Machine Learning – Data to Action

Marius Jooste and Stephan Mare

Introduction:

Syntell

Provide practical technology-based traffic & municipal services and solutions.

Speaker – Marius Jooste

Maluti-X
explore | discover | improve

Assists customers to digitise processes and use their data to drive business improvement.

Speaker – Stephan Mare

Agenda:

1. **Introduction**
   - Intro to the businesses
   - Traffic fines at supply chain conference?
   - Intro to traffic fines
2. **Journey**
   - Objectives and solution
   - Outlining the journey
3. **Machine Learning (ML)**
4. **Learnings and Impact**
5. **Application to Supply Chain Management**

Traffic Fines at a Supply Chain Conference?

Understanding our Traffic Fine Business

Preparing the field	Planting the Crop	Cultivating the Crop	Selling the Crop
• Prime contravention system • Camera and mobile solution roll out • Fixed & Semi-fixed site implementation • Recruitment & Training	• Camera and mobile solution deployment	• Back-office processing	• Notice communication • Notice Payment • Managing transgressions (Roadblock & Summons serving)
KPI: Time to Live	**KPI**: Raw and final violation	**KPI**: On-time processing	**KPI**: Paid violations

SYNTELL – Problem Statement

- How can we increase payments?
- What are the correlating factors/ drivers to increase payments?
- How can we succinctly measure progress?

THE CHALLENGE

1. Vast amount of **un-centralised data sets** available across **multiple systems**
2. **No real data analysis**/ data science capability in house
3. Limited **"know our offender"** and the "**payment journey of an offence**"
4. Can we "proactively" **better predict payment** to shape our communications

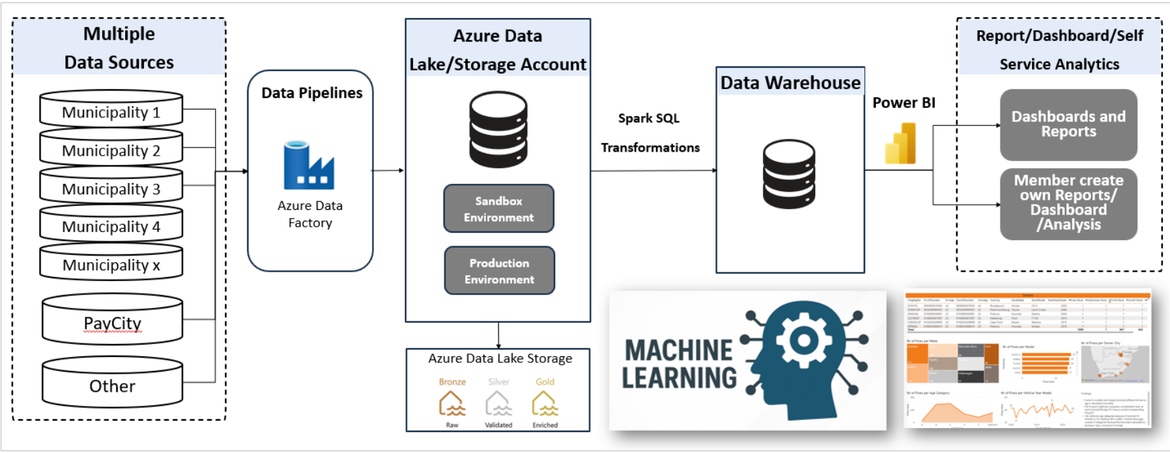
Solution Journey

Phase 1 - Enablement

- **Consolidate, clean and standardise** various **data source** across **multiple platforms.**
- Develop and implement a **modern data platform** using the MS Azure architecture

Phase 2 – Dashboard & Analysis

- **Create investigative Power BI** dashboards to understand all dimensions of fines issued, messaging, payments, etc.
- Supported capability to perform **ad-hoc analysis**
- **Machine Learning** for **Payment Probability**



