A photograph of a modern building's exterior featuring a complex, angular facade made of light-colored panels and glass windows. The building is set against a bright blue sky with wispy white clouds.

MIS710 Machine Learning in Business

How to Write a Business Report on ML Initiatives

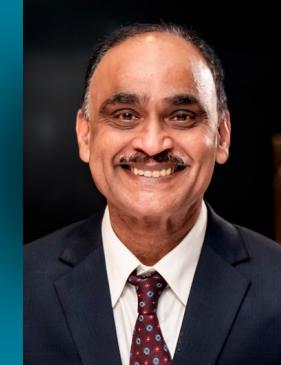
Associate Professor Lemai Nguyen





Unlocking the Power of AI: Strategy, Platforms, and Practice

Monday 23rd Sep 2024, 12.00pm AEST, 7.30am IST



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Prof Raju Varanasi
Professor of Practice
Deakin Business
School

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Nguyen**
Information Systems
and Business
Analytics

How to Write a Business Report on ML/analytics

- Principle 1 – Know the Audience
- Principle 2 – Know the Purpose
- Principle 3 – Know Your Story
- Principle 4 – Speak Their Language
- Principle 5 – Be Direct, Convincing, and Clear
 - Great Ocean Bank Reports (Thanks Trevor Alback)
 - Data Maturity Report (Deakin – TCS)



Introduction



Importance of Business Reports

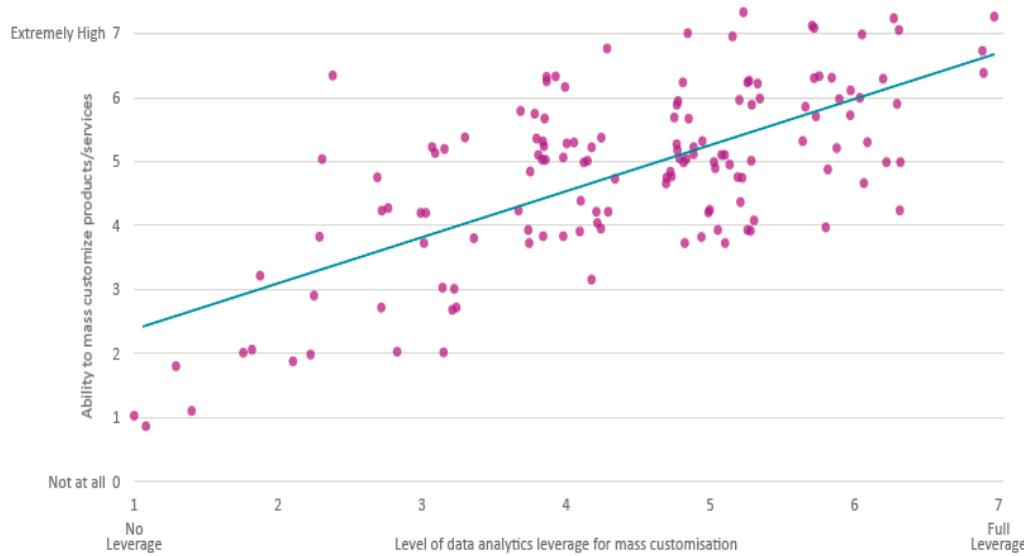
- Crucial for business decision-making
- Focus on practical business values

Differences Between Business and Technical ML Reports

- Business reports often assess situations or propose solutions, focusing on clear, effective, story-telling communication
- Technical reports often specify solutions, focusing on technical details and implementation aspects

Example 1: State of Data and Analytics Maturity Report Example

Nguyen et al., 2022 – Deakin – TCS report



- **Business value demonstrated** by relating data maturity to business performance
- Increased data analytics leads to effective strategic and operational decision-making, efficient operations, and better customer experiences
- A value-driven maturity journey, inclusive data and analytics culture, and a balanced data governance approach were found to be **key elements to success**

Example 2: Great Ocean Bank – Sale Outcome Prediction

Alback (2024)

The Great Ocean Bank Story



- How to increase Sale conversation rates, improve operational efficiency, enhance customer experience
- The proposed ML model offers Sale Outcome **predictions with high accuracy**.
- Predicting Sale customers helps with new onboarding and targeted sales operations.
- Predicting No Sale customers informs marketing strategies to either attract customers through alternative marketing campaigns or decide not to allocate resources to them.

