

Predictive Maintenance & Quality

System of Industry Intelligence and Operation Excellence

Dominik IMRICH, Stefan PERO (IBM Kosice)

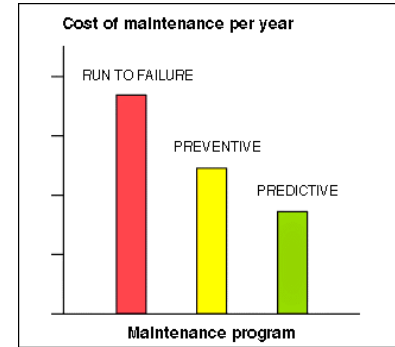
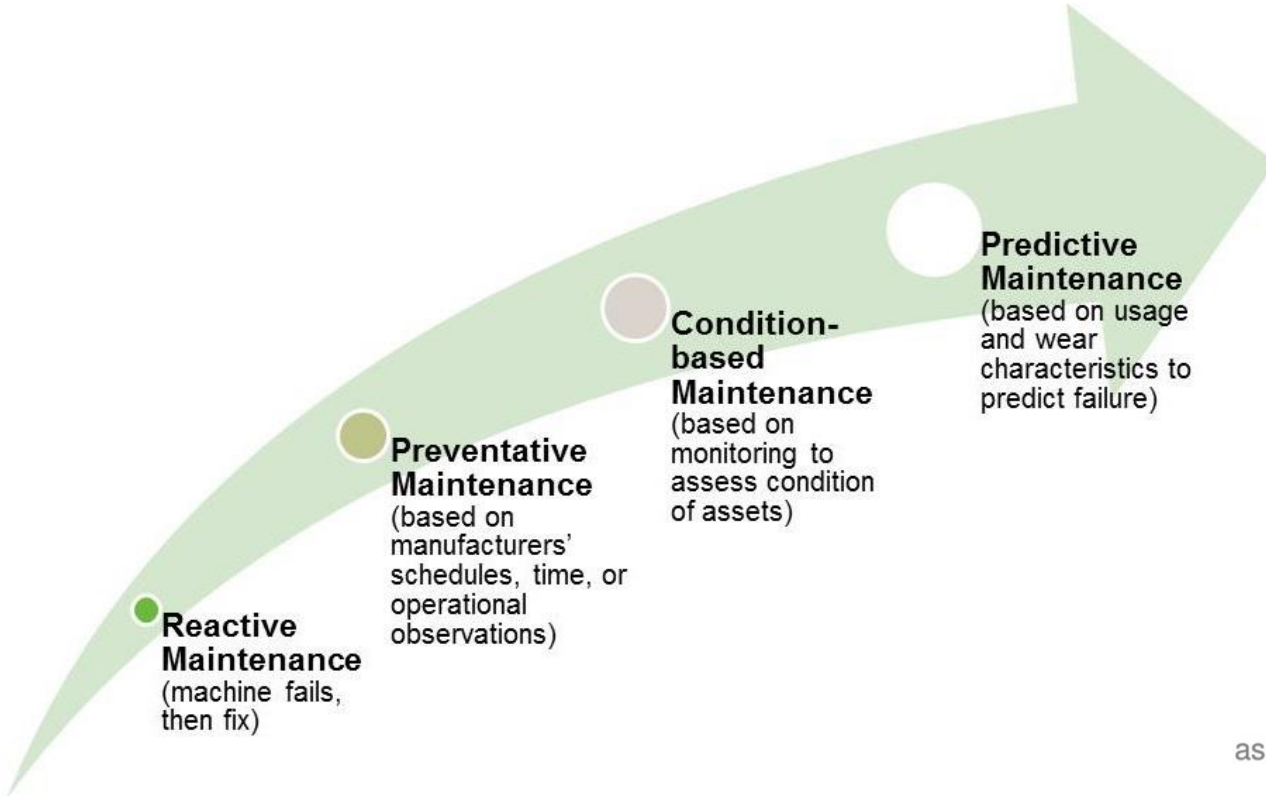
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Traditional maintenance



Reactive – Preventive – Predictive



Predictive maintenance

- **Predict** where, when, and why asset **failures** are likely to occur
- Quickly **identify** primary factors or variables as part of root-cause analysis process (failure patterns).
- Identifies small deviations and **patterns** leading to outage or downtime of asset or production line

FIX THINGS **before** THEY BREAK

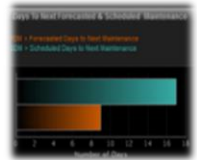
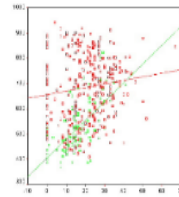


What you need?

