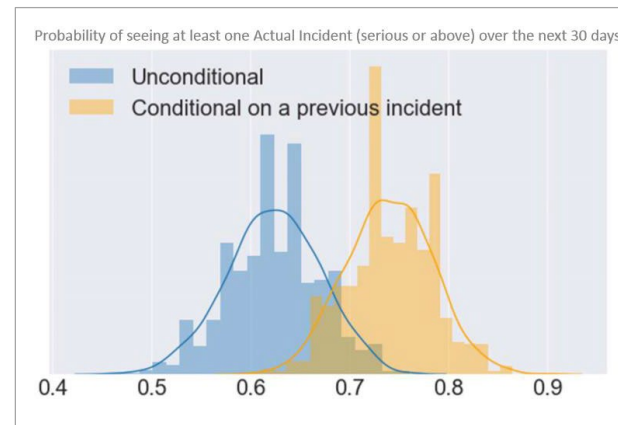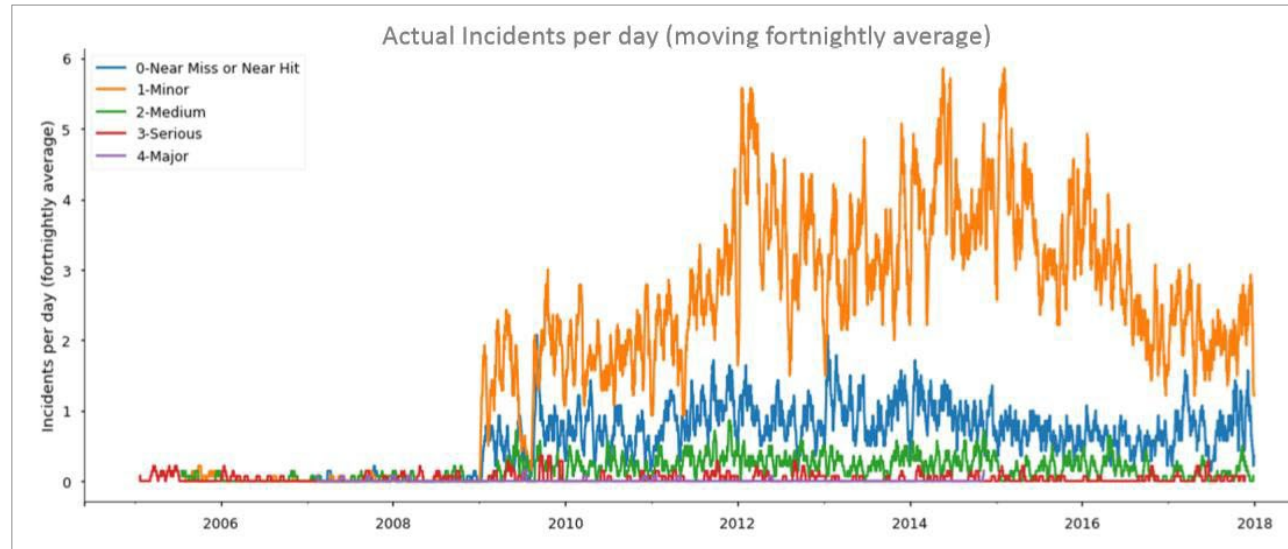
HSSE Product: Market Standard Platforms

Environment Management (Emissions, GHGs)

Incident Management (BBS, Inspections)

Operational Safety (ePtW, eMoC, BarrierMgmt)

Audits & Risk

90% Reduction in HSSE applications

$100m Expected savings per year with deploying one strategic platform

Market scan | RFI | RFP | Recommendation

22 | 7 | 4 | 1

Does the vendor have experience working with organisations of similar size and complexity?

Can the solution support all the required safety processes/ sub-processes and support safety performance improvement?

Can the solution be implemented and sustained in a way that meets the operational, commercial, risk and financial requirements of the business?

Desktop study of vendors, starting with Verdantix Green Quadrant, assessing **Experience & Capability, Process Coverage** and ability to **Deliver and Support** solution. Eliminated vendors that did not have scale or full process coverage

Assessed 7 vendors through RFI questionnaire, demos & interviews on capabilities of standard solution. Eliminated vendors that were not functionally capable, intuitive, or market-standard

Vendors assessed through detailed requirements questionnaire, hands-on demos, and commercial analysis

Preferred vendor recommended using a multi-element scoring methodology (Functional, Technical, Commercial)

Predictive Analytics for Injury Prevention
Case Study Highlights

Actual Incidents per day (moving fortnightly average)

Probability of seeing at least one Actual Incident (serious or above) over the next 30 days

Probability of seeing at least one Actual Incident (serious or above) over the next N-days

With increased number of near misses and minor incidents, our team defined advanced predictive models, **using incident data sets, combining the same with operational and weather data sets**. Our predictive models pointed out the following insights:

- Increase in injury rates during shift change over, due to SOP non-compliance; further evaluated to SOP deficiencies

- Higher probability in injury rate with associated unsafe conditions reporting, especially around confined space entry

- Increase in injury rates with changes in weather conditions, especially drop in visibility, increased wind speeds, further extended to include weather impact in site SOPs

