



***Data-Driven Technologies** in
The Directorate General of Treasury, Ministry of Finance
The Republic of Indonesia*

AI in Treasury Operations: Experience of Indonesia

Directorate General of Treasury
Jakarta, 29 May 2025



Today's Agenda

I. Introduction

II. Operational Coverage & System Complexity

III. Digital Transformation Journey

IV. Use Cases of AI/ML Implementation

V. Ongoing & Future AI Developments

VI. Lessons Learnt & Conclusion



Introduction

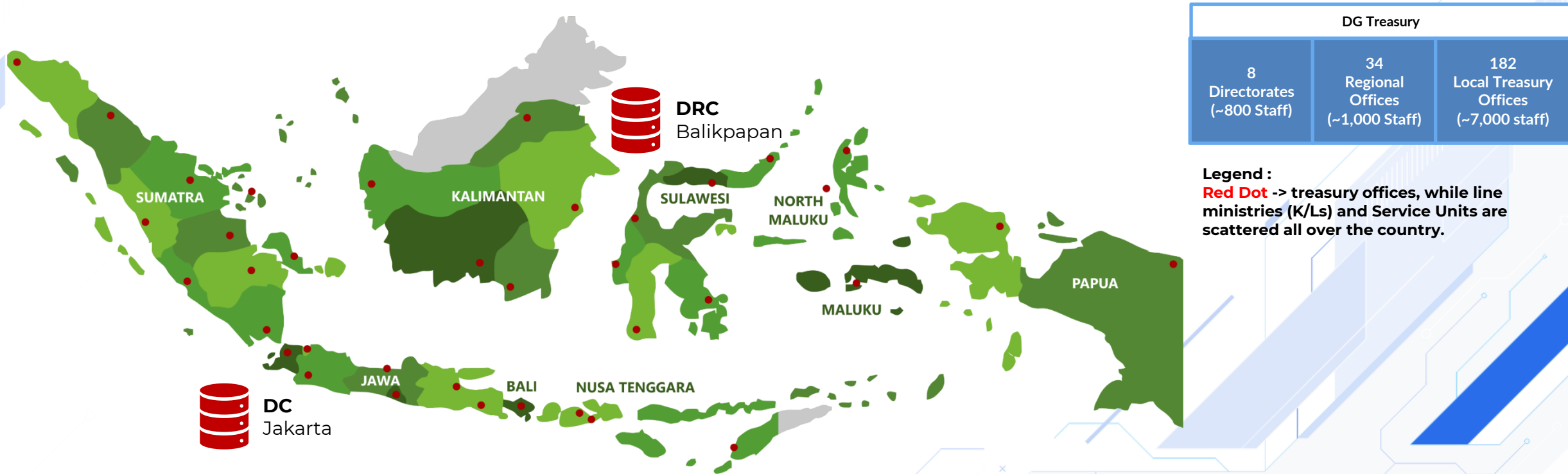
The Minister of Finance of the Republic of Indonesia underscored the immense value of the wealth of data available to the Ministry, likening it to a new kind of mine—a mine of information suited for the digital era. However, it is imperative that this data is meticulously processed and comprehensively understood to unlock its full potential.

Within the DG Treasury, **the Ministry is actively harnessing data science, machine learning, and artificial intelligence to enhance financial management, bolster decision-making, and improve operational efficiency.** This strategic utilization of data seeks not only to refine processes but also to drive informed decisions based on actionable insights.

The application of data science, machine learning, and artificial intelligence **incorporates sophisticated analytical methodologies to scrutinize financial data, discern patterns, anticipate trends, optimize workflows, and support data-driven decision-making.** This innovative approach positions the Ministry to adapt and thrive in a rapidly evolving financial landscape.



Operational Coverage & System Complexity



Landmass of **1,9** million square miles with **17,508** Islands



Population **281.6** Million (2024)



83 Ministries with **19.459** Spending Units (SUs)



550 Local Governments



GDP ~**1,357** billion USD in 2024



GDP Growth Rate **5.03%** (2024)