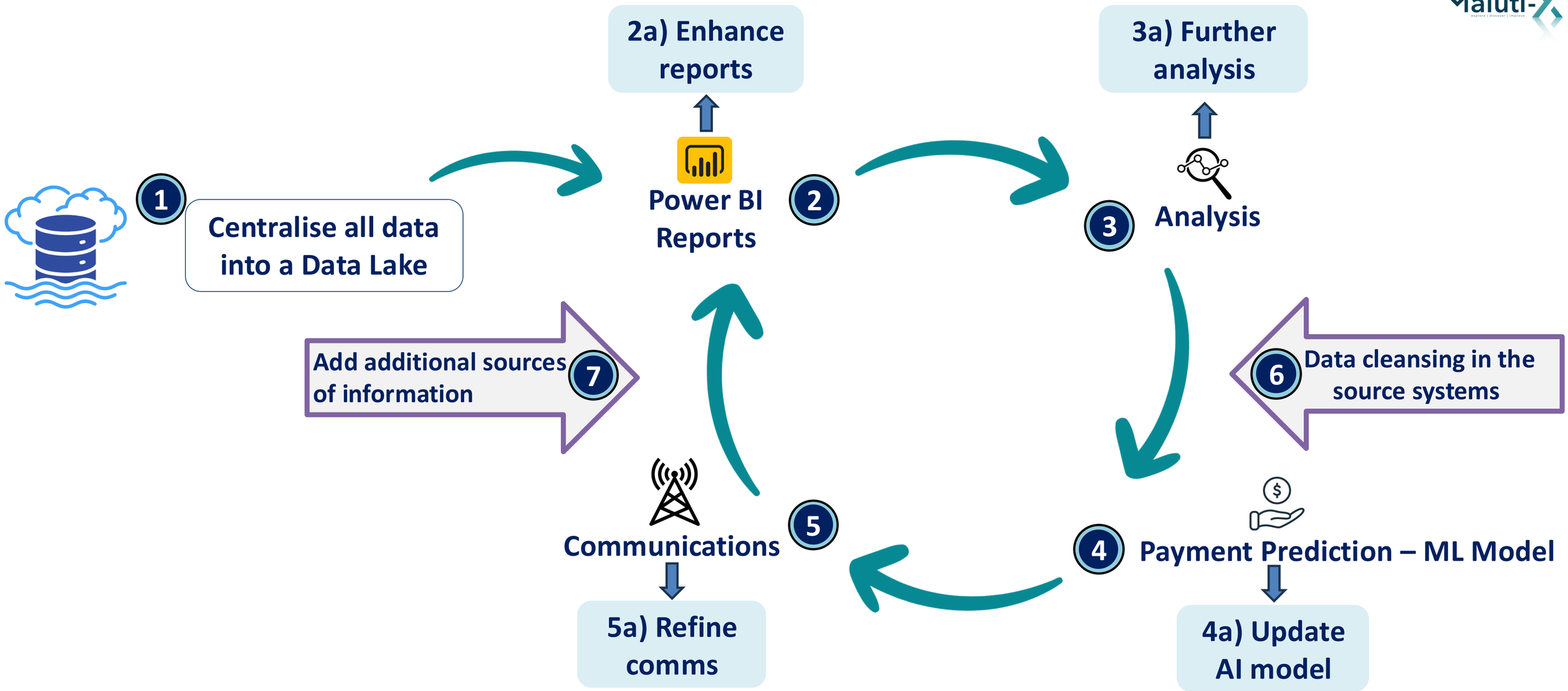
Phase 3 - Refinement

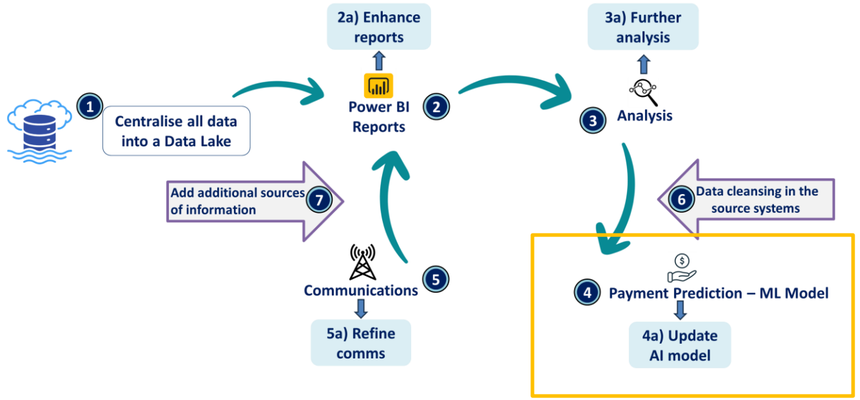
- **A/B** testing
- **Clean data** in source systems
- **Additional** data sources
- **Retraining of the Machine Learning model** for continuous improvement.

