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# **Working advantages and compliance with marine digitalization from a classification point of view**

LR Aurora - Digital Solutions with Human Intelligence

**Sept 3 2019**



# Our Approach

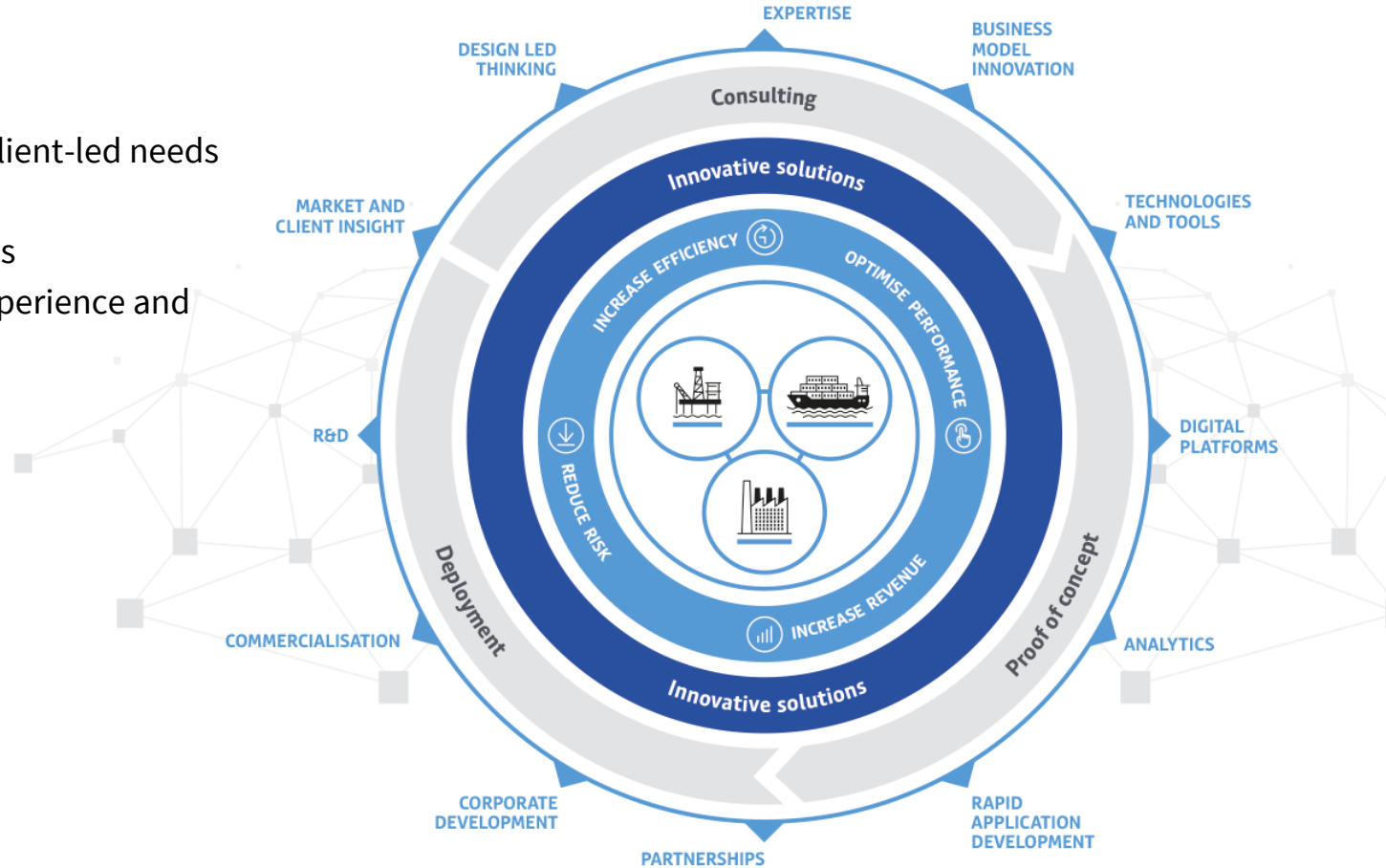
LR Innovation strategy focuses:

- Our digital services evolve around client-led needs
- Alignment to LR's our core principles
- Combined with over 250 years of experience and learning
- Tried and Tested solutions
- New core capabilities

LR Is independent

No Shareholder - Foundation funded

We do not want to own the Data



# Lloyd's Register Digital - Summary

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## LR's Digital has 200 people across it's teams and initiatives:

- **Teams (200):**

- **Development teams in :**
  - USA : Colorado, Houston, Aberdeen,
  - EU : London, Hamburg, Bulgaria, ,Stockholm
  - Asia : Singapore & Beijing
- **Software, platforms and solutions across**
  - Energy : Oil and Gas, Renewables, Nuclear
  - Marine & Offshore
  - Manufacture : Food, Pharma, parts manufacturers
- **Customer engagement specialists**
- **Dedicated data science team (10)**

- **Data Platforms:**

- **Connected Assets** - IIoT & big data platform
- **Visual Data platform** - Image & Video data platform
- **IRIS™** - real time geospatial project Mgmt. platform.

