APOGEE INOVATION CHALLENGE

PROBLEM STATEMENT:- Supply Operations Distribution

Predictive Analytics for HPCL's Supply Operations and Truck Logistics

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ABSTRACT

The abstract highlights the challenges faced by Hindustan Petroleum Corporation Limited (HPCL) in efficiently managing its fuel supply and distribution network across multiple locations. It emphasizes the critical need for precise forecasting of daily fuel demands and the importance of leveraging AI/ML technologies to optimize logistics and enhance customer satisfaction.

PROBLEM STATEMENT

HPCL faces challenges in accurately forecasting daily fuel demands across its network, exacerbated by fluctuating sales volumes, storage capacities, and weather conditions.

Inefficient truck management, compounded by fragmented systems and lack of real-time visibility, leads to suboptimal allocation and utilization of contracted trucks, resulting in delays and customer dissatisfaction.

Integrated solutions are needed to streamline logistical operations, enhance forecasting accuracy, and improve overall efficiency in fuel distribution.

PROPOSED SYSTEM

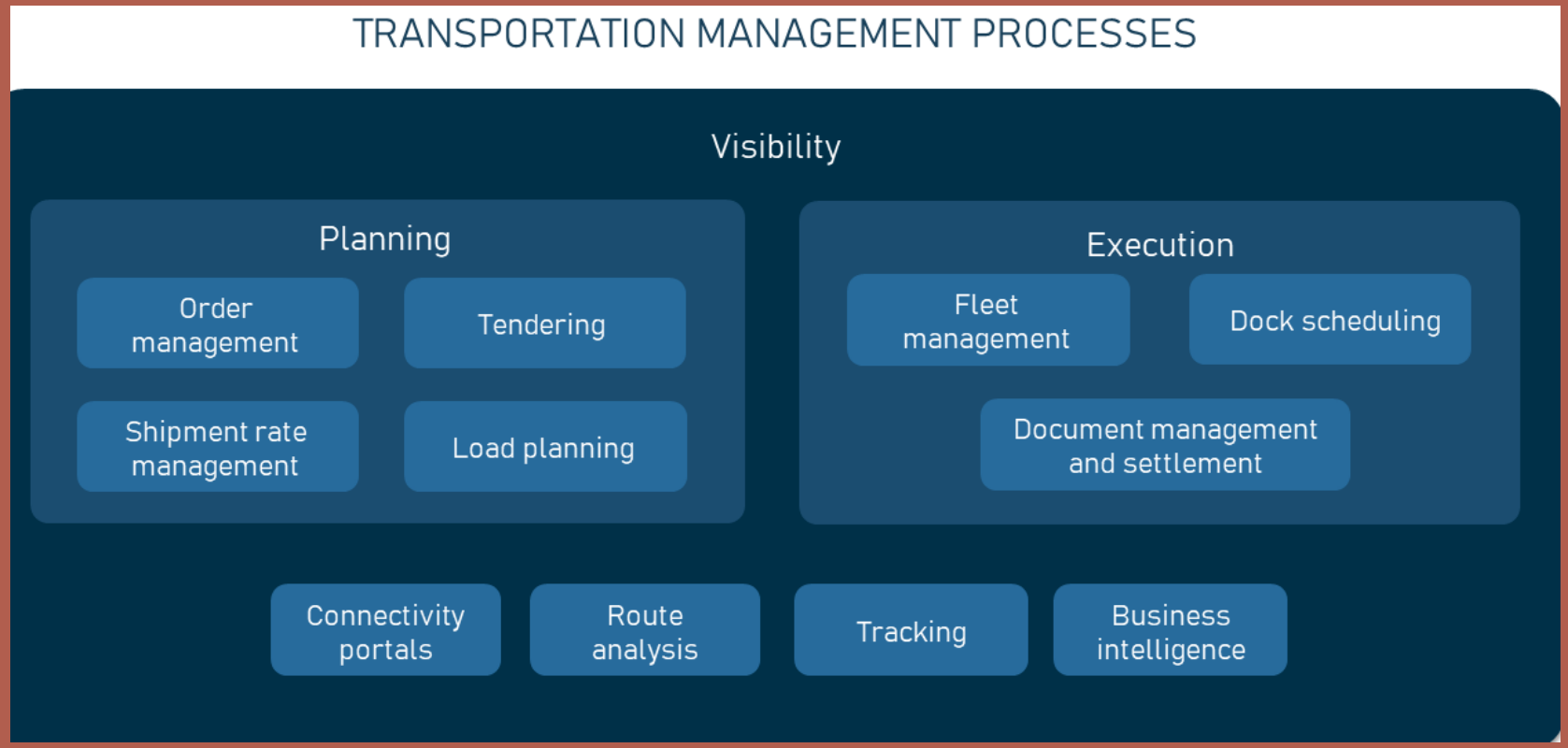
The proposed system aims to revolutionize HPCL's fuel distribution operations by leveraging advanced technologies and seamless integration of key components.