FUTURE

- Create a **Gen-AI model** to build customized messaging based on key features.

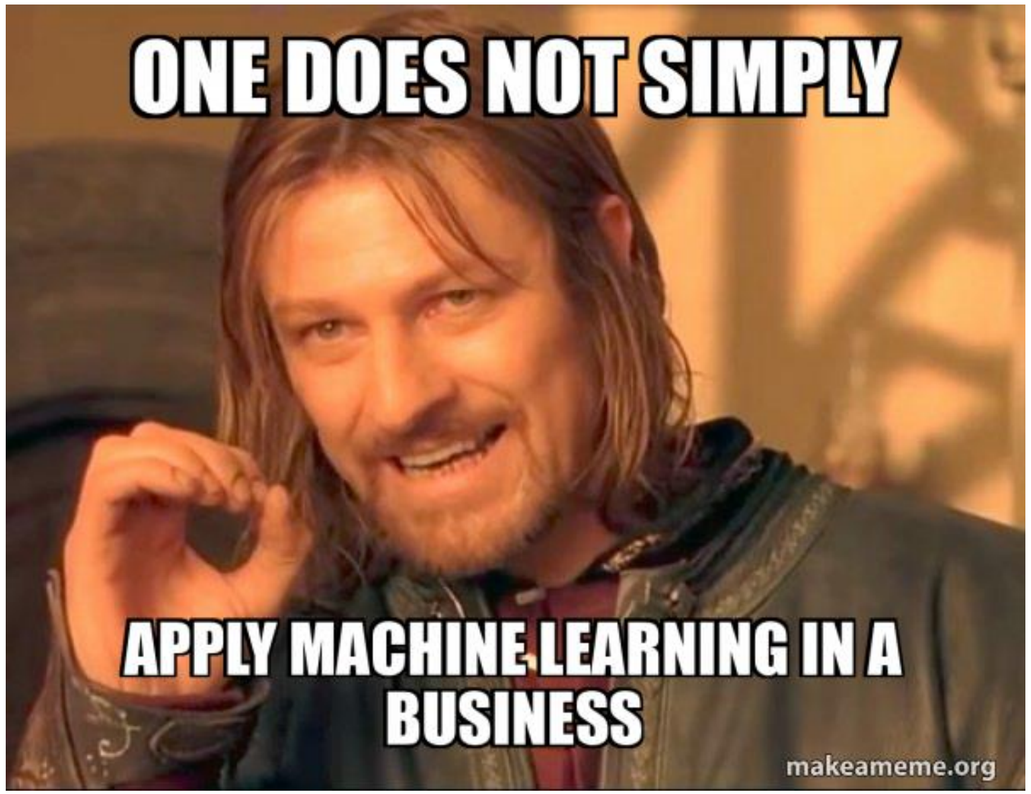
The Journey


1
Centralise all data into a Data Lake
2a) Enhance reports
Power BI Reports
2
3a) Further analysis
3
Analysis
6
Data cleansing in the source systems
4
Payment Prediction – ML Model
4a) Update AI model
5
Communications
5a) Refine comms
7
Add additional sources of information



4 Payment Prediction – ML Model

4a) Update AI model



Finding fit for purpose Machine Learning application that really add value is difficult !

How does Machine Learning work?

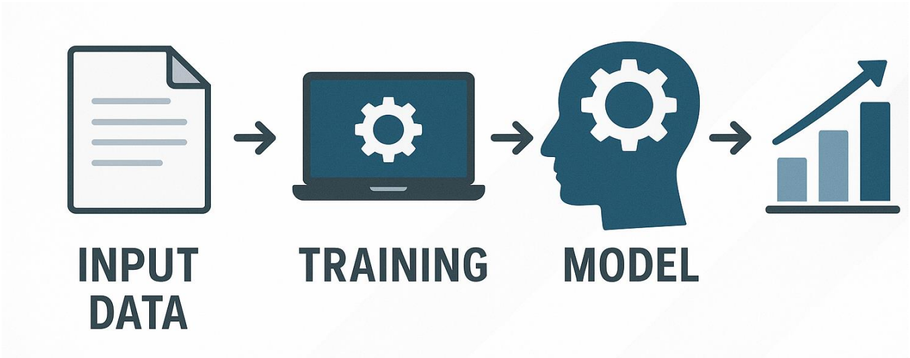
Machine learning (ML) is a branch of **artificial intelligence (AI)** that **enables computer systems** to **learn and improve from data without hard coding or a set of rules.**

Example:

We want to automatically move emails to a SPAM folder.