- **Research Initiatives:**

- **Turin Artificial Intelligence institute** - a £10mil investment in partnership with Intel corp.
- **LR 'SafteyTech' Accelerator** (June '18) - In partnership with the **Lloyd's Register Foundation** where **invite key LR clients** and innovation partners
- **LR 'Discovering Safety' Programme** – a £10mil investment in a joint program with HSE UK & Manchester Uni' for data analytics for QHSE, utilizing 40+ years of HSE reports.

# Agenda

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## Innovation Solutions Overview

- Safety Scanner
- Maintenance Analytics
- Condition Based Maintenance



# LR SafetyScanner.

Harnessing technology for a stronger  
safety culture and better business  
outcomes

July 2018



# Impact

Work related accidents or fatalities have a significant impact but most are the result of human error

2.78 million work-related fatalities globally per year or 7, 616 per day →	374 million non-fatal work-related injuries and illnesses every year or approx 1m per day →
Increasing regulation around HSE →	Workforce and skills deficit →

## Impacts on:



**Reputation**



**Productivity**



**Revenue**

50%-80% of work related accidents are human error driven or related

# Reducing safety incidents – the challenge

Every day organisations are continuously challenged by:

- Operating from a '**rear view mirror**' mind-set, instead of identifying upcoming risk
- When available, safety data analysis is **labour intensive & highly inefficient**
- Difficulty in seeing the **bigger safety picture** (behaviourally, geographically & historically).
- Difficulty in **standardising, collecting & digitising** safety data
- Lack of **hard data based, actionable insight** to develop HSE strategies, prevention and mitigation activities
- Hard to identify and hard to affect change



This means  
organisations  
are:

Unable to ingest and  
understand all of  
their safety data



Unable to clearly  
foresee emerging risks  
and safety issues



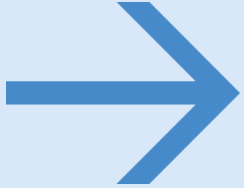
Unable to assign  
mitigation strategies to  
the most common issues  
to prevent them from  
happening again



# LR SafetyScanner transforms HSE management

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Use advanced data and digital tools to identify and analyse the **direct cause** of incidents at scale to get a clearer picture of where to focus your HSE efforts – mitigating risk and identifying issues that were previously unknown

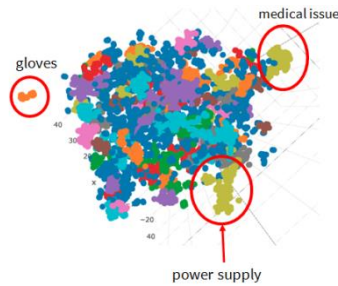


- **Easy collection and visualisation** of large amounts of data
- **Identify patterns, hot spots & blind spots** using the full extent of your data
- **Better target your audits & training** to make HSE practices **proactive & preventative**
- **Use ‘hard data’** to help define your HSE strategy
- Leverage **LR’s vast risk consulting expertise**



# A unique set of tools and capabilities

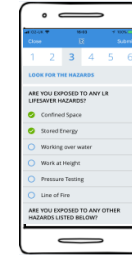
## Safety & Operation managers



Comparative Ratios



## Employees



### Advanced text analytics engine:

- Rapidly digest vast amounts of free text
- Automatically tag previously 'un-tagged' reports
- Accurately define your organisation's current hazard types
- Identify hidden direct causes
- Identify emerging hazard trends

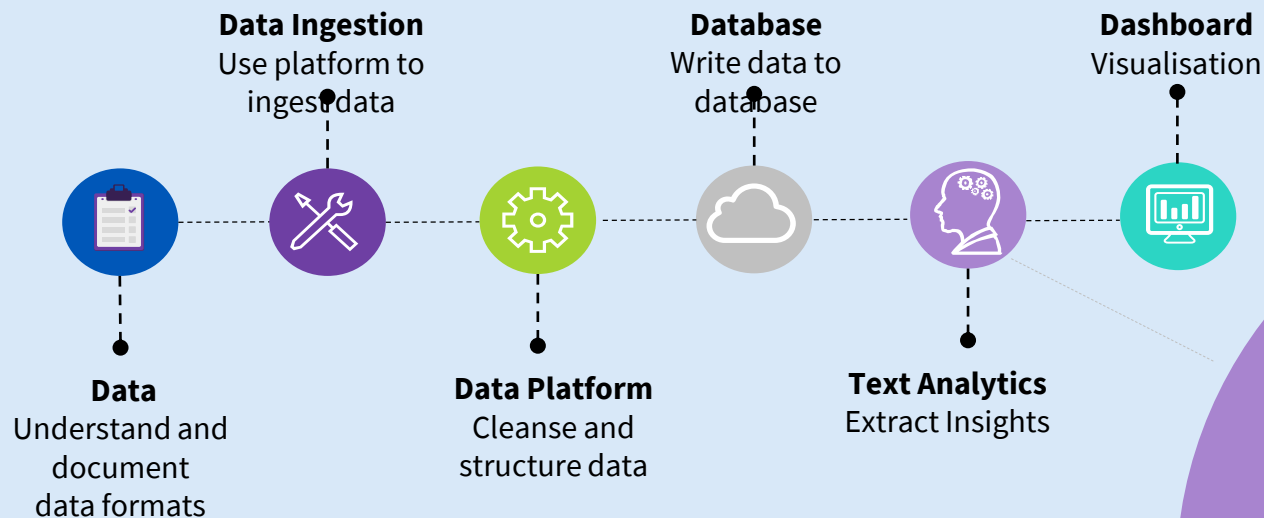
### Interactive dashboards and data driven reporting:

- Filter their data by people, asset, geography or hazard type
- Produce global/business wide risk heat maps
- Analyse time based trends

### Mobile application:

- Enable easy event reporting
- Enable easy Risk Assessment
- Push alerts to your workforce

# How it works - HSE data & analytics

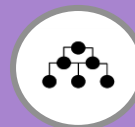


## Extracting data insights through NLP



### Near-Miss

Speed up review of near-miss events by automating process.



### Hazard Taxonomy

Classify events as specific hazard types based on free text.



### Observations

Review observations to extract all information



### Insights










Extracting insights from unclassified "other" events.



### Multi-Labelling

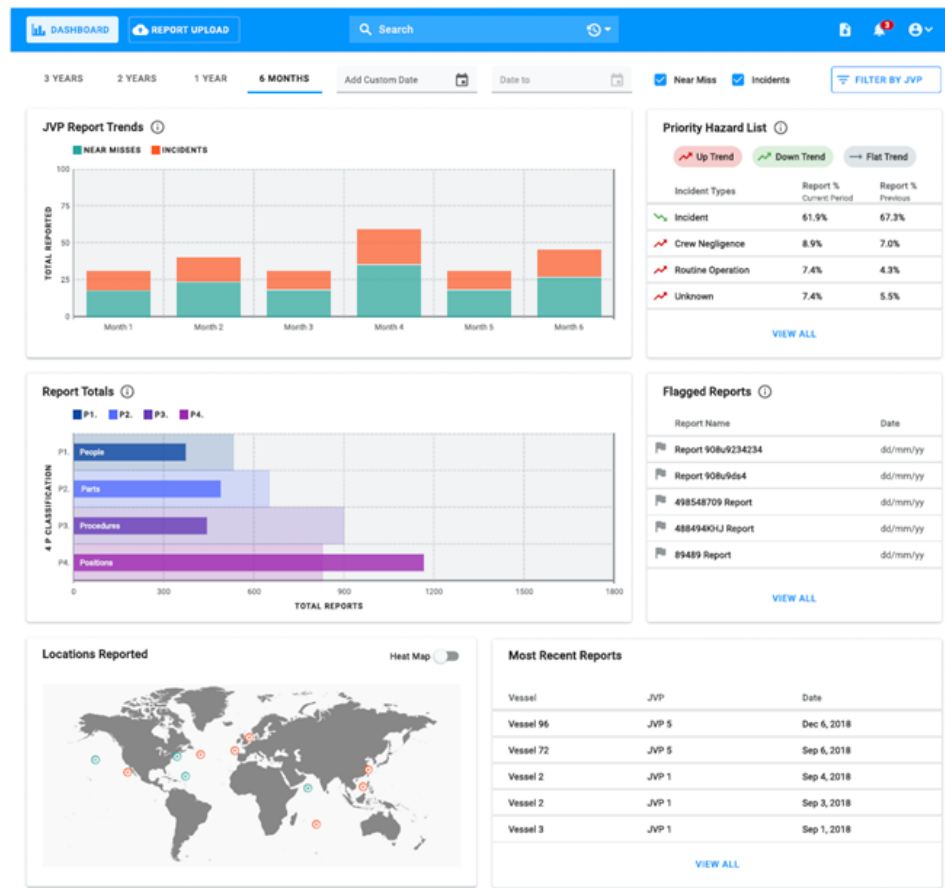
Capture multiple events in a single report  
e.g. slip/trip from ladder at height

# LR SafetyScanner™ – Key Features delivered to the client

DATA ENRICHMENT		BUSINESS INTELLIGENCE		WORKFLOW DIGITISATION	
1. Auto location & weather		4. Prioritized Hazard List		7. Trend Dashboard	
2. Intelligent search tool		5. Hazard Pattern Recognition		8. Correct/Prevent Action Generator	
3. Automatic Incident Tagging		6. Anomaly detection		9. Report Generator	

# Dashboard

## Example



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# Maintenance Analytics

Harness asset maintenance data from multiple formats to extract key business insights