It entails precise forecasting of fuel demands through AI/ML models, considering historical data and dynamic factors like sales volumes and weather conditions.

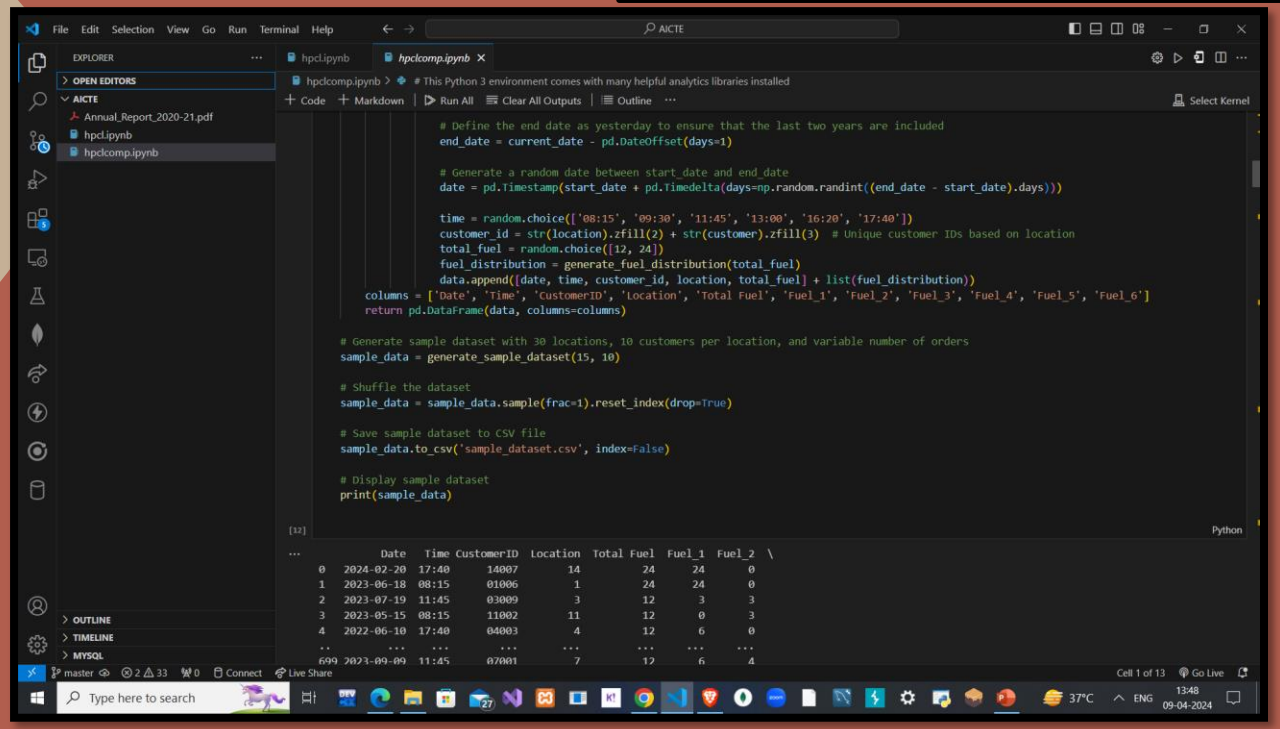
Integration of Indent Management, Terminal Automation, and Vehicle Tracking Systems enables real-time monitoring of fuel indents, truck loading status, and movements.