Instead of writing manual rules for certain Key word like ("Boost your company with AI", "Collect your free prize", etc.) you let the ML model

1. **Look at example of Span and Non-spam emails**
2. **Learn patterns – like key words, specific senders, etc.**
3. **Use the patterns to decide if a new email is spam or not**



Overtime the more emails are processed the better it gets at spotting a spam email.

How do you implement ML – Phase 1: Model Build and Validation

Input Data and Features

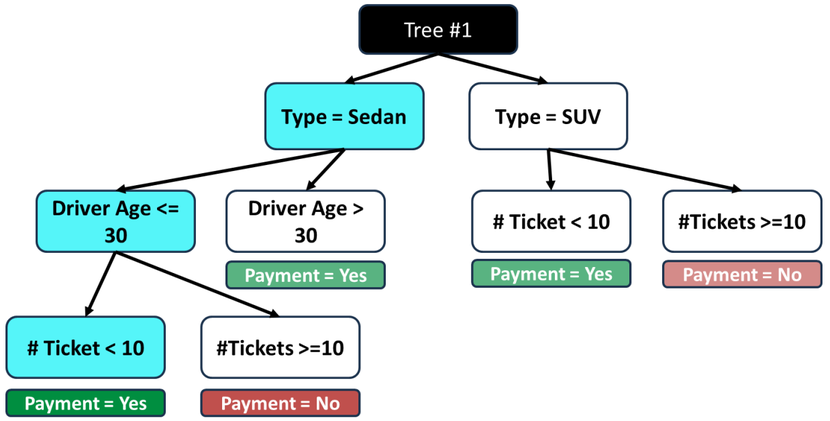
- **Create your Features –** A **characteristic** that **describes** something important about **what we want predict**

Vehicle ID	233
Type	Sedan
Colour	Blue
Driver Age	28
Suburb	Centurion
Vehicle Age	5
# Fines	15
ETC	…

- **It needs enough "fields"** to generate features but not too many to dilute or confuse the result
- **It needs enough "rows"** to find trends and train the model