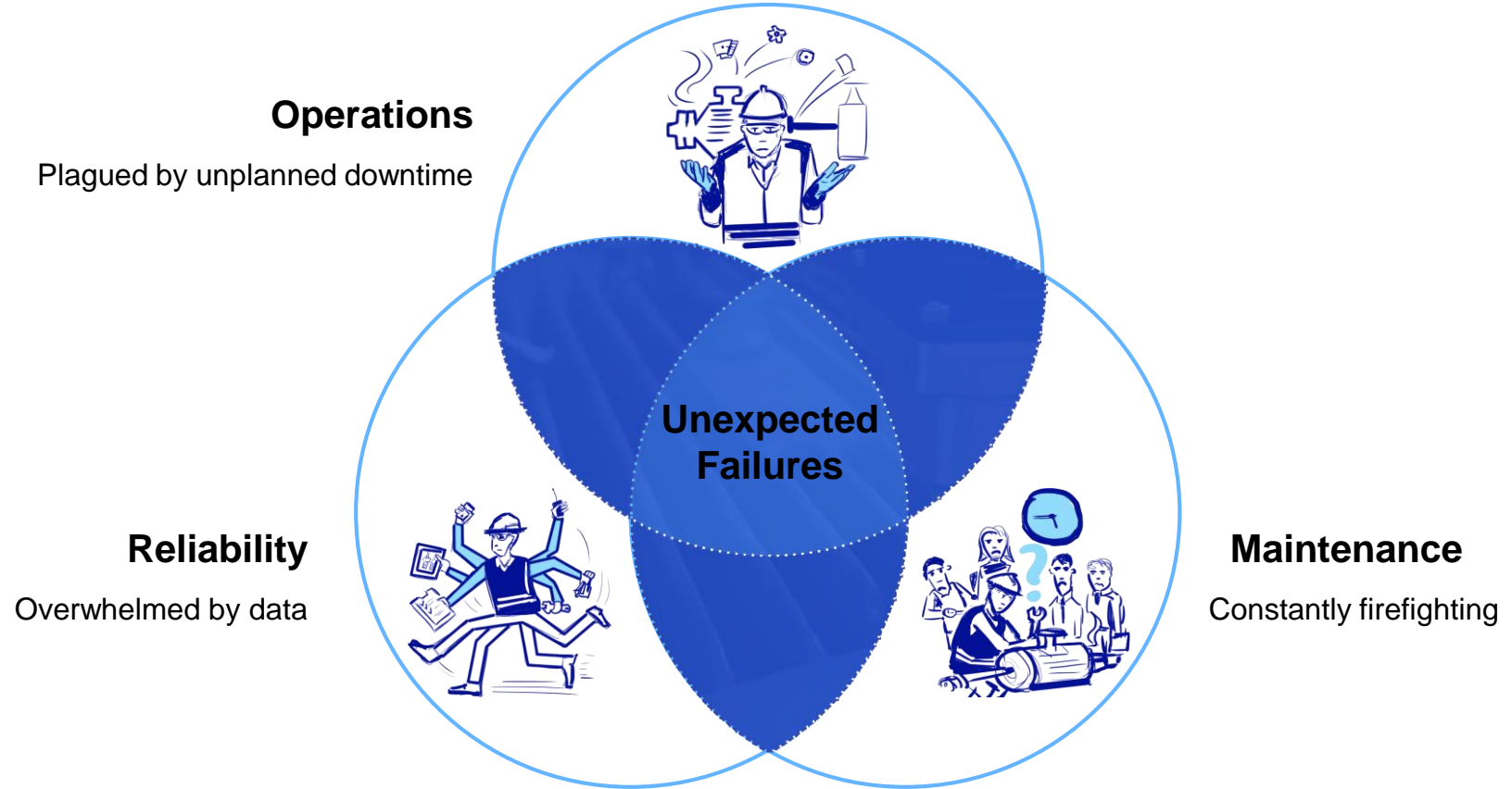
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# Industry Challenge

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# An insight into the maintenance

Businesses, on average, spend 80% of their time **reacting** to maintenance issues that arise rather than **preventing** them

