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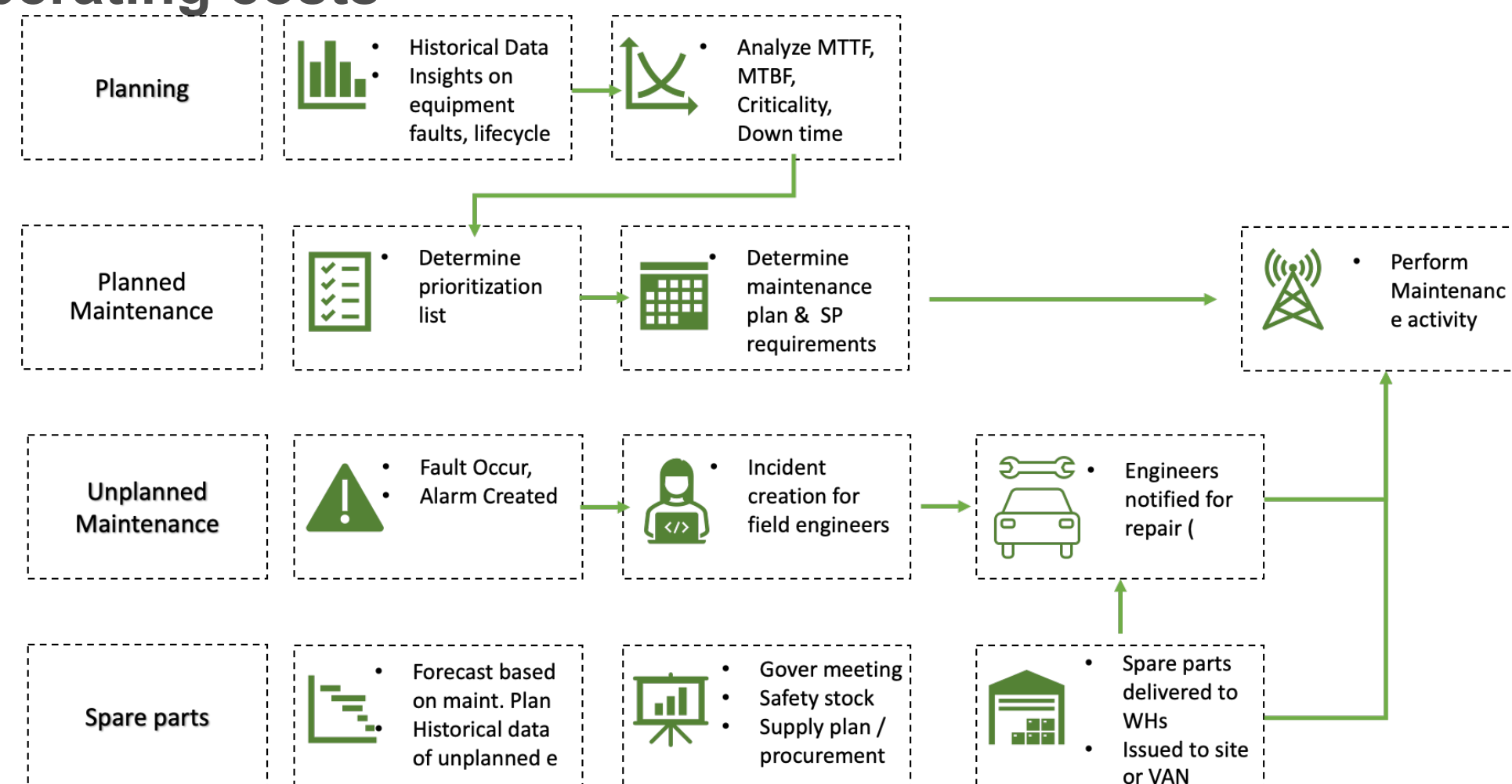
Sponsor: Telecommunications company