Key Principle 1 – Know the Audience



Address the Audience

- Who will read the report? Their roles.
- What matters to them? (ROI, operational efficiency, sale outcomes, customer experience)

Respond to their needs:

- Tailor content to their needs and decision-making responsibilities
- Align recommendations with their needs

Key Principle 1 – Know the Audience

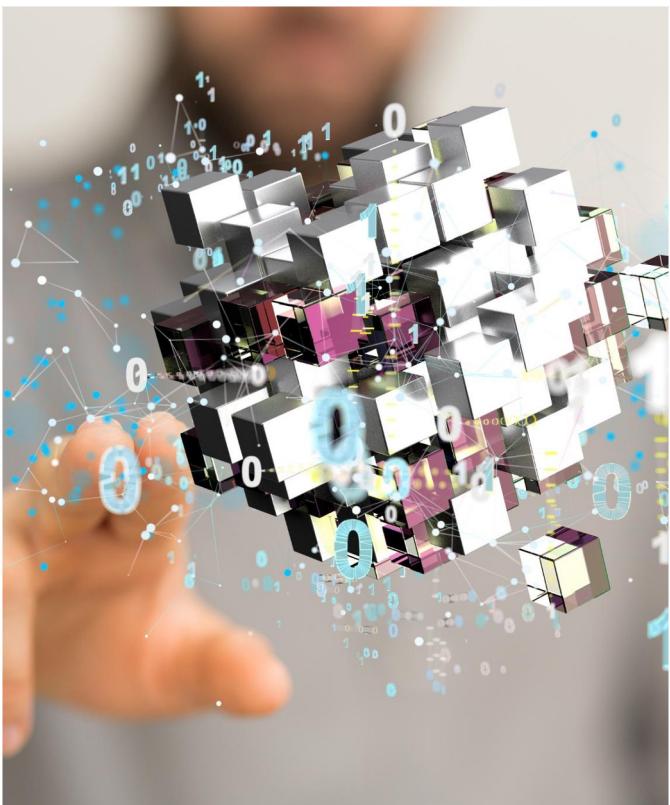


Example from the Great Ocean Bank Report

This consultancy report addresses the business problem proposed by Great Ocean Bank, as requested by Gary Peterson, the Head of Customer Experience. It analyses key questions raised, describes the machine learning models developed based on the insights gained, and offers recommendations. The report is produced by Trevor Alback, a business analytics consultant at Deakin University.

Edited from Alback (2024)

Principle 2 – Know the Purpose



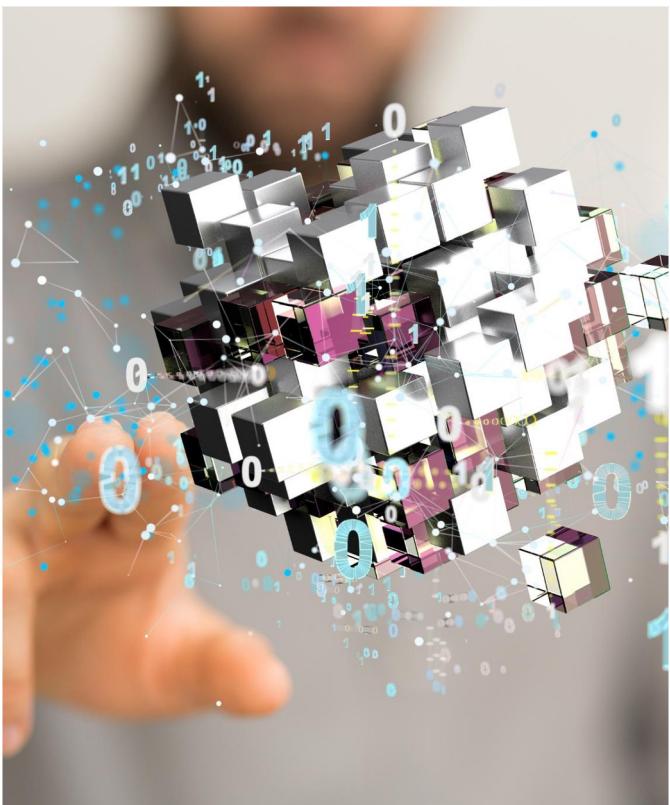
Identify and Address the Report's Objective

- Assessing current situation: data analysis of performance metrics -> key insights
- New technology evaluation: potential impacts, costs, risks, and advantages of the technology.
- Solution development: proposed approaches, models, and how they solve the identified problem.
- Benefit realisation evaluation: outcomes against expectations, tracking ROI and business impact.