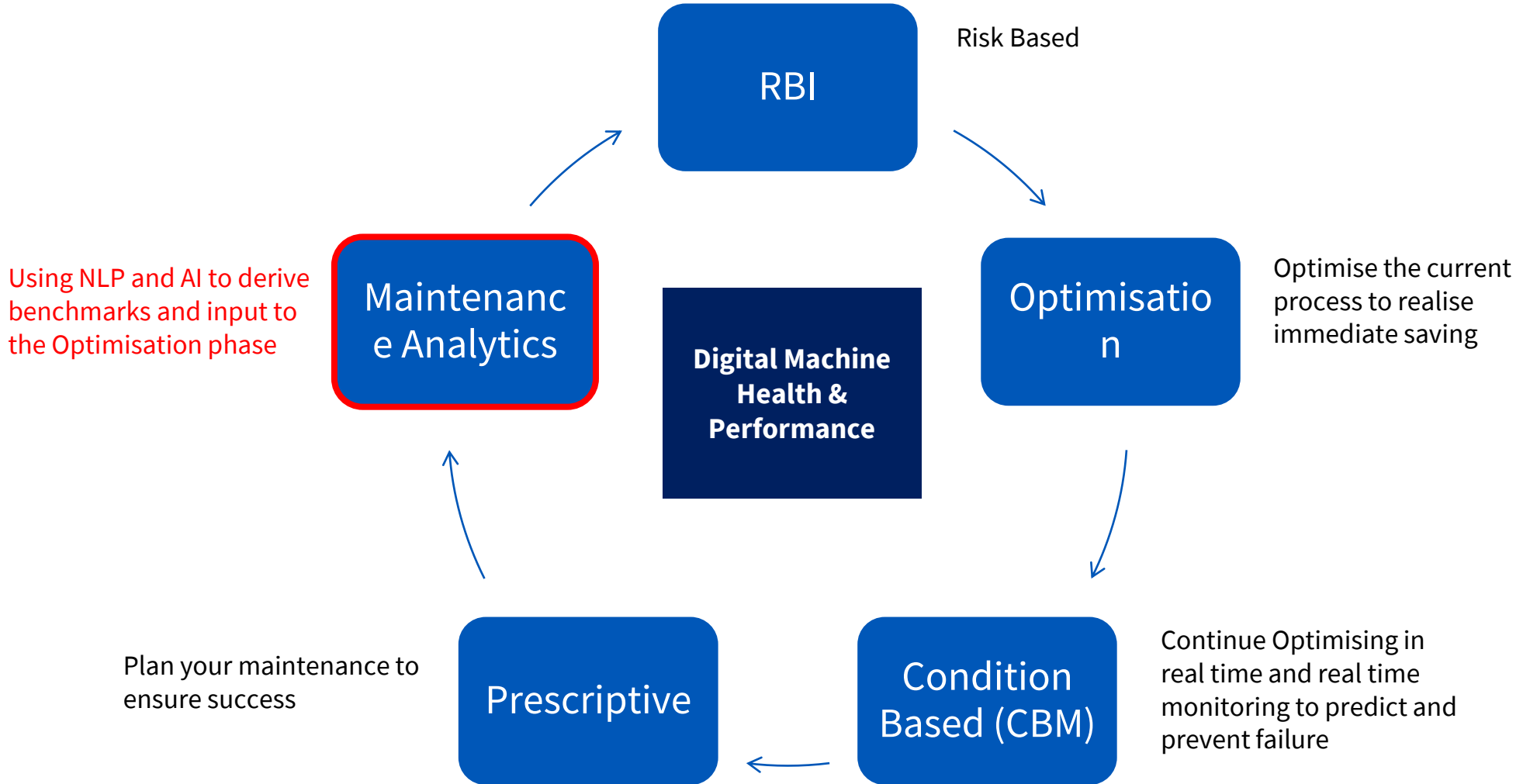
**52%** of businesses say the biggest challenge to improving maintenance is lack of resources or staff

Any business can save **12-18% by investing in preventive** instead of reactive maintenance

**53%** of businesses use Computerized Maintenance Management System (CMSS) for asset maintenance, with 52% using spreadsheets

Maintenance management typically takes up at least **40-50%** of a business' operational budget

# Future Fit into the Maintenance lifecycle

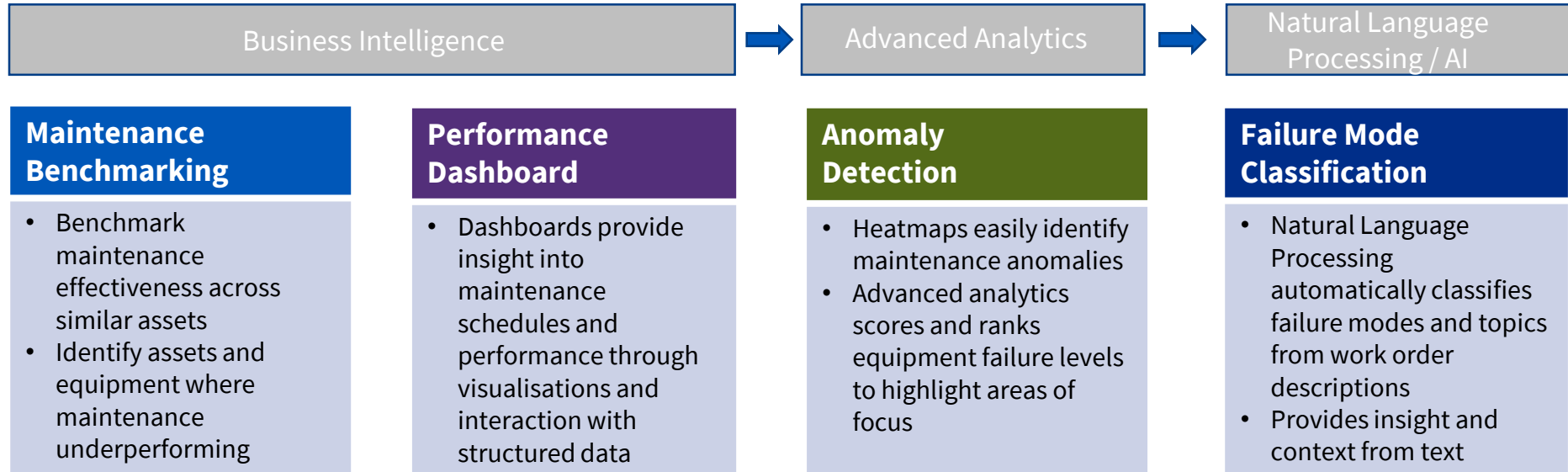




# Maintenance Analytics: Core offering

## LR Maintenance Analytics:

Harness business insight from asset maintenance reports and data using advanced analytics and Natural Language Processing