Spare Parts Predictive Analytics for a Telecommunications Company

May 2022

Motivation / Background

- Asset intensive industries are strongly dependent on an effective MRO process and the availability of Spare Parts.
- Lack of spare parts has significant impact on operations and customer service. Based on studies, **50% of the unscheduled downtimes are caused by the lack of Spare parts.**
- For our sponsor, spare parts management is a key process but **demand planning is currently manually driven based on historical data causing increased inventory levels and operating costs**

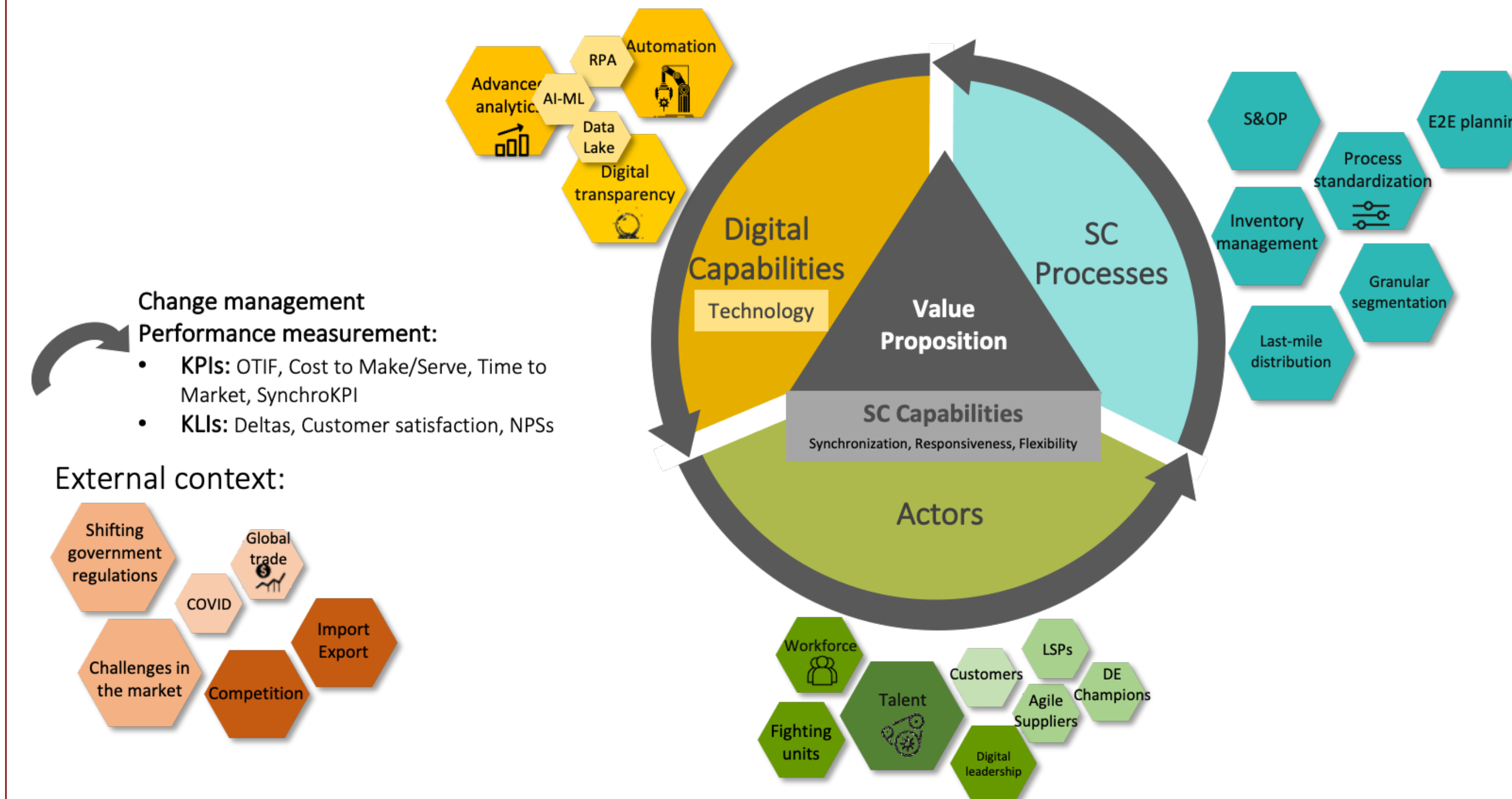


Key Question / Hypothesis

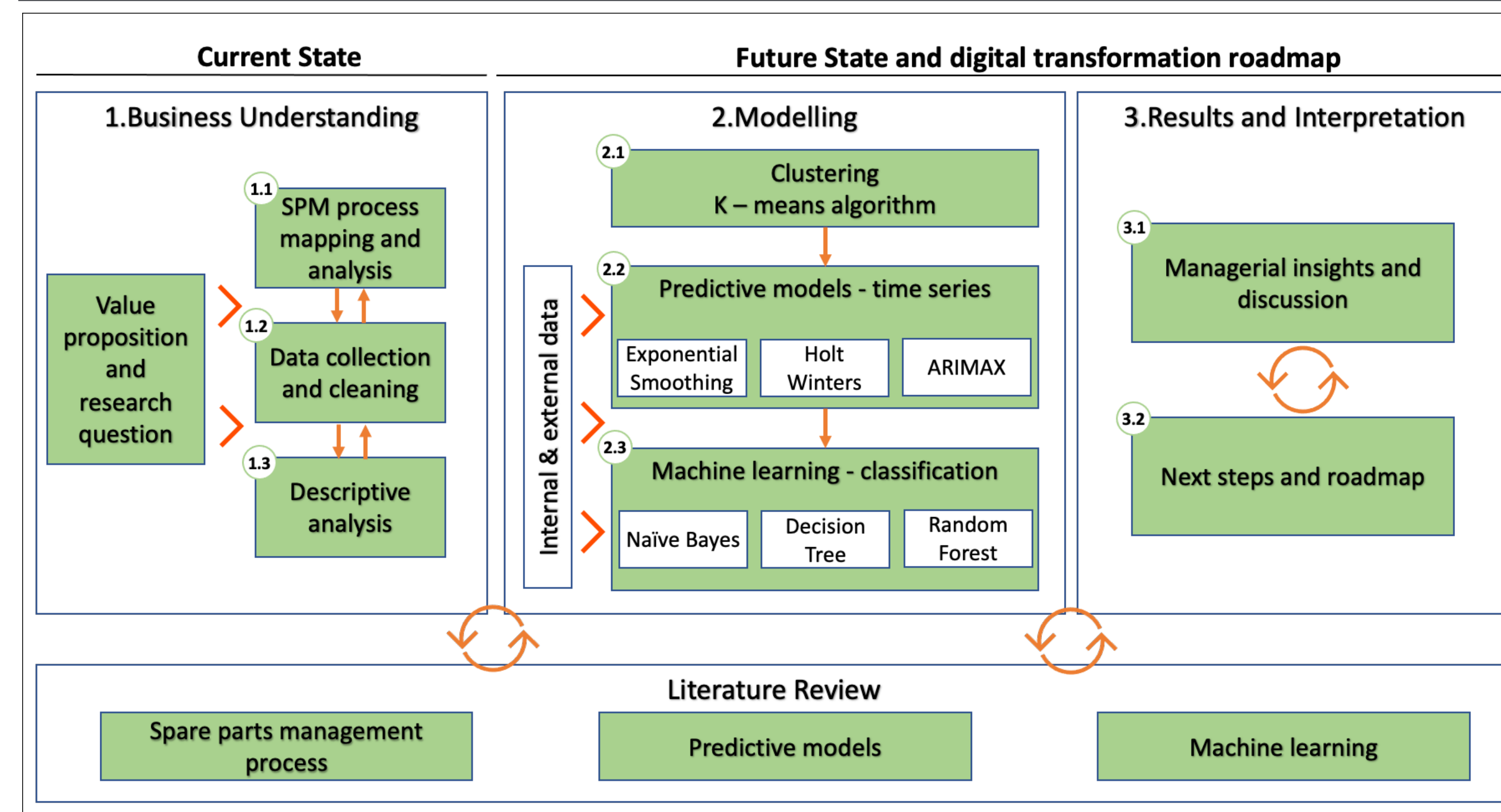
- How can the sponsor improve the prediction of site failures and introduce a proactive maintenance approach using advanced analytics and machine learning for spare parts management?