Offer actionable insights

Ensure strategic alignment

Principle 2 – Know the Purpose



Example from the TCS report

"The second key finding reveals that on average, as the organisation improves their data and analytics maturity level, the extent to which data analytics contributes to business performance (net income) also increases (see Figure 3), regardless of industry sector and organisation size."

"A business-driven data analytics maturity journey should seek to balance the different, sometimes competing, interests of organisation-wide stakeholders with resource availabilities.... This recommendation requires both an organisational cultural preparedness as well as a process-based approach."

(Nguyen et al., 2022)

Principle 3 – Know Your Story



Craft a Story with Connecting Dots

- Build a cohesive narrative that links and flows logically from your BACCM analysis, how your data analysis and ML results address it, leading to insights and actions.

Evidence Each Dot

- Back each finding with data analysis and ML results.
- Use visuals to clearly communicate your findings.

Insights and Recommendations

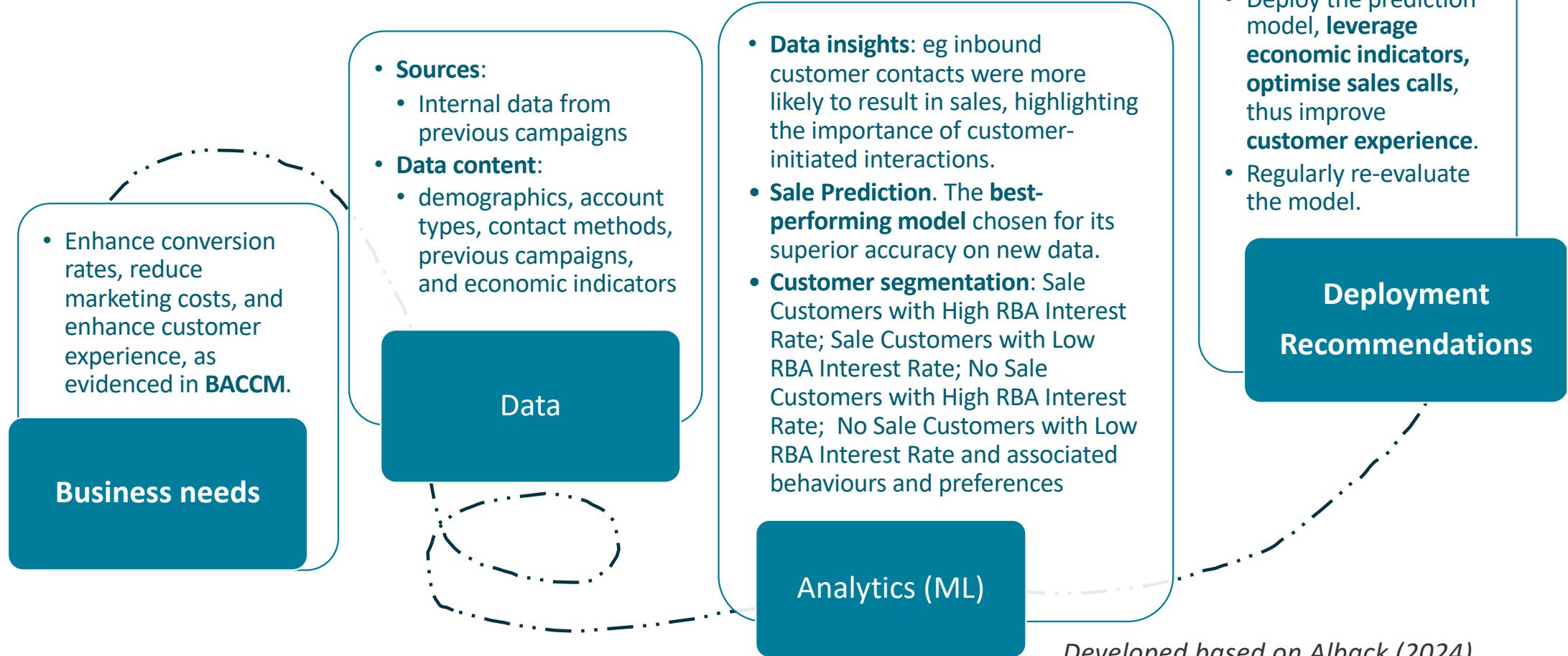
- Connect findings to actionable insights to the business context or decision-making needs (BACCM).