# Case study: Vessel Owner/Operator - maintenance reports

## Client problem

- Operating multiple fleets under a unified maintenance operation.
- Wish to understand how well maintenance operations are being carried out across the group and understand where there are areas for optimisation and improvement.
- Pilot project focused on two equipment types.

## Benefits:

- Able to identify which fleets and vessels demonstrate higher levels of equipment failures
- Visualise how consistently planned maintenance is carried out
- Provide insight into likelihood that planned maintenance may have contributed to the introduction of failures
- Provide insight and features from text descriptions in the inspection reports
- Able to compare performance of similar equipment on sister ships



## Outcomes to date

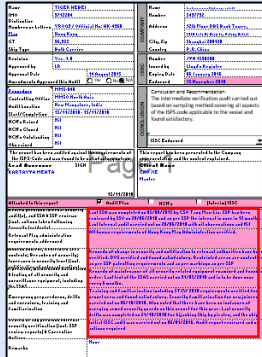
- Initial phase of unsupervised text analytics completed. Supervised text classification ongoing to classify failure modes.
- User interface / visualisation development 90% completed.
- Data analytics on structured data completed.
- Insight delivered into variance in regularity of planned maintenance performed.
- Statistical analytics developed to establish benchmark for normal operations and plot relative performance of different fleets and vessel classes
- Heatmaps highlighting areas of focus
- Insight into variation in cost of spares and utilisation across different vessels

# Summary - A unique set of tools and capabilities

## Maintenance Scanner Processing

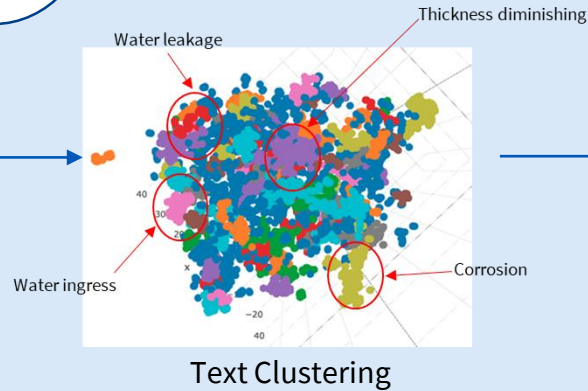
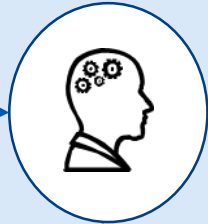
LR Maintenance Analytics Engine (proprietary maintenance and asset models)

Asset Maintenance Report  
(PDF, Word, Excel)



Name	1000000000	Address	1000000000
Address	1000000000	City	1000000000
City	1000000000	State	1000000000
State	1000000000	Country	1000000000
Country	1000000000	Postal Code	1000000000
Postal Code	1000000000	Phone Number	1000000000
Phone Number	1000000000	Fax Number	1000000000
Fax Number	1000000000	Email Address	1000000000
Email Address	1000000000	Website	1000000000
Website	1000000000	Notes	1000000000
Notes	1000000000	Attachments	1000000000
Attachments	1000000000	Comments	1000000000
Comments	1000000000	History	1000000000
History	1000000000	Log	1000000000
Log	1000000000	Footer	1000000000
Footer	1000000000		

Extraction of  
free text from  
report



## Maintenance Analytics Dashboard



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# Condition Based Maintenance