Training

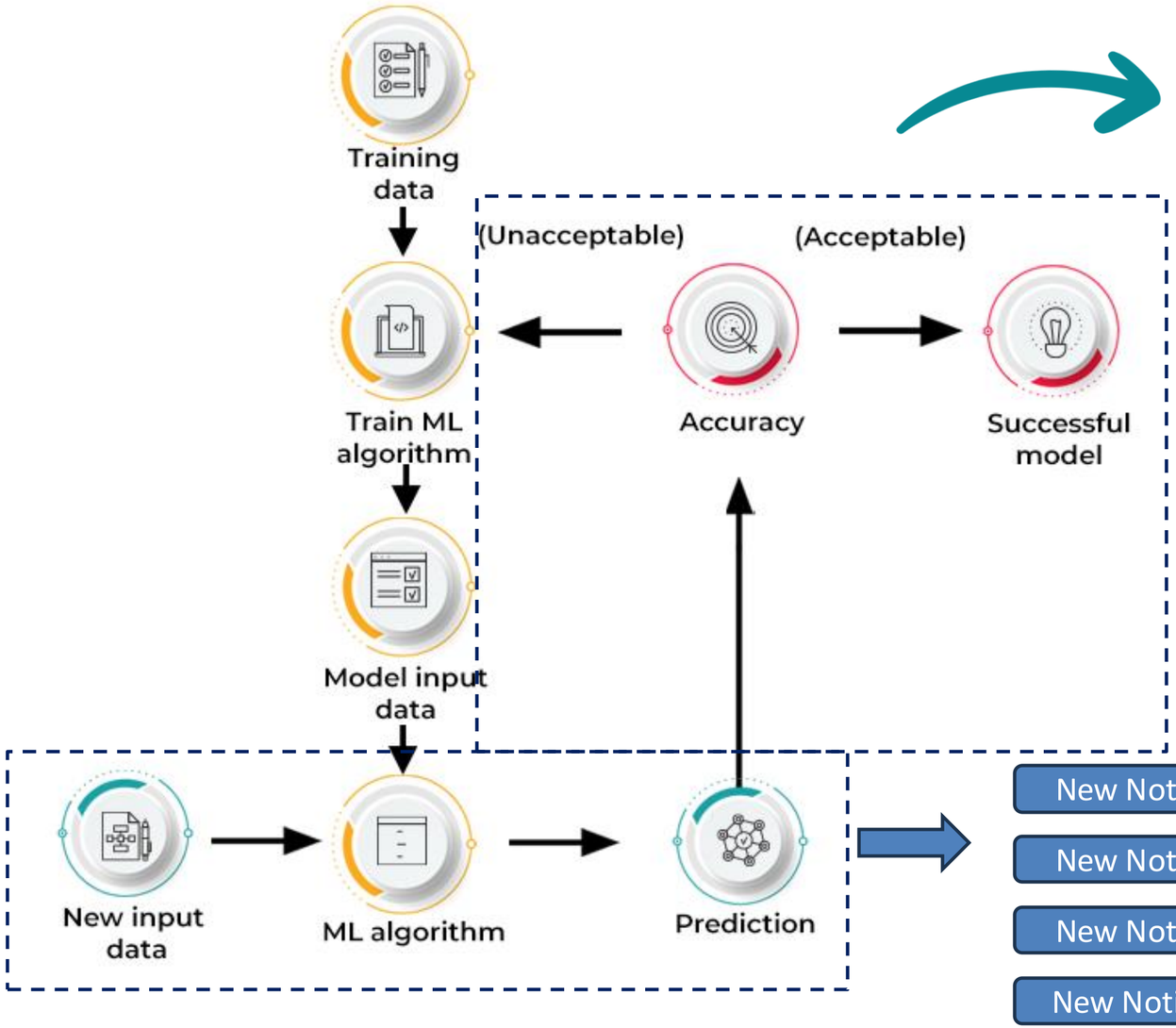
- The model will evaluate **each feature in the data** and **determine a pattern of success or failure of each.**
- **This will be used to predict the outcome of future data sets**



Model Evaluation and Refinement

- **Evaluate the model results – Use a validation data set.**
- **Refine and Optimize the model**

How do you implement ML – Phase 2: Model Deployment



- **It's important that the model keeps learning or "retraining" and tested on the latest historic data (which has an outcome).**

- If model results are used correctly, they will influence future outcomes positively and therefore models can become redundant and need to continually learn.

What impact did it have on Syntell?

- An important building block to hone targeted communication
- Better "**bang for buck**" communications
- Enable **A/B testing** and better "**impact analysis**"
- Better "**orphan**" investigation
- Better "**cleaning of source data**“
- Enablement of **automated communication**

Project Learnings

- Basic reports from integrated accurate data = $GOLD$
- Buy into a **journey** not a dashboard
- Do not underestimate the **change management** (people with their own Excel reports)
- Make provision for a "**quarantine model**" to cleanse data in the source system
- An integrated solution could provide both **"how we are doing"** and **"Investigative"** insights
- Lots of data ≠ lots of value
- **External specialists** fast track results

How can Machine learning help Supply Chain Businesses?

Based on the example provided, Machine learning models can help decision support in many ways

Prediction

- Predict Supplier lead time
- Predict future demand

Classification

- Classify shipment as “on-time”, “Late” based on historic patterns to action accordingly

Recommendation

- Optimal re-order quantities based on inventory levels and supplier characteristics
- Product baskets based on consumer behaviour

Anomaly Detection

- Abnormal fuel consumption rates
- Carrier delivery times suddenly increasing
- Sale order anomalies - repeat small order qty.

NLP and OCR

- Automate document capturing into systems
- Automatically action from customer emails
- Create customised and automated customer feedback

What can you take home?

1. **AI does not have to be expensive**
   - Identify a business case and run a POC first to test the impact. (This can be done at low cost).
2. **Don’t feel pressure to implement AI**
   - Find a valid business case before investing in AI or run ring fenced test.
3. **You need to have a solid data foundation**
   - Centralized ,labeled and clean data is needed to run ML models successfully
4. **Machine learning and AI is not a once-off implementation**
   - It is a continuous process of refinement and improvement

THANK YOU !