- Assets producing data
- Meaningful historical data
- Model (predictions)
- Monitoring & action element

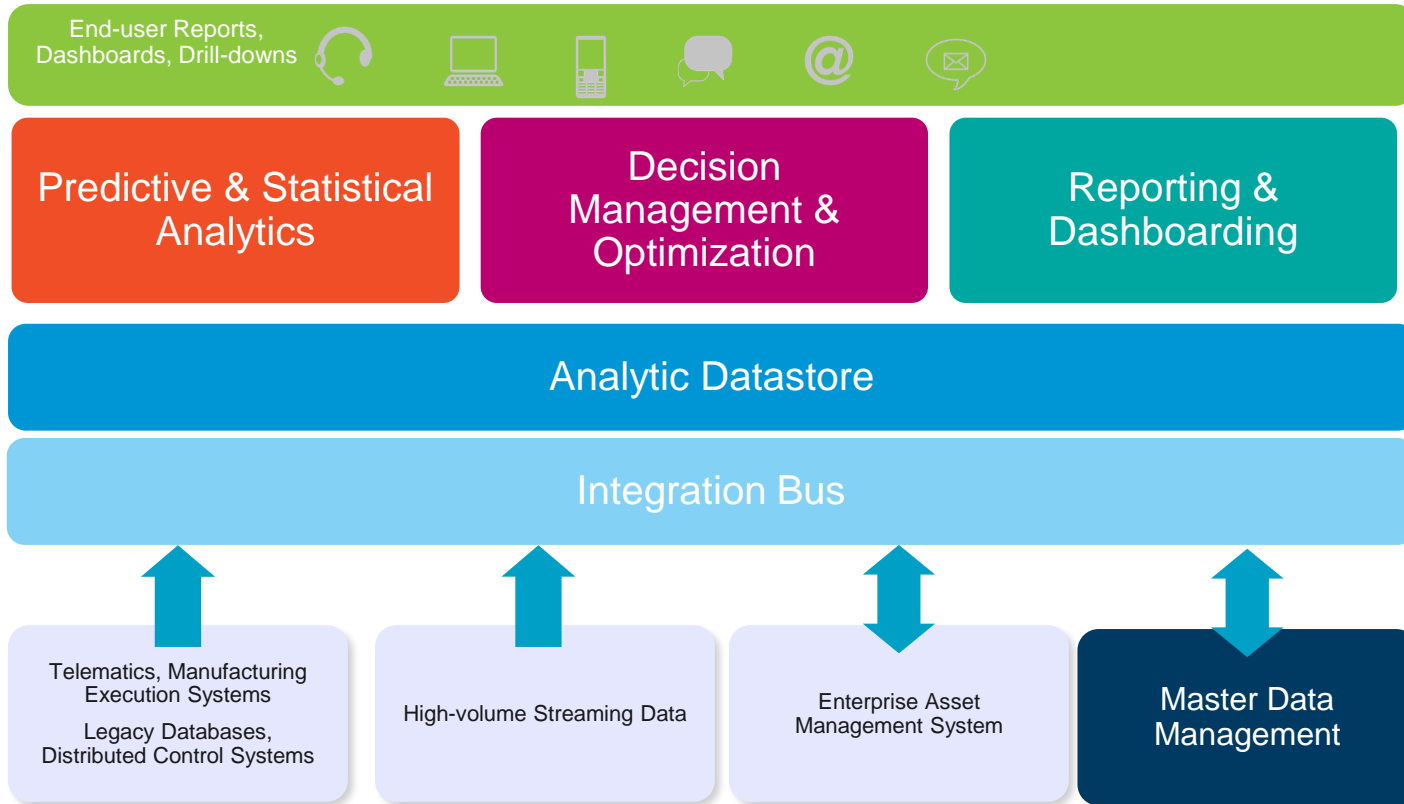


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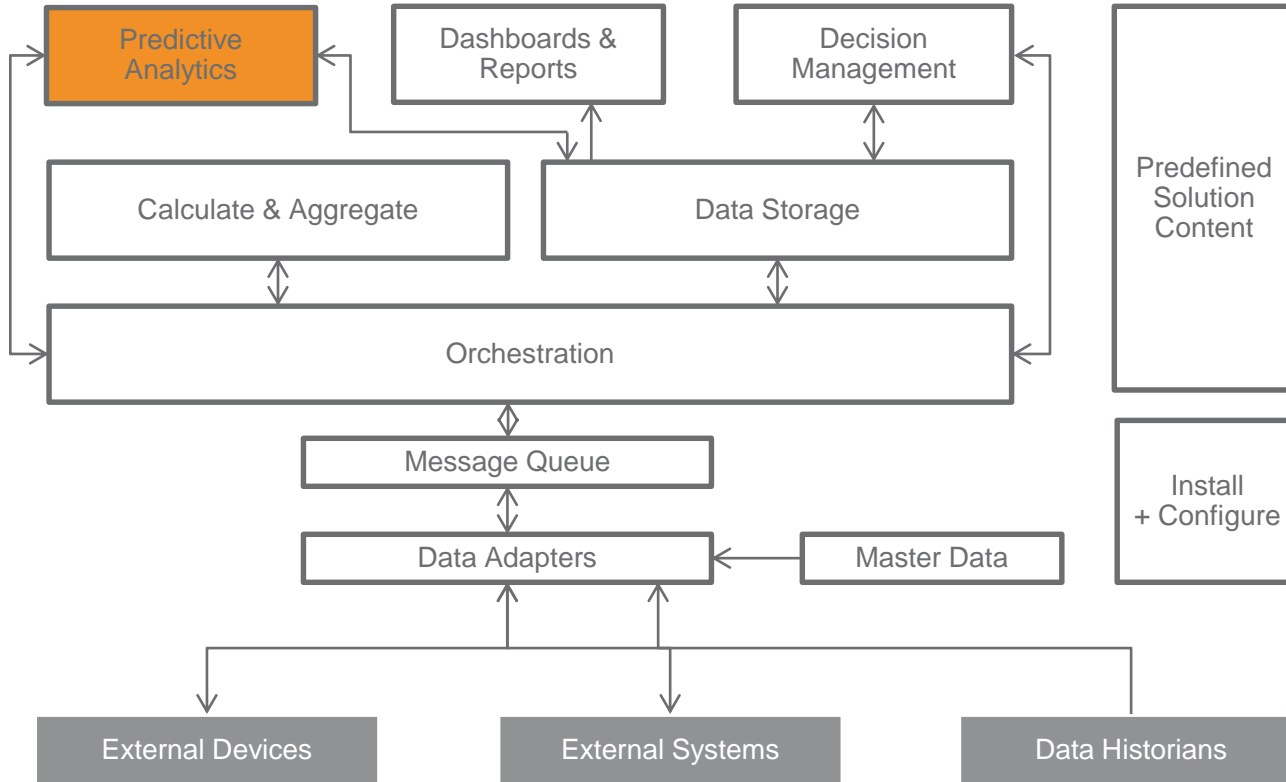


asset + instrumentation + data + connectivity + analytics + monitoring + reporting

PMQ logical architecture



PMQ Logical Architecture



Energy provider keeps the power on

- This foresight helped the company take immediate action to **avoid an imminent outage**.
- Able to schedule maintenance for long-term prevention.
- With PMQ, this energy provider **reduced costs** by up to 20 percent (based on similar previous cases) by avoiding the expensive process of reinitiating a power station after an outage
- **Predicted turbine failure** 30 hours before occurrence, while previously only able to predict 30 minutes before failure
- Saved approximately \$100,000 in combustion costs by preventing the malfunction of a turbine component
- Increased the efficiency of maintenance schedules, costs and resources, resulting in fewer outages and **higher customer satisfaction**