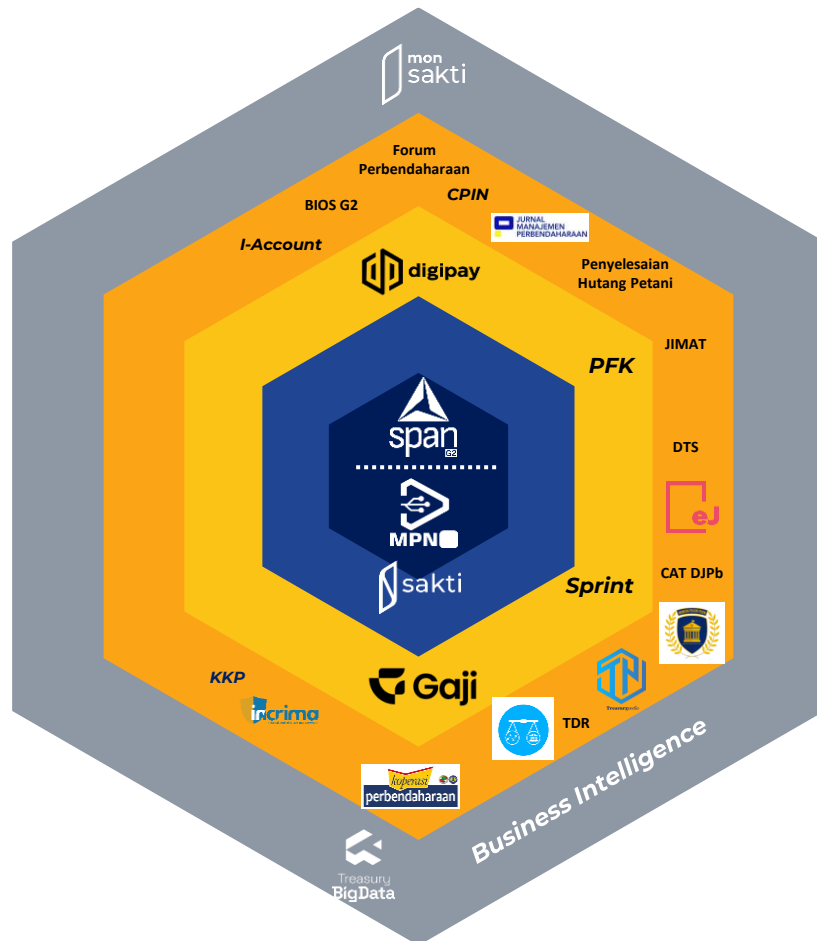


Debt to GDP Ratio **39.2%** (2024)



Digital Transformation Journey at DG Treasury

EXISTING



FUTURE



Use Cases of AI/ML Implementation



Treasury Big Data Open Data

Leadership Dashboard Subsidy Dashboard Asset & Liability Dashboard
FLPP Dashboard RCE Dashboard

Financial Distress Local Gov. Early Warning System SOE Fraud Detection Village Funds
Anomaly Detection PPP Disbursement Docs Classification

Cash Forecasting Treasury Artificial Intelligence

01

Big Data

Aggregates and manages vast volumes of structured and unstructured data from various treasury sources to enable deeper insights, efficient storage, and fast retrieval for downstream analytics and modelling.

02

Data Analytics

Explores and interprets large datasets using statistical and visual techniques to discover patterns, trends, and insights that support strategic decision-making in treasury operations.

03

Machine Learning (ML)

Utilizes algorithms and statistical models to enable systems to learn from historical treasury data, automate processes, detect anomalies, and improve forecasting accuracy over time without being explicitly programmed.

04

Artificial Intelligence (AI)

Builds intelligent systems that simulate human reasoning, decision-making, and problem-solving using advanced ML techniques, natural language processing, and automation to enhance treasury functions.

FLPP: Government Payment Liquidity Facilities
RCE: Regional Committee of Economy
PPP: Government Payment Platform



