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CUSTOMER 360 VIEW INSIGHTS USING PROCESS AUTOMATION AND CLOUD

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ABSTRACT

Today's fast-changing digital world calls for organisations to understand exactly what customers are looking for as it happens. The outcome of this project demonstrates that using process automation and cloud solutions can create a consistent view of customers, enabling organisations to take wiser decisions and increase client loyalty. GCP handles cloud analysis and storage, interactive visualisations are handled by Power BI, and data manipulation is taken care of by Python. This process allows for a flexible and efficient way to use business intelligence, by cleaning and analysing customer information in real time. At its core, the project helps build smarter and client-focused plans by providing a well made tool for better data, automation, and useful results. Keywords :Automating data pipelines, Using cloud analytics, BigQuery connection, Extract, Transform, Load (ETL), Analysing data instantly, Power BI charts, Strong data architecture, Storing data in the cloud, Automated business intelligence, Cleaning data with Python

KEYWORDS: *Data pipeline automation, Cloud-based analytics, BigQuery integration, ETL process, Real-time data processing, Power BI visualization, Scalable data architecture, Data warehousing, Cloud storage, Business intelligence automation, Python data cleaning*

1. INTRODUCTION

More and more, organisations use specic and useful insights about customers to guide their actions and increase customer satisfaction in data-driven businesses. Conventional CRM methods rely on standalone systems that sometimes miss key information about customers.The method in this article by integrating data, automating cleansing, and using the cloud, aims to present a full picture of what customers like and do. Through combining Python, Google Cloud Platform, BigQuery, and Power BI, businesses in this project gain a scalable option for better decisions, optimising strategies, and exploring customer behaviour.

2. LITERATURE REVIEW

Within the last decade, many companies recognised that gathering multiple customer details in one place would help them make better decisions. It is clear from available literature that people have taken several routes to achieve this 360-degree view through the use of cloud, BI, and automation technology. Some recent studies point out that using cloud services such as Google Cloud and BigQuery helps to manage large sets of customer data and that using process automation benefits data workows. Businesses are also noticing that using Power BI and similar business intelligence tools helps generate real-time dashboards that business users can use to understand data.Recent studies emphasize the importance of using cloud platforms such as Google Cloud and BigQuery to handle large volumes of customer data, as well as the value of integrating process automation for improving data workflows. The increasing use of business intelligence (BI) tools like Power BI has also been highlighted for their ability to generate real-time, interactive dashboards that can empower business users to derive insights from the data.

3.SYSTEM ARCHITECTIURE

This system is built to streamline activities, maintain scalability, and increase eciency using customer data from multiple places, after it is cleaned and stored in the cloud, for support of analytically driven management decisions. The architecture is made up of main parts. They work on tasks related to data ingestion, processing, storing, analysing, and reporting.

3.1 Data Sources

- Customer Data: Information is collected by the system from CRM platforms, databases of transactions, social media sites, interactions with the website, and customer service systems. The most common AI types of customer data include interactions, buying behaviour, purchase history, and demographics.
- External Data Integration: In addition, the system can process data from transactions, market trends, competitor behaviour, and third-party customer opinions to improve insights.

3.2 Data Ingestion Layer

- Data Collection: Data, or files, are brought into the system either by batch processing or in near-real-time using data streaming. Almost every time, this kind of data is unstructured or partly structured, and it may have repeating values, some values missing, and different ways of organising it.
- Batch Ingestion: Timed extraction of data from customer databases stored using CSV, JSON, or XML formats.

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- Real-time Ingestion: APIs or webhooks are used by web analytics, social media platforms, and IoT sensors to supply data.

3.3 Data Processing Layer

- Data Cleaning and Preprocessing: When data is taken in, Python scripts help to clean and preprocess the information.
- This includes: Filtering out duplicated reservation_id's or customer_id's. Replacing missing values with default values or by imputing them. Ensuring that all column names are formatted the same and are easy to understand. Parsing date and time formats.
- Data Transformation: Raw data is organised and made into useful forms.For example: Customer Profiling: Pulling out useful information like someone's age, gender, location, and their likes.
- Behavioral Insights: Capturing the amount spent, the frequency in which purchases are made, and interactions with the brand.
- Customer Segmentation: Alternatively, you can use clustering algorithms to place customers into different groups using their actions or background information.

3.4 Cloud Storage and Data Warehousing Layer

- Cloud Storage (Google Cloud Storage): Data is stored on the cloud (Google Cloud Storage) so it can be accessed easily and can scale as needed.
- Data Warehouse (BigQuery): Once the data is cleaned and changed, it is uploaded to Google BigQuery, a cloud service designed for handling large-scale data quickly.
- BigQuery stores: Customer Information Table: Features information on customers including their age, location, and how to get in touch with them.
- Transactional Data Table: Tracks what customers have bought, any interactions they have had, and other types of behaviour.
- Aggregated Metrics Table: Shows collected data, including total spending by customers, customer value after all payments, the number of touchpoints, among others.

3.5 Data Analytics Layer

- The business intelligence (BI) tool that is used is Power BI. Analysts can connect Power BI to BigQuery to draw data for conducting analytics and reporting using BigQuery tools. They are created to help visualize customer behavior, how they purchase, and the different types of customers.
- Customer 360 Dashboard: A display with all customer data, split into metrics, demographics, purchasing data, and customer behaviors. Custom Reports: You can generate reports that show trends, outliers, and predictions for your marketing efforts, keeping customers, and sales increase.
- Real-Time Insights: Real-time information on customer actions such as viewing products, making buys, and using the site can be seen on the system.

3.6 Reporting and Insights Layer Customer Segmentation Reports