- On a "typical" day (blue curve) there is a probability of about 62% that a severe incident (serious or above) will happen in the next 30 days

- However, If an incident has just happened (orange data), this probably rises to about 74%

Enterprise (un)safety related data resides in many systems which can be tapped to drive Safety performance

ERM's 'SafeT' algorithms leverage text analytics using machine learning to analyze safety data for further classification and action

- **Exploratory Data Analysis**
  - Apply Text Analytics techniques (word cloud, unigrams, bigrams etc.) to slice and generate preliminary insights

- **Classification of Records**
  - Automatically classifying / labelling the individual records based on a predefined set of categories (labels) to improve consistency and drive automation at scale
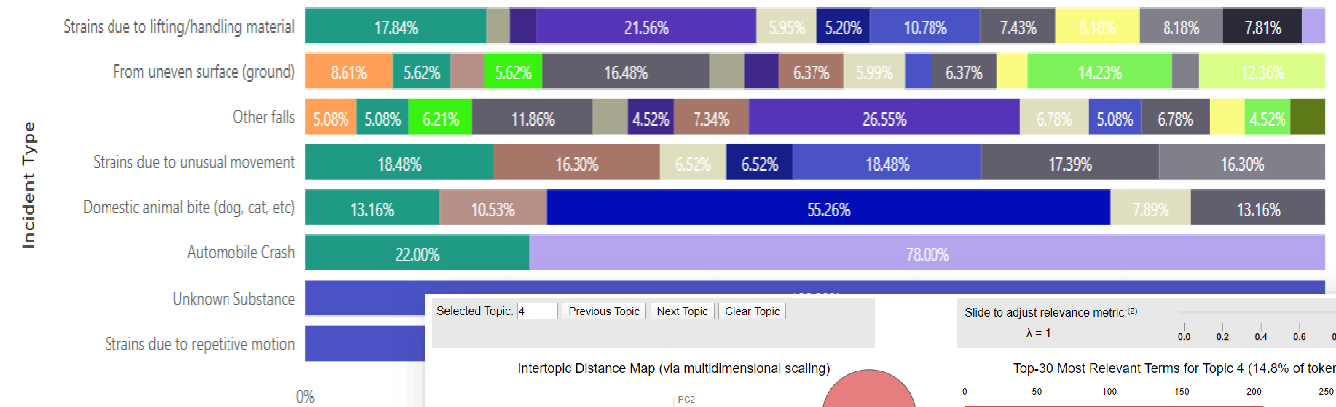
- **Rule Based Classification**
  - Influence the automated classification by applying guided keywords based on advanced subject matter expertise and business needs; minimizing the need for manual intervention and review for low risk items
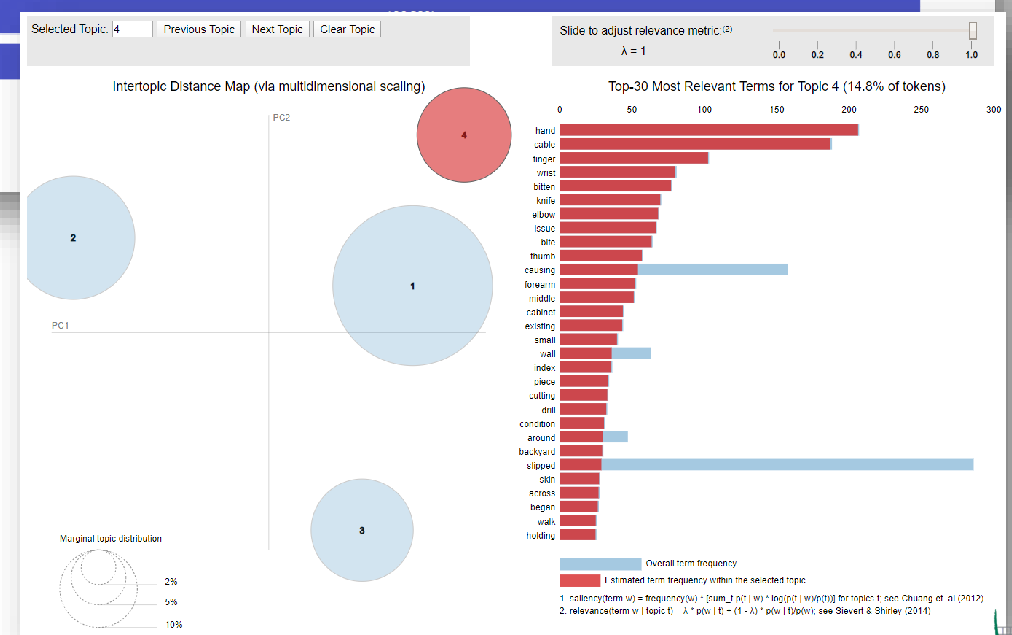
- **Topic Modelling**
  - Automatically find key themes and topics to decide what requires further validation or investigation

52%
reduction in operations costs, & improved CAPA planning

Key words used to describe incidents

TNChE CPSS - Augmented human intelligence to drive actionable safety insights, JY Voon

Case Study

Thank you

Contact

Jye Yng Voon
jyeyng.voon@erm.com

TNChE CPSS - Augmented human intelligence to drive actionable safety insights, JY Voon

ERM