Align with Business Objectives

- Keep the business goal in mind throughout the story.
- Show how your findings contribute to strategic goals like cost savings, efficiency improvements, or customer satisfaction.

Principle 3 – Know Your Story

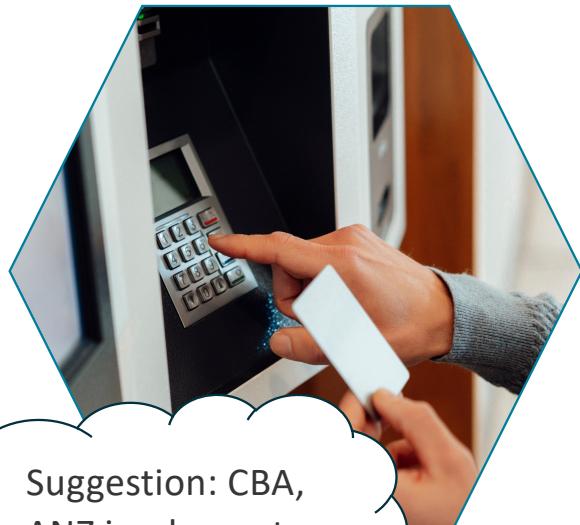
ML framing cards



Developed based on Alback (2024)

Principle 3 – Know Your Story

The Great Ocean Bank Story



Suggestion: CBA,
ANZ implement
similar systems

BACCM

- **Context:** Great Ocean Bank is a regional Victorian bank serving over 1 million customers across Australia, offers a range of financial services. The banking industry in Victoria, and Australia as a whole, is undergoing significant changes driven by technological advancements, regulatory shifts, and evolving customer expectations [1, 2, 3].

[1] Australian Banking Association. (2024). Banking and banking industry data, research and analysis. [Australian Banking Association](#)

[2] Statista Research Department. (2024). Banking industry in Australia - statistics & facts. [Statista](#)

[3] Australian Banking Association. (2024). Bank on it – Customer Trends. [Australian Banking Association](#)

Principle 3 – Know Your Story

The Great Ocean Bank Story



BACCM

- **Need:** *Great Ocean Bank aims to enhance sales campaign performance – conversation rates, marketing and sales costs, and improve overall customer experience*
- **Solution:** *Apply analytics to understand factors that contribute to sale outcome. Develop predictive model to inform sales campaign performance and identify likely sale/no sale customers. Apply clustering to identify key customer segments*
- **Value:** *Increased profit margins, improved sales operations, for Great Ocean Bank and financial prosperity for customers.*

Adapted based on Alback (2024)

Principle 3 – Know Your Story

The Great Ocean Bank Story



BACCM

– Internal Stakeholders:

- Sales Department: Responsible for using the model to guide sales campaigns and customer interactions.*
- Marketing Department: Responsible for developing marketing strategies based on the insights.*
- Data Analytics Team: Responsible for maintaining and updating the predictive model.*

– External stakeholders:

- Current account holder and prospective customers who will benefit from improved services*
- Stakeholders interested in the financial performance and profitability.*
- Regulators: Australian Prudential Regulation Authority (APRA), ASIC, RBA.*