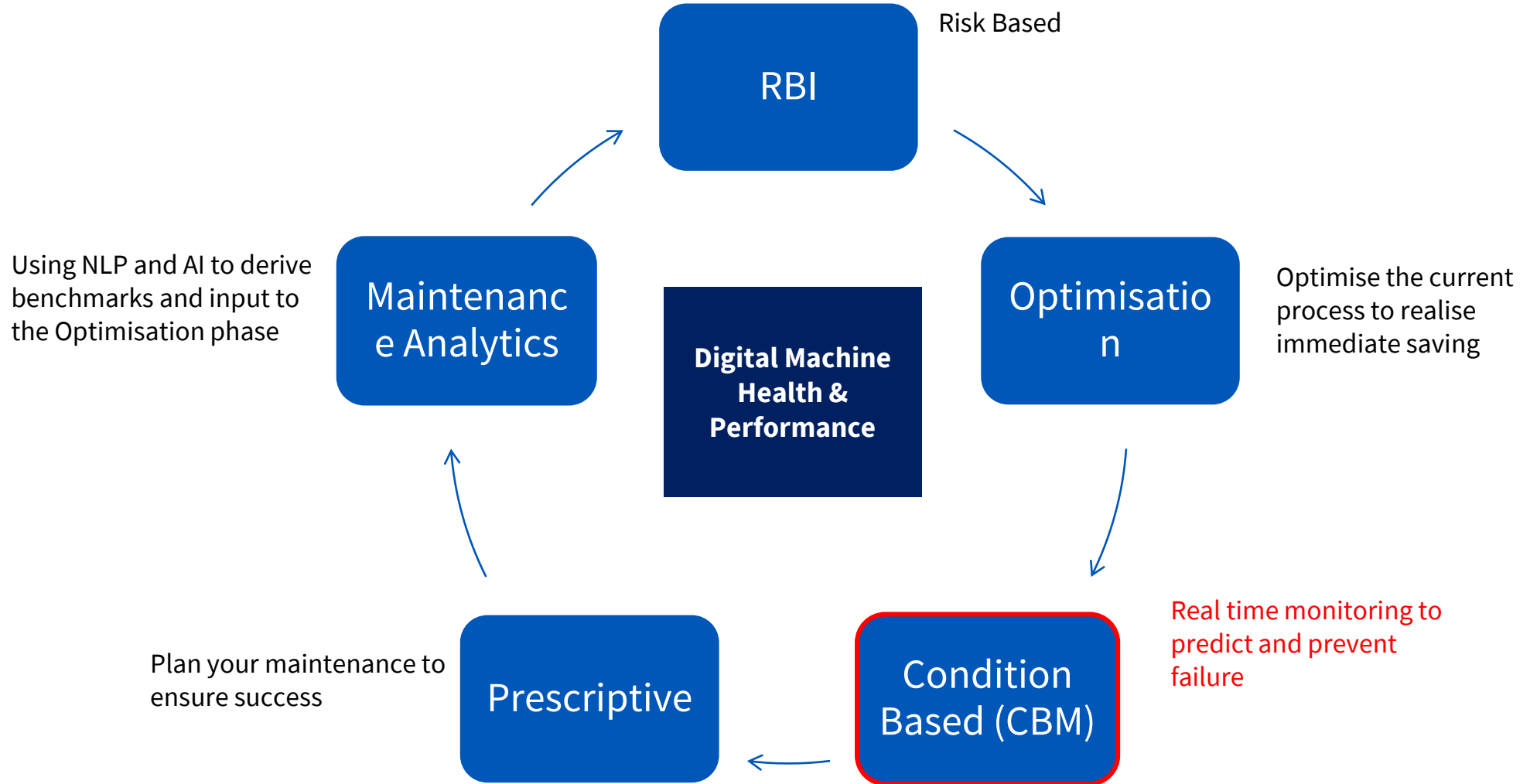
Using real time information combined with industry proven models & rules to identify and prevent failure

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# Future Fit into Maintenance lifecycle



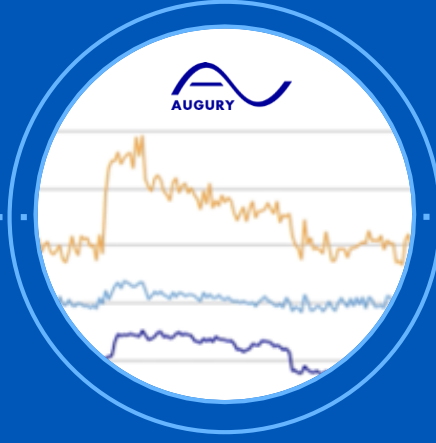
# Enabling Condition based maintenance

In Partnership with Augury LR Provides an End to End Solution – Connect the Asset, Analyse the Data, Diagnose and Verify the Issue before Visualizing and letting you know what to do