Petroleum company avoids ice floes in the Arctic

- To better safeguard its oil rigs, personnel, and resources, the company had to **track** the courses of thousands of moving potential hazards.
- The company utilized PMQ by analyzing direction, speed, and size of floes using satellite imagery to detect, track, and **forecast** the **floe trajectory**.
- In doing so, the company saved roughly \$300 million per season by reducing mobilization costs associated with needing to drill a second well should the first well be damaged or evacuated
- Saved \$1 billion per production platform by easing design requirements, **optimizing** rig placement, and improving ice management operations
- **Efficiently deployed icebreakers** when and where they were needed most

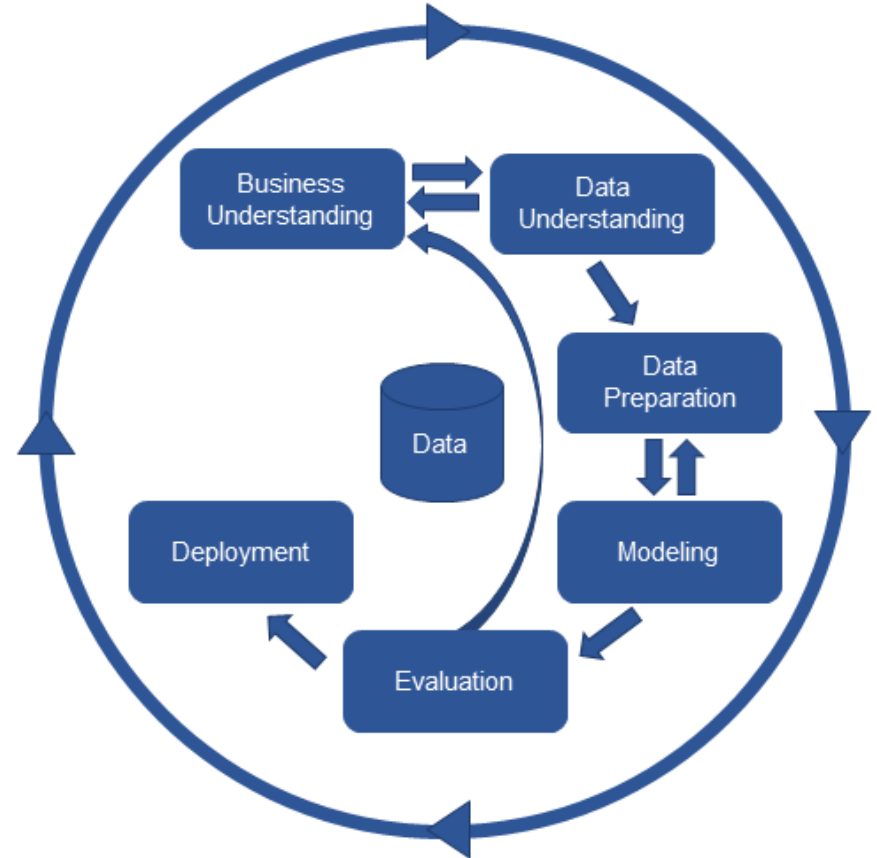
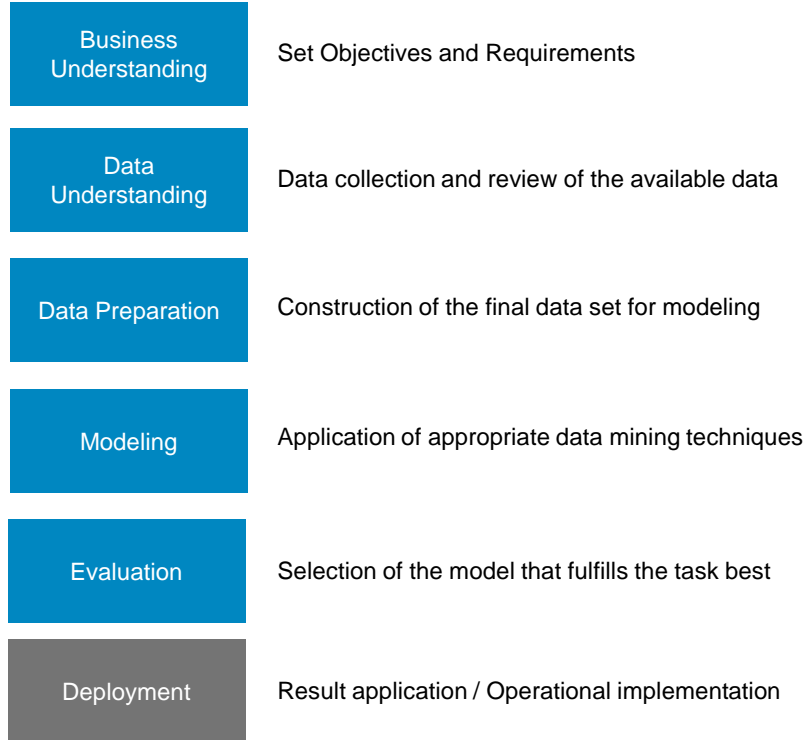