Use Case on Cash Forecasting: In-House Development

Development Background

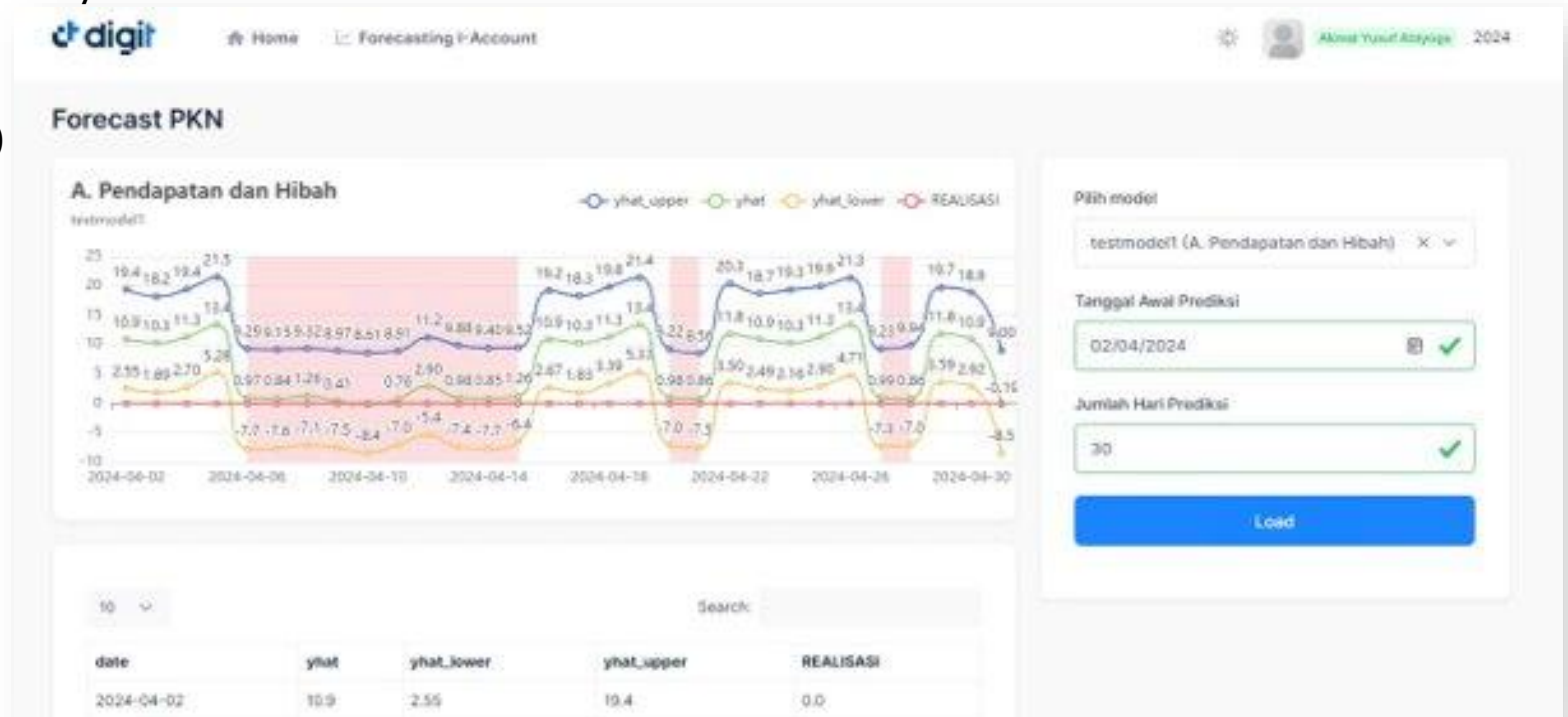
The Ministry of Finance is facing challenges in managing government cash due to the complexity of its duties and the abundance of financial data. With manual analysis becoming more difficult, decision-making is impacted, and it's leading to increased uncertainty and risk. Timely and accurate decisions are vital for financial stability and efficient public services, considering economic changes and political dynamics.

Description

A simulation system that can produce projections of the state budget (APBN) realization based on predetermined scenarios. This includes projections of income, expenditure, and other main items in the APBN.

Objective

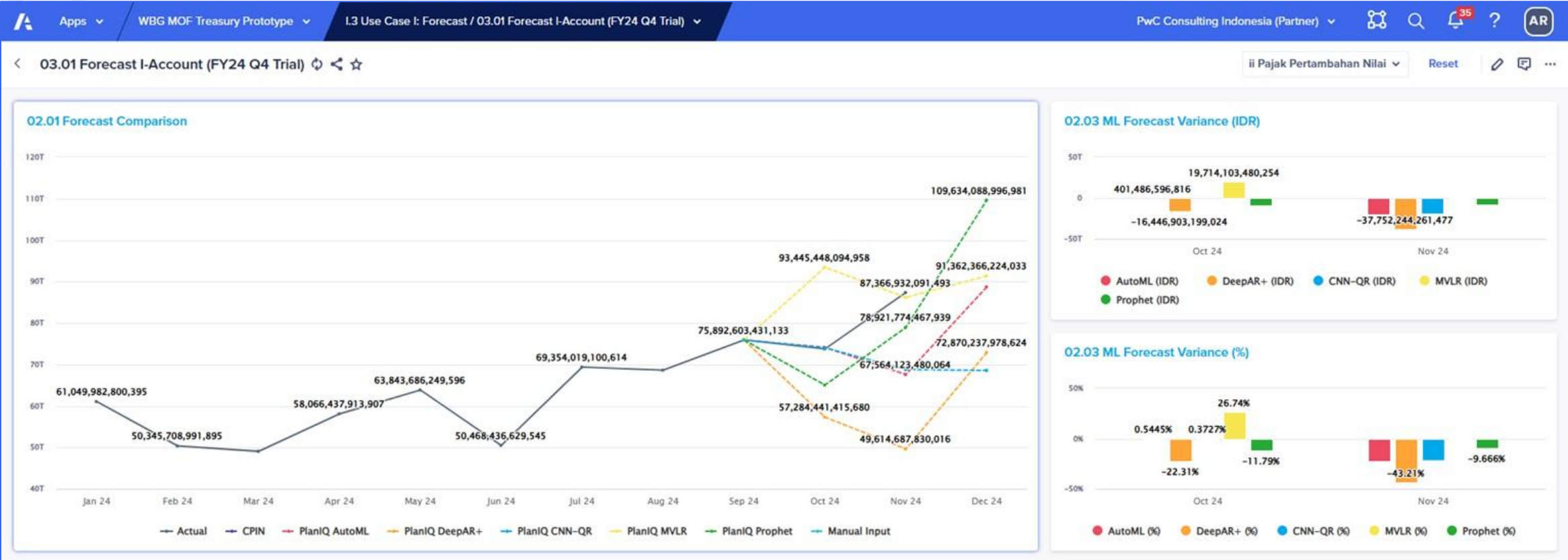
Implementing an IT-based treasury system for APBN simulation, facilitating rapid financial data processing and strategic decision support to maximize government cash management efficiency.