Principle 3 – Know Your Story

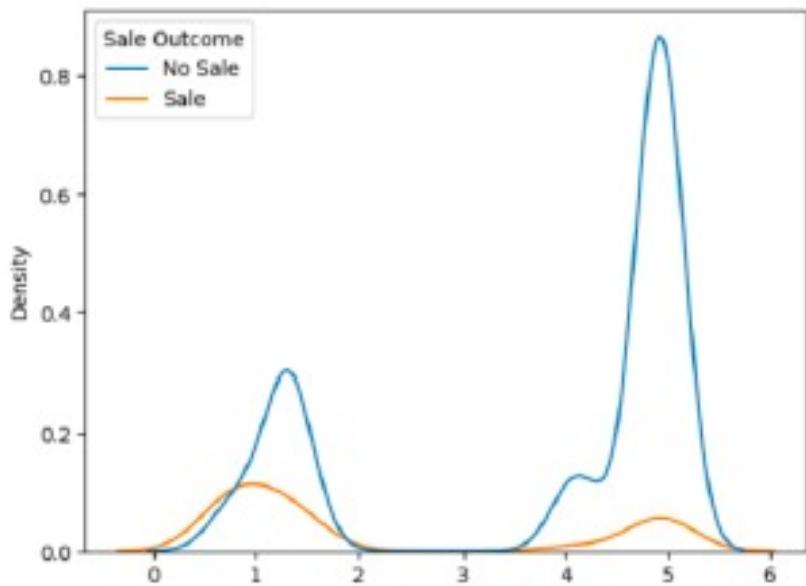


Fig 9. RBA Interest Rates by Sale Outcomes

Data Insights

In response to Data Enquiry 3, we examined various economic indicators to understand their impact on customer behaviour. The findings revealed that higher sales are observed when RBA Interest Rates are lower (Fig 9), and when the Consumer Confidence Index is lower (Fig 10). Lower consumer confidence indicates a pessimistic attitude toward the economy, leading customers to adopt saving behaviour (OECD, 2024). These insights suggest that different economic periods require tailored strategies for sales campaigns. Consequently, these factors have been included as features in the Sales prediction model development.

Edited from Alback (2024)

Principle 3 – Know Your Story

The Great Ocean Bank Story



Customer Segmentation: Leveraging economic factors

- *Sale Customers with High RBA Interest Rate: targeted with specific offers that cater to their financial resilience.*
- *Sale Customers with Low RBA Interest Rate: more responsive to favourable loan terms and lower interest rates*
- *No Sale Customers with High RBA Interest Rate: targeted with alternative marketing strategies.*
- *No Sale Customers with Low RBA Interest Rate: a lack of need for financial products at the time and could be approached with different value propositions.*

Principle 4 – Speak Their Language

Report A

- data scientists, data analysts, or IT teams
- the ML approach, pre-processing and EDA techniques and findings, model training, evaluation, optimisation, comparison, and model performance, implementation details
- technical terminology and mathematical expressions (e.g., KNN, Random Forest, hyperparameter tuning, imputation methods).
- **objective and precise**, do not include Python code

Report B

- executives, managers, or decision-makers
- business value, insights, and actionable recommendations based on the EDA and ML results, and how these will benefit the business.
- non-technical, business and domain-friendly language (e.g., "improving customer experience," "increasing sales conversion")
- **persuasive and strategic**, aligning the results with business objectives



Principle 4 – Speak Their Language

Report A

Data preparation and Exploratory Data Analysis

The supplied dataset consists of 22,940 rows and 19 columns. Each row is a unique customer record containing descriptive information which is summarised below (Table 1).

Table 1. Summary of dataset

Variable	Description	Data Type	Comment
CustomerID	Unique identifier for each customer	String/Varchar, Nominal	This can be used as a reference for any specific data problems. IDs are not useful for EDA or modelling so exclude from analysis
Age	Age of customer	Discrete numeric integer	Range from 17-98

Edited from Alback (2024)

Report B

Internal data from previous campaigns include demographics, account types, contact methods, previous campaigns, and economic indicators.

Principle 4 – Speak Their Language

Report A

ML development and evaluation

- focuses on the technical performance of the models: precision, recall, F1 score, ROC-AUC, and accuracy
- technical graphs, such as ROC curves, confusion matrices, and feature importance plots
- compare the models' strengths and weaknesses, include hyperparameters.
- discuss performance robustness and model drift in implementation recommendations.

Report B

Proposed AI/ML solutions

- focuses on business impact on customer sales outcomes, customer targeting, and sales strategies
- simplified visualizations, such as bar charts or pie charts
- aligned with business goals like increasing conversion rates, reducing customer acquisition costs, and enhancing customer satisfaction.
- how they solve business problems and create value

Principle 4 – Speak Their Language

Report A - ML development, evaluation and comparison

A summary of model performance metrics is provided for the best models below (Table 2). Confusion matrices for both models are shown in Figure 18. The optimised random forest (RF) classifier performs better across all metrics and is therefore provided as the best predictive model of choice. The RF model also classifies more Sale and No Sale data points correctly relative to the KNN model.