Iron industry

- Find reason, why coils getting stripped during rolling
- Identify key attributes causing breaking of coil
- Predict which coil tend to break, notify supervisor, suggest line parameter adjustments (slower rolling, lower pressure etc.)

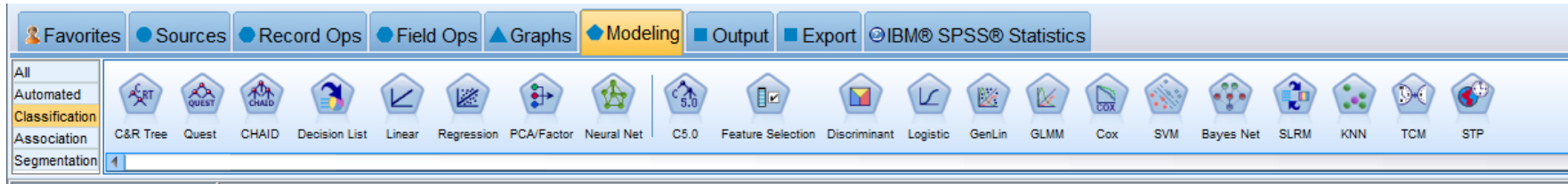
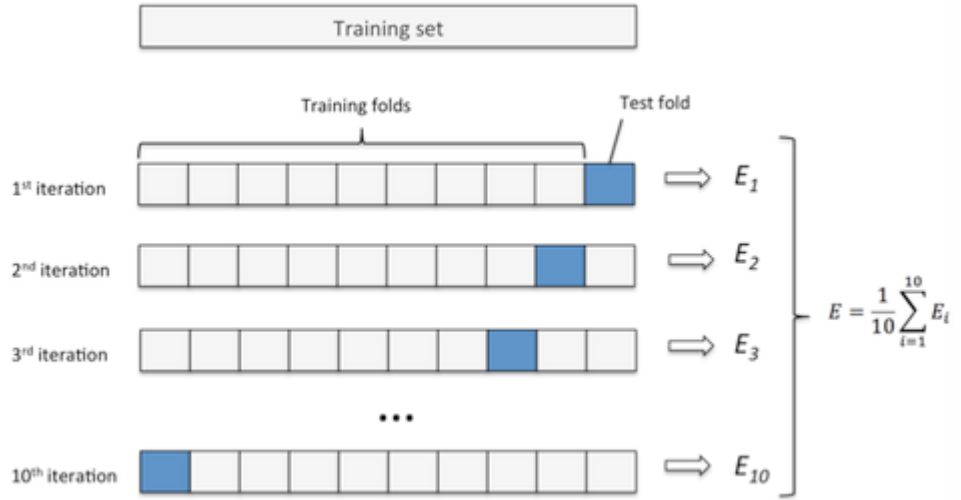


CRISP-DM



Challenges

- Data preparation
 - Focus on right data
- Modelling
 - Choose model(s)
 - supervised/unsupervised
 - Train & test your model
- Evaluation – metrics, overfitting
- Optimization – tuning hyperparameters



Contacts

- IBM Slovensko, spol. s r.o.
@ Kosice - Aupark Tower
- Dominik IMRICH
 - dominik.imrich@sk.ibm.com
 - <https://www.linkedin.com/in/dimrich/>
- Stefan Pero
 - stefan.pero@sk.ibm.com



Thank you
for your attention

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