Additionally, the Optimized Logical Allocation module ensures equitable distribution of loads to contracted trucks based on historical trends, transit times, and feedback, maximizing truck utilization and optimizing fuel distribution efficiency.

SYSTEM ARCHITECTURE



OUTPUTS


File Edit Selection View Go Run Terminal Help
AICTE
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hpcl.ipynb
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This Python 3 environment comes with many helpful analytics libraries installed
Code Markdown Run All Clear All Outputs Outline
Select Kernel
# Define the end date as yesterday to ensure that the last two years are included
end_date = current_date - pd.DateOffset(days=1)
# Generate a random date between start_date and end_date
date = pd.Timestamp(start_date + pd.Timedelta(days=np.random.randint((end_date - start_date).days)))
time = random.choice(['08:15', '09:30', '11:45', '13:00', '16:20', '17:40'])
customer_id = str(location).zfill(2) + str(customer).zfill(3) # Unique customer IDs based on location
total_fuel = random.choice([12, 24])
fuel_distribution = generate_fuel_distribution(total_fuel)
data.append([date, time, customer_id, location, total_fuel] + list(fuel_distribution))
columns = ['Date', 'Time', 'CustomerID', 'Location', 'Total Fuel', 'Fuel_1', 'Fuel_2', 'Fuel_3', 'Fuel_4', 'Fuel_5', 'Fuel_6']
return pd.DataFrame(data, columns=columns)
# Generate sample dataset with 30 locations, 10 customers per location, and variable number of orders
sample_data = generate_sample_dataset(15, 10)
# Shuffle the dataset
sample_data = sample_data.sample(frac=1).reset_index(drop=True)
# Save sample dataset to CSV file
sample_data.to_csv('sample_dataset.csv', index=False)
# Display sample dataset
print(sample_data)
[12]
Python
Date Time CustomerID Location Total Fuel Fuel_1 Fuel_2
0 2024-02-20 17:40 14007 14 24 24 0
1 2023-06-18 08:15 01006 1 24 24 0
2 2023-07-19 11:45 03009 3 12 3 3
3 2023-05-15 08:15 11002 11 12 0 3
4 2022-06-10 17:40 04003 4 12 6 0