Relevant Literature

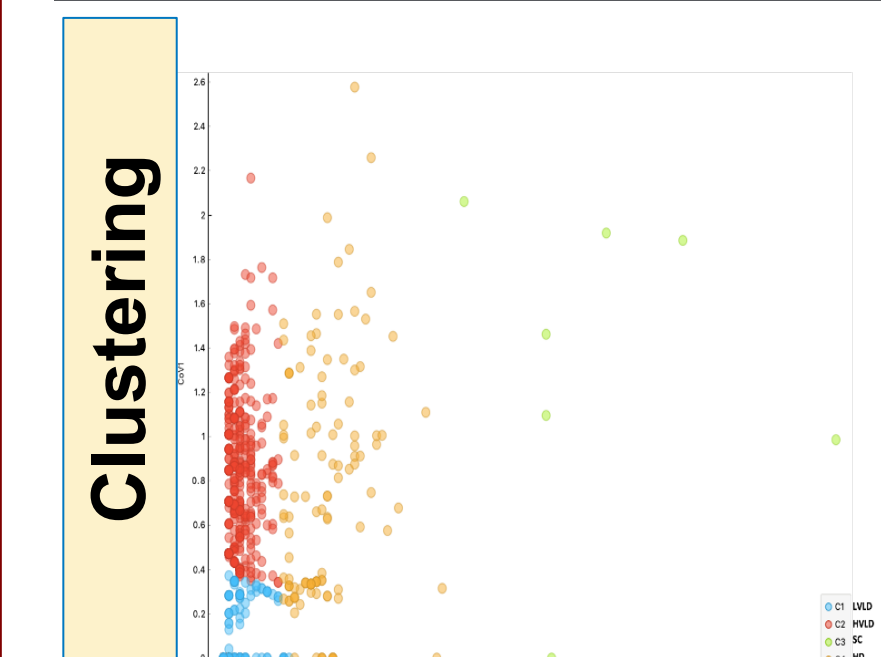
- Saenz, M. J., Borella, I., & Revilla, E. (2022, April). DIGITAL SUPPLY CHAIN TRANSFORMATION: ALIGNING OPERATIONS AND STRATEGY. Supply Chain Management Review
- Selim, M., & Gurel, A. (2007). Machining conditions-based preventive maintenance. International Journal of Production Research, 45(8), 1725–1743. <https://doi.org/10.1080/00207540600703587>
- Gary Forger. (2018, February). NextGen Supply Chain: NextGen Technologies Are Already Here. https://www.scmr.com/article/nextgen_supply_chain_nextgen_technologies_are_already_here