Use Case on Cash Forecasting: VAT Revenue Forecast Using Anaplan ML

Prophet was the only model that accurately predicted October's decrease and November's increase, albeit with significant variances of -11.8% (IDR 8.7 trillion) and -9.7% (IDR 8.4 trillion), respectively. In contrast, CNN-QR, though it incorrectly predicted the trend for November, provided precise results for October, with a slight deviation of just 0.4% (IDR 0.3 trillion) from the actual figures.

For December, all models except CNN-QR anticipate a medium to significant increase in VAT revenue, projecting totals of IDR 72.9 trillion, 88.7 trillion, 91.4 trillion, and 109.6 trillion. Please note that the news of the upcoming VAT increase to 12% in January 2025 may influence revenue patterns beforehand, as the April 2022 VAT increase allegedly resulted in relatively stagnant revenue from March 2022 to March 2023.



FY24 Q4 Selected Revenue Forecast Using Anaplan ML

Use Case on Cash Forecasting: VAT Revenue Forecast Using Anaplan ML (cont'd)

The performance of the machine learning models is improving with the addition of FY24 budget realization data, while no features have changed since the second iteration of the proof of concept (POC).

Below are the results from the model evaluation for each selected revenue account, along with the average increases in model performance. These averages were calculated by taking the mean of the changes in evaluation metrics across all algorithms and metrics.

Value-Added Tax

	Auto ML	DeepAR+	CNN-QR	MVL R	Prophet
MASE	0.523	0.683	0.803	0.669	0.719
MAPE (%)	0.561	0.612	1.688	2.836	2.094
RME (IDR Tn)	1.562	2.293	2.096	1.685	1.896

39%

average increase in model performance

Non-Oil & Gas Income Tax

	Auto ML	DeepAR+	CNN-QR	MVL R	Prophet
MASE	0.829	0.608	0.829	1.104	0.826
MAPE (%)	3.866	0.815	4.446	6.16	4.635
RME (IDR Tn)	3.456	3.805	3.595	3.549	3.689

11%

average increase in model performance

Import Duty

	Auto ML	DeepAR+	CNN-QR	MVL R	Prophet
MASE	0.292	0.342	0.367	0.327	0.286
MAPE (%)	0.548	0.413	0.477	0.802	0.59
RME (IDR Tn)	0.035	0.043	0.046	0.039	0.034

49%

average increase in model performance

Legend: MASE > 1 (not good) Best Performing Worst Performing

Ongoing & Future AI Developments

Ongoing & Future Development



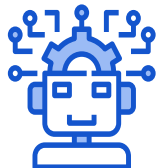
Integrated Platforms

Establishing an integrated data analytics platform across DG Treasury to unify fragmented analytics initiatives. This platform will serve as a central hub for data governance, metadata standards, dashboard consolidation, and collaborative analytics, enabling more strategic and consistent data utilisation across units.



Enhancing Treasury Big Data Environment

Upgrading the Treasury Big Data infrastructure to support scalable and advanced data science use cases. This includes enhancing data pipelines, automating data quality checks, expanding data cataloguing, and enabling high-performance computing capabilities to accelerate machine learning and predictive modelling projects.



Next Phase Development of TreasurAI

Expanding the capabilities of TreasurAI, DG Treasury's AI assistant, to move beyond prototyping into operational deployment. The next phase includes integrating real-time data access, fine-tuning large language models for domain-specific tasks, improving response accuracy, and embedding TreasurAI into decision support systems to assist various treasury functions.



