

PROJECT CASE STUDY

# Market Intelligence & Visualization Engine

Automated Data Pipeline & Distribution System

DATA / AUTOMATION | 2024

CONFIDENTIAL · INTERNAL USE

01

# Project Overview

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A fully automated market intelligence system that monitors, processes, visualises and distributes commodity pricing data to stakeholders.

# Project Overview

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YEAR	CATEGORY	STATUS
2024	Data / Automation	Production Deployed

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## Executive Summary

The Market Intelligence & Visualization Engine is a production-grade automation system designed to eliminate manual data gathering and reporting in commodity markets. The engine scrapes live material prices from multiple sources, processes and normalises the data, renders high-definition branded analytical charts, and distributes the right insights to the right stakeholders via Email and Telegram — entirely unattended.

Built with reliability and scale in mind, the system operates on a scheduled cadence with zero manual intervention post-deployment, enabling decision-makers to receive timely, visually consistent market intelligence directly in their inboxes and messaging apps.

## Technology Stack

Python

PIL

Selenium

Telegram Bot API

Email API

**100%**

AUTOMATED

**HD**

CHART RENDERING

**Multi**

DISTRIBUTION

# 02

## **The Problem**

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Financial data is dense, time-sensitive and difficult to digest quickly on the move.

# The Problem

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## CORE CHALLENGE

Financial and commodity data is inherently dense, frequently updated, and difficult for stakeholders to digest quickly — especially when accessing information on mobile devices or under time pressure. Manual compilation and distribution is slow, error-prone and does not scale.

## Key Pain Points

### 1 Data Fragmentation

Material and commodity prices are scattered across multiple sources, requiring manual aggregation from disparate websites, portals and data feeds.

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### 2 Time Lag

Manual data collection and chart creation introduces significant delays, meaning stakeholders often act on outdated information.

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### 3 Inconsistent Visual Output

Ad-hoc chart creation leads to inconsistent branding, formatting and quality — undermining professional credibility in client-facing communications.

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### 4 Distribution Overhead

Manually sending reports via Email and Telegram to segmented stakeholder groups is repetitive, tedious and susceptible to human error.

# 03

## **The Solution**

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A fully automated pipeline that extracts, processes, visualises and distributes market intelligence with zero manual effort.

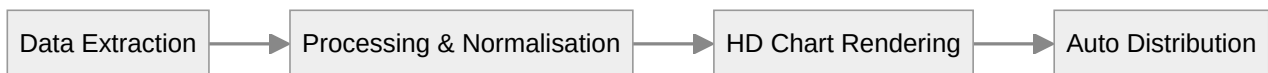
# The Solution

## APPROACH

Built a fully automated market intelligence pipeline that monitors commodity and material prices across multiple sources. The system uses Selenium for data extraction, processes and normalises the data, then renders high-definition analytical charts programmatically using PIL with custom branding. Distribution is handled automatically — the right charts go to the right stakeholders via Email and Telegram at scheduled intervals.

## System Architecture

The pipeline is architected as a linear, fault-tolerant workflow with four discrete stages. Each stage is modular, enabling independent maintenance, testing and scaling without disrupting the broader system.



## Pipeline Components

**Table 1** Pipeline Stage Breakdown

Stage	Technology	Function
<b>Data Extraction</b>	Selenium (Python)	Automated browser-based scraping of commodity and material price data from multiple authenticated and public sources on a scheduled basis.
<b>Processing</b>	Python (Pandas/NumPy)	Data cleaning, normalisation, outlier detection and transformation into standardised structures ready for visualisation.
<b>Rendering</b>	PIL (Pillow)	Programmatic generation of high-definition analytical charts with custom branding, colour palettes and layout specifications.

**Distribution**

Email API +  
Telegram Bot API

Targeted, segmented delivery of charts and summaries to stakeholder groups via Email and Telegram channels.

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## Key Features

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Enterprise-grade capabilities designed for reliability, scale and professional presentation.

# Key Features & Capabilities

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## 1 Multi-Source Data Extraction

Selenium-based scraping layer handles dynamic JavaScript-rendered pages, authenticated portals and paginated listings across multiple commodity data providers. Built-in retry logic and failure alerting ensure robustness against source downtime.

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## 2 Programmatic HD Chart Rendering

Charts are rendered programmatically using Python Imaging Library (PIL) at high resolution, ensuring pixel-perfect output suitable for presentations, reports and mobile viewing. Custom branding, typography and colour schemes are applied consistently across every chart.

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## 3 Stakeholder-Segmented Distribution

Distribution logic maps chart types and data categories to specific stakeholder groups. Different audiences receive only the intelligence relevant to their function — via Email for formal reporting and Telegram for real-time alerts.

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## 4 Fully Unattended Operation

Once deployed, the system requires zero manual intervention. Scheduling, execution, error handling and reporting are fully automated, freeing up analyst time for higher-value interpretive work rather than data wrangling.

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## 5 Fault Tolerance & Monitoring

The pipeline includes comprehensive exception handling, logging and alerting. Failed scrapes, rendering errors or distribution failures are captured and reported to maintain operational transparency.

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## Results & Impact

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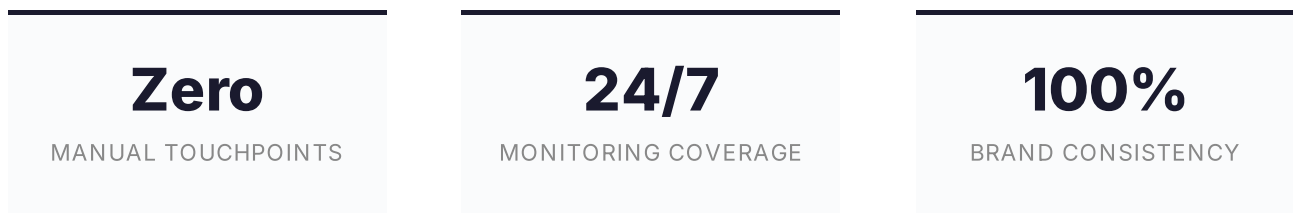
Measurable operational improvements in speed, consistency and resource efficiency.

# Results & Impact

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## Operational Outcomes

The deployment of the Market Intelligence & Visualization Engine delivered immediate and sustained improvements across three core dimensions: speed, consistency and operational efficiency.



## Key Achievements

**Table 2** Operational Impact Summary

Dimension	Before	After
Data Collection	Manual, hours per cycle	Fully automated, minutes
Chart Creation	Ad-hoc, inconsistent branding	Programmatic, brand-locked HD output
Distribution	Manual send, generic lists	Segmented, targeted auto-delivery
Error Rate	Human-dependent variability	Logged, alerted, recoverable
Scalability	Limited by human capacity	Modular, source-agnostic expansion

## Conclusion

The Market Intelligence & Visualization Engine demonstrates how targeted automation can transform a labour-intensive, error-prone reporting workflow into a reliable, scalable and professionally presented intelligence service. By combining web scraping, programmatic visualisation and multi-channel distribution into a single cohesive pipeline, the system delivers consistent value to stakeholders with zero ongoing manual effort.