## Connect

Smart sensors monitor your machines 24/7



## Diagnose

Algorithms diagnose malfunctions and provide alerts and recommendations



## Visualize

You get full visibility of machine health across your facility



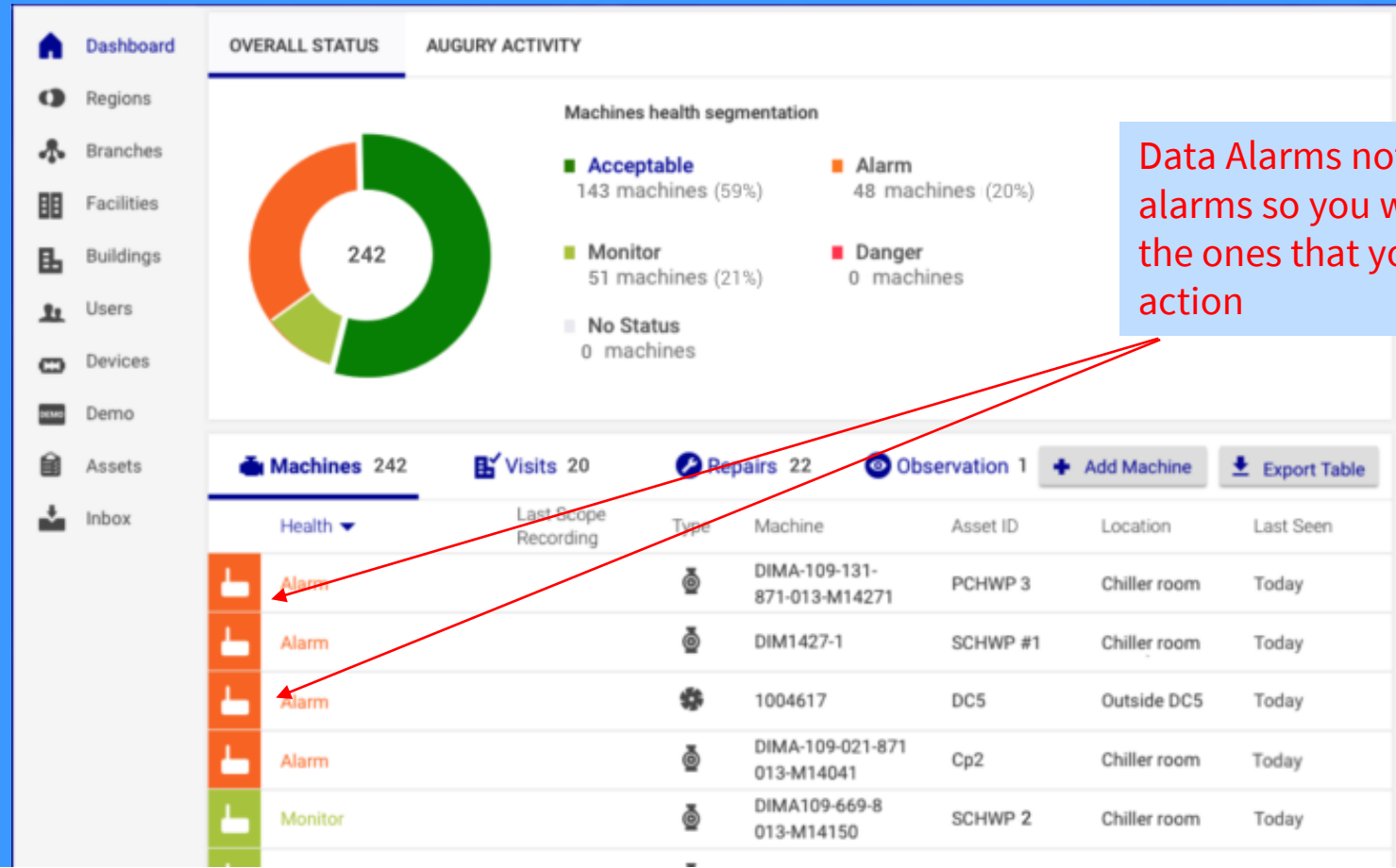
## Example Installation

Wireless vibration, temperature and magnetic field sensors



# Complete Asset or Site and company level health

full visibility into equipment condition across single or multiple facilities

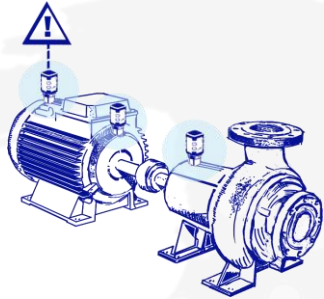


Data Alarms not control room alarms so you will only see the ones that you need to action



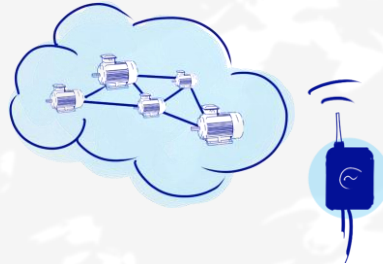
# Review - End to End Solution

## SENSING & HARDWARE



- Sensing Capabilities
- Specialization
- Certification
- Power Consumption
- Cost Optimization

## IIoT & DATA INFRASTRUCTURE



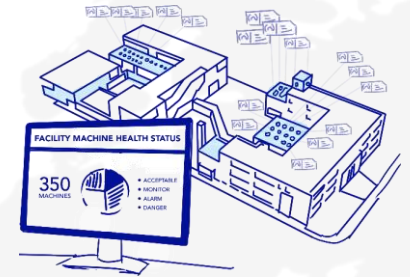
- Data Acquisition
- Edge Computing
- Data Scalability
- Security
- IoT Management

## DIAGNOSTICS & ALGORITHMS



- Signal Processing
- Anomaly Detection
- Fault Analysis
- Expert Verification

## INSIGHTS & INTERFACES



- Actionable Machine Health Insights
- Machine Performance Insights
- Multi-platform (Web, iOS, Android)
- API Integrations

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# Thank You

Anders Höfnell  
Lloyd's Register Group

**Sept 3 2019**