Lessons Learnt & Conclusion

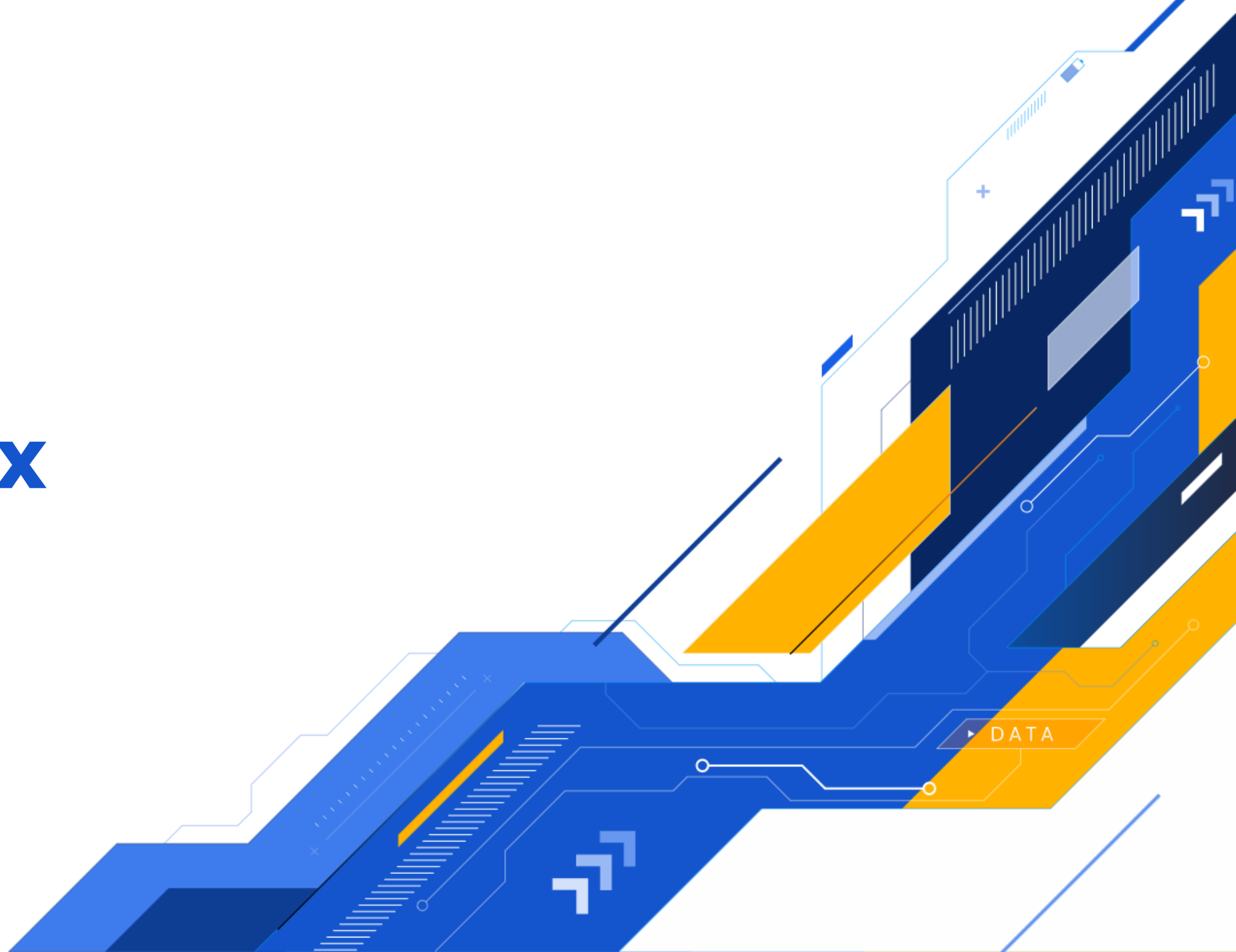
- Artificial Intelligence (AI) and machine learning (ML) are currently **delivering substantial advantages within treasury operations**, significantly enhancing efficiency, accuracy, and the generation of insightful data.
- Establishing **a robust data infrastructure is essential** for fostering scalable and sustainable innovation in both analytics and intelligent systems.
- Effective **collaboration across various units, coupled with continuous capacity-building**, is critical to ensuring successful adoption and lasting impact.
- Looking forward, AI has **the potential to enable predictive, adaptive, and autonomous decision-making**, fundamentally transforming the landscape of public financial management.

THANK YOU

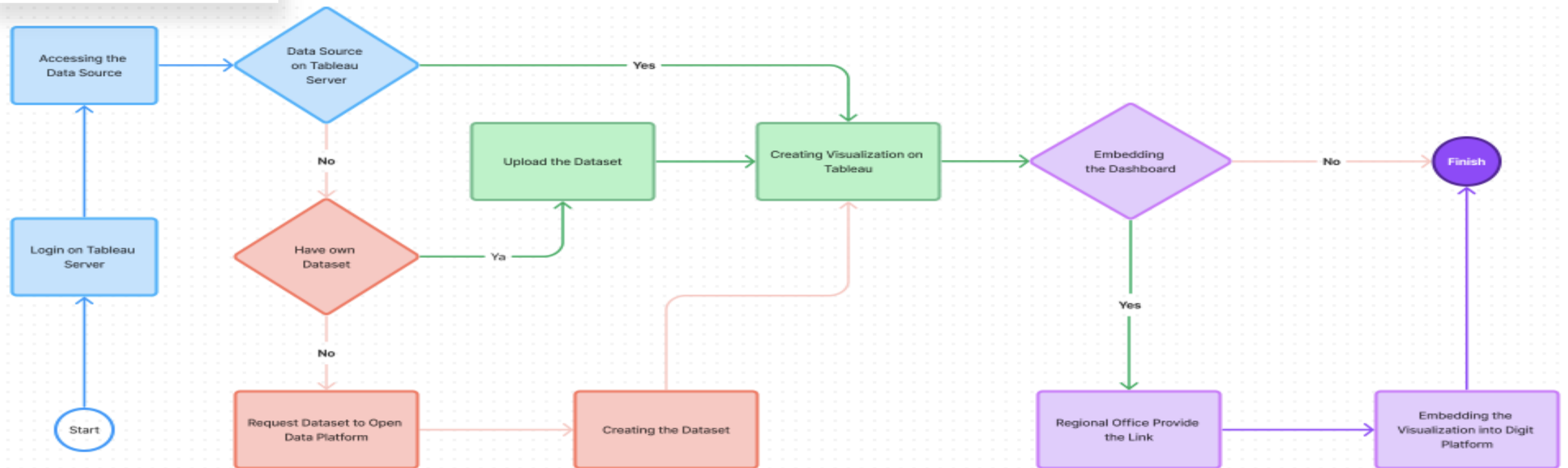
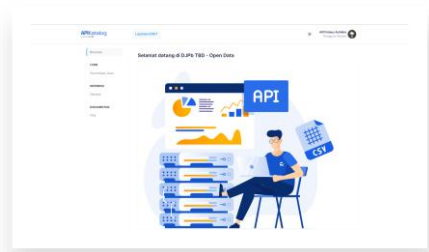