Model	Accuracy	Precision	Recall	F1	ROC AUC
Best KNN	0.884	0.707	0.642	0.673	0.92
Best RF	0.894	0.735	0.672	0.702	0.95

Table 2 – Summary table of performance metrics for best KNN and RF models

Edited from Alback (2024)

Principle 4 – Speak Their Language

Report B - Proposed AI/ML solutions

We evaluated several machine learning models to predict customer sales outcomes. The Random Forest model, a decision-tree-based method, performed the best in terms of accuracy. It accurately identifies most customers likely to open a new bank account, which will improve conversion rates. The model also correctly identifies such customers, helping you optimise your marketing and sales efforts.

However, the Random Forest model is less explainable than other methods. While the accuracy is around 90%, this means approximately 10% of predictions may not be correct.

Despite these limitations, we recommend:

- implementing the Random Forest model to improve sales conversion rates, reduce marketing costs, and enhance customer experience.*
- displaying a caution to sales and marketing staff, ensuring they are aware of these potential inaccuracies when making decisions based on the model's predictions.*

Edited from Alback (2024)

Principle 5 – Be Direct, Convincing, and Clear

- short, punchy sentences; no fluff
- why does this paragraph/section matter to the business?
- back every claim with evidence (data, findings)



Types of Paragraphs: PREP and PCR



Each paragraph should have one key theme.



PREP: Proposition, Reason, Evidence, Proposition

PCR: Proposition, Conflict, Resolution



Maintain continuity of your argument.

In response to Data Enquiry 3, we examined various economic indicators to understand their impact on customer behaviour. The findings revealed that higher sales are observed when Employment Variation rates are lower (Fig 9), and when the Consumer Confidence Index is lower (Fig 10). Lower consumer confidence indicates a pessimistic attitude toward the economy, leading customers to adopt saving behaviour (OECD, 2024). These insights suggest that different economic periods require tailored strategies for sales campaigns. Consequently, these factors have been included as features in the Sales prediction model development.

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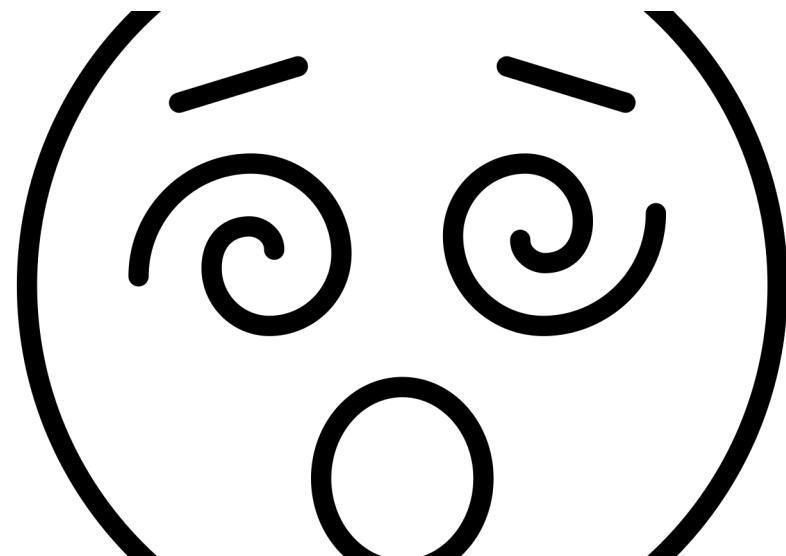
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Edited from Alback (2024)

Principle 5 – Be Direct, Convincing, and Clear

Example of poor writing

After a thorough and extensive evaluation of a wide range of sophisticated machine learning models designed to predict the complex patterns of customer sales outcomes, we came to the conclusion that the Random Forest model, which operates using a highly intricate and elaborate decision-tree-based method, outperformed all other models in terms of its exceptional accuracy. This model, through its advanced and highly intelligent algorithms, is able to meticulously and precisely identify the majority of customers who are most likely to open a new bank account, a feature that will undoubtedly lead to a significant improvement in conversion rates.



Principle 5 – Be Direct, Convincing, and Clear

A better way

We evaluated several machine learning models to predict customer sales outcomes. The Random Forest model, a decision-tree-based method, performed the best in terms of accuracy. It accurately identifies most customers likely to open a new bank account, which will improve conversion rates. The model also correctly identifies such customers, helping you optimise your marketing and sales efforts.



Effective business communication is crucial for consultants

- Know the Audience
- Know the Purpose
- Know Your Story
- Speak Their Language
- Be Direct, Convincing, and Clear



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