699 2023-09-09 11:45 07001 7 12 6 4
OUTLINE
TIMELINE
MYSQL
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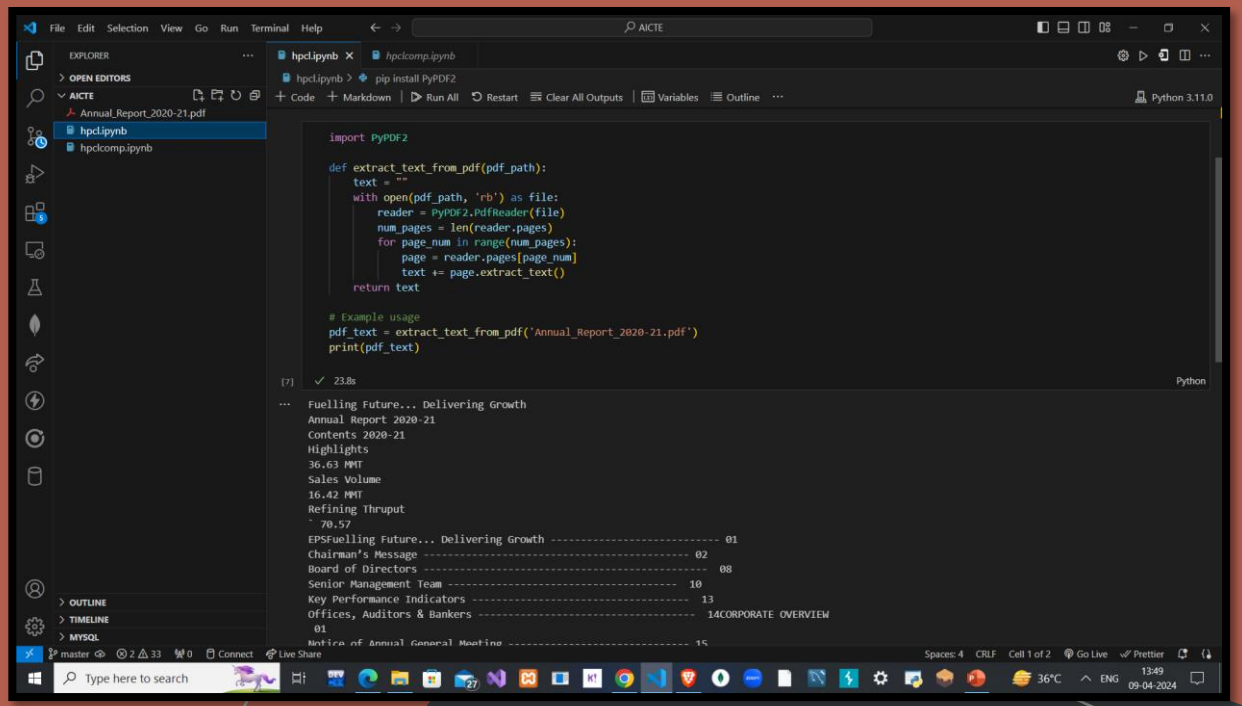
09-04-2024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hpclcomp.ipynb
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hpclcomp.ipynb
pip install PyPDF2
Code Markdown Run All Restart Clear All Outputs Variables Outline
Python 3.11.0
import PyPDF2
def extract_text_from_pdf(pdf_path):
text = ""
with open(pdf_path, 'rb') as file:
reader = PyPDF2.PdfReader(file)
num_pages = len(reader.pages)
for page_num in range(num_pages):
page = reader.pages[page_num]
text += page.extract_text()
return text
# Example usage
pdf_text = extract_text_from_pdf('Annual_Report_2020-21.pdf')
print(pdf_text)
[7]
23.8s
Python
Fuelling Future... Delivering Growth
Annual Report 2020-21
Contents 2020-21
Highlights
36.63 MMT
Sales Volume
16.42 MMT
Refining Thruput
` 70.57
EPSFuelling Future... Delivering Growth ---------- 01
Chairman's Message ---------- 02
Board of Directors ---------- 08
Senior Management Team ---------- 10
Key Performance Indicators ---------- 13
Offices, Auditors & Bankers ---------- 14CORPORATE OVERVIEW
01
Notice of Annual General Meeting ---------- 15
OUTLINE
TIMELINE
MYSQL
master
Connect
Live Share
Spaces: 4
CRLF
Cell 1 of 2
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CONCLUSION

Thus, to conclude the proposed system not only addresses HPCL's challenges in fuel supply and distribution management but also significantly enhances operational efficiency and cost optimization.

By leveraging AI/ML technologies and integrating key systems, it ensures timely fuel deliveries while reducing operational expenditures through optimized truck allocations and proactive resource management. Looking ahead, further enhancements in data sources, analytics techniques, and feedback mechanisms will enable HPCL to adapt to changing market dynamics, optimize fuel distribution operations, and solidify its position as a leading fuel supplier in the country.