Appendix



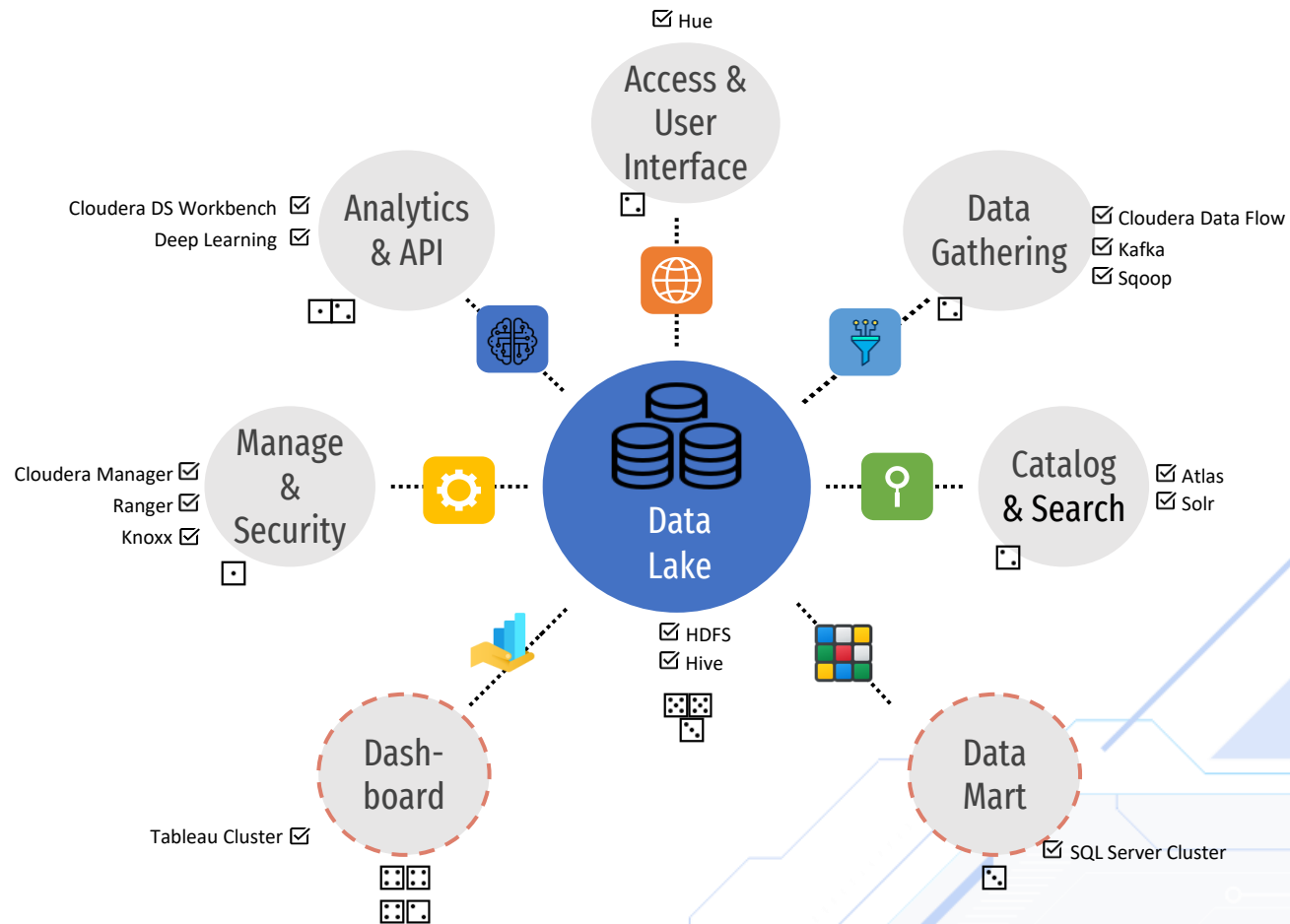
Integrated Platforms



Developing an integrated platform that will be used by the Regional Office of the Directorate General of Treasury (Kanwil DJPb) and the State Treasury Services Office (KPPN).



Enhancing Treasury Big Data Environment for the Next Data Science Projects



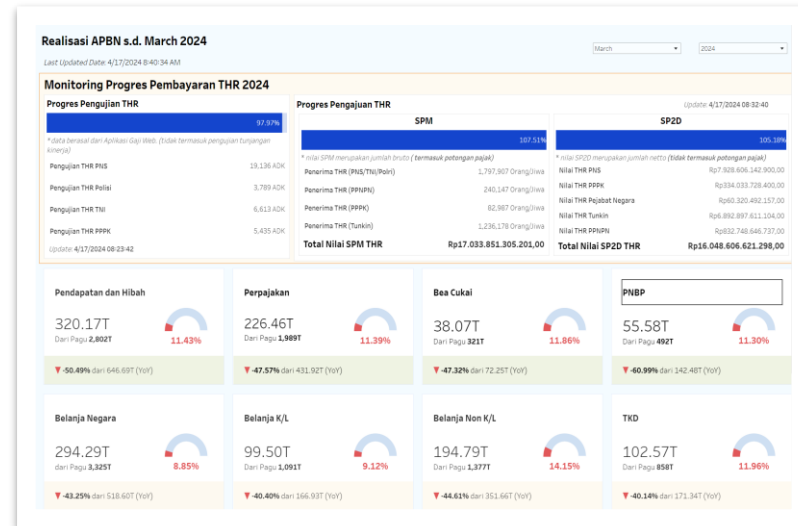
Dynamic Dashboard

Description

Leaders use a dynamic dashboard to monitor the latest business process developments and make decisions.

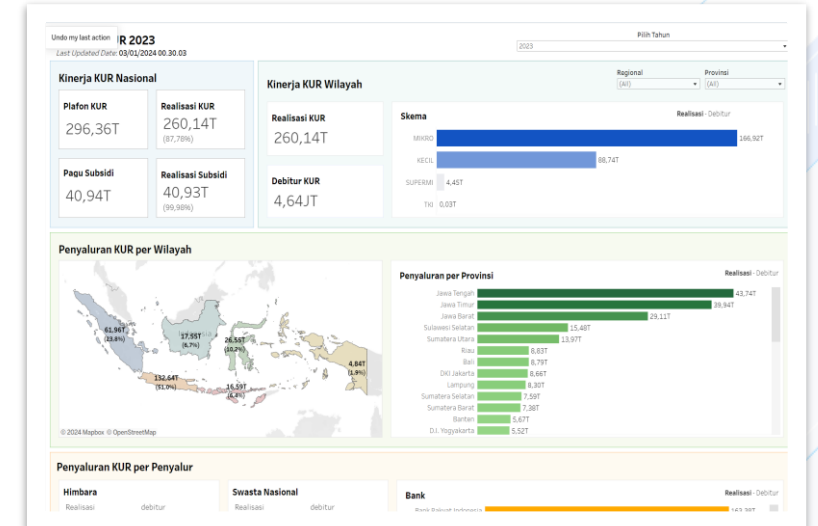
Objectives

The purpose of this dynamic dashboard is to assist leaders in monitoring business process activities and making more informed decisions.



Leadership Dashboard – State Budget Realization

The dashboard is utilized by the Director General of Treasury to monitor the realizations that have occurred within the specified fiscal year.



Government Subsidy

This dashboard is utilized by leaders at the Directorate General of Treasury to review the distribution of government subsidies in the current year, both nationally and regionally.

Data Analytics

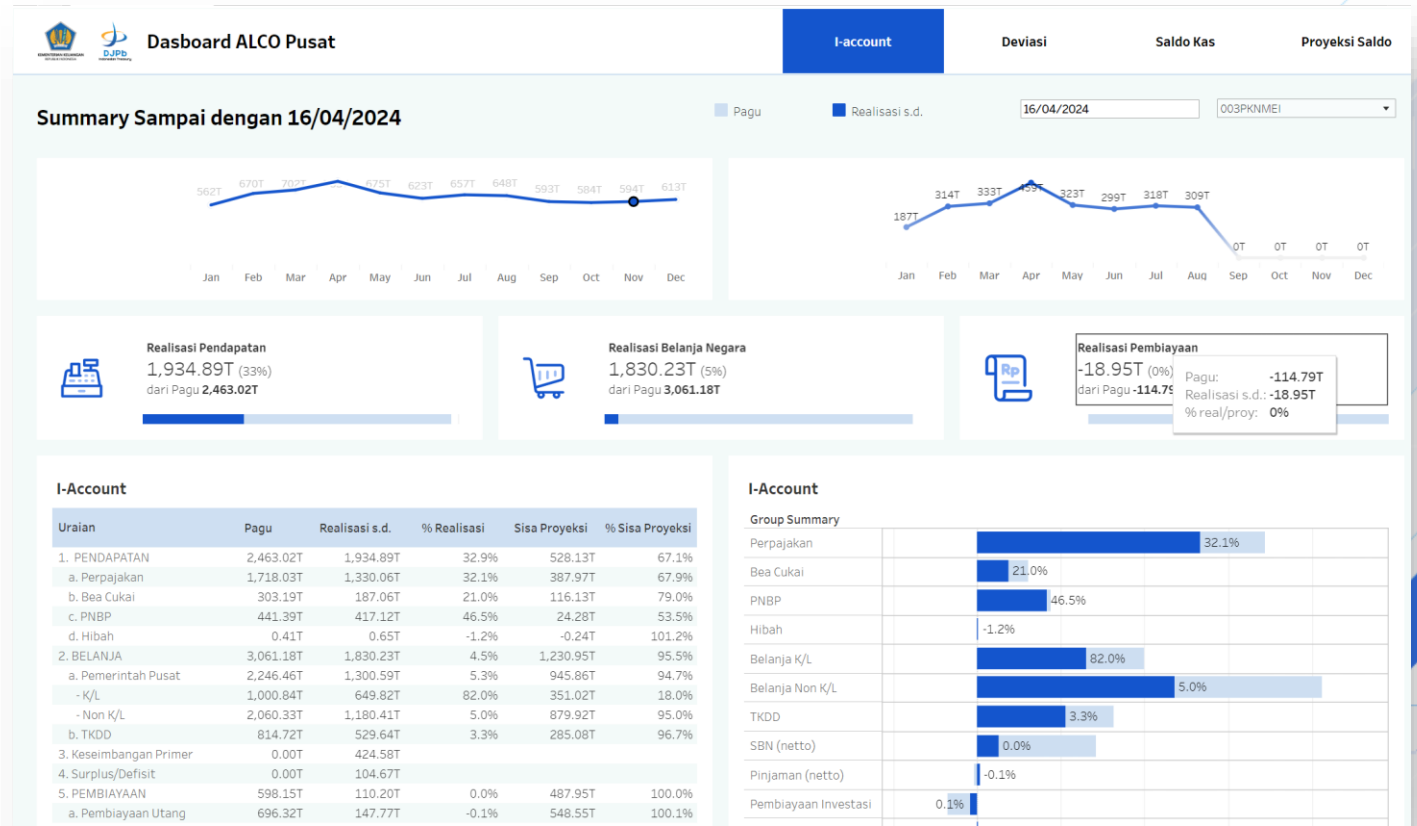
Asset Liability Committee's Dashboard

Development Background

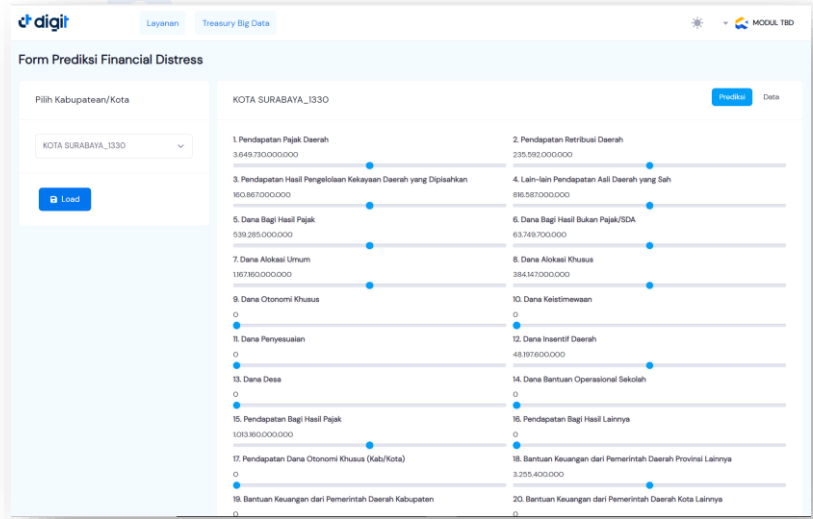
1. Data presentation is still static and does not answer decision-making needs.
2. Preparation of reports to support decision-making is still manual (using Microsoft Excel)
3. There are no projections yet prepared using a Machine Learning (ML) approach

Objective

Providing systems that allow flexibility in presenting actual and projected data, as well as producing forecasts using a Machine Learning approach, to facilitate decision-making.



Machine Learning



Financial Distress of SNG

Using machine learning as a risk mitigation effort in predicting debtor (local government) failure to pay. The user selects the name of the Province/District/City, and then adjusts the existing financial components so that the user can predict whether the debt can be paid or not



Early Warning System For State-Owned Enterprises

Platform to determine the payment capacity of state-owned enterprises as a step to prevent payment failures of state-owned enterprises (SOEs).