Methodology

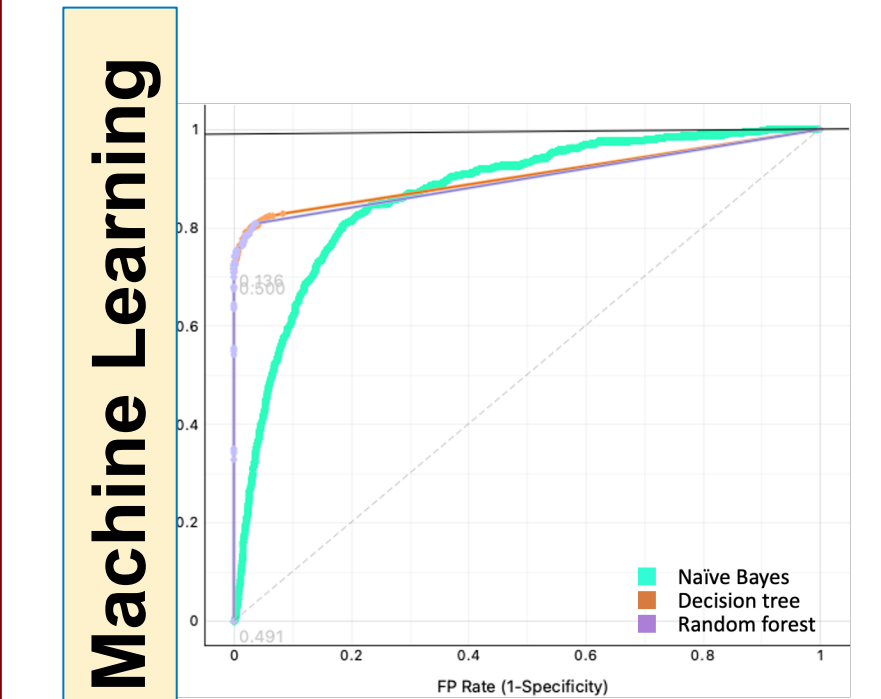
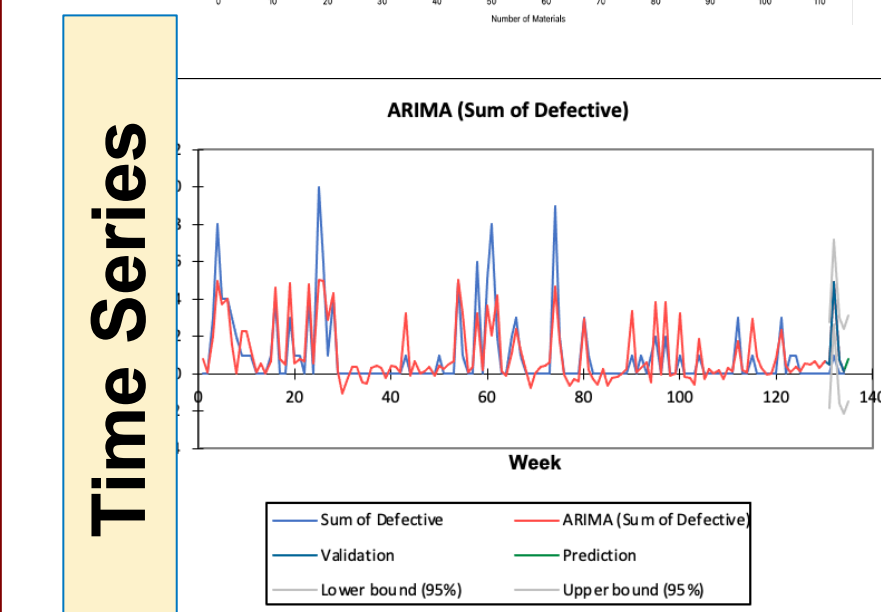


Results



3 main clusters

- C1. Low variability and low demand cluster
- C2. High variability and low demand cluster
- C3. Special Cases cluster, was excluded



- ARIMAX outperforms the other 2 methods
- All three methods have a high MAPE (>50%)
- RMSE seems low (1 to 4) but is also high based on total number of failures per week
- Naïve Bayes cannot capture failures in almost all clusters
- Decision Tree accuracy from 50% to 80% but misses some regions
- Random Forest algorithm outperforms the other two (prediction accuracy from 60% up to 85% for the failures)

Contribution

- Machine Learning classification algorithms and especially random forest can provide a prediction accuracy between 60% - 85%
- Accurate forecast of site failures will allow the company to define new inventory strategy for SPM
- It is expected that the company can achieve inventory reduction (up to 15%), ageing reduction (more than 10 days), and overall operating cost through the optimization of the process (up to 10% due to better planning and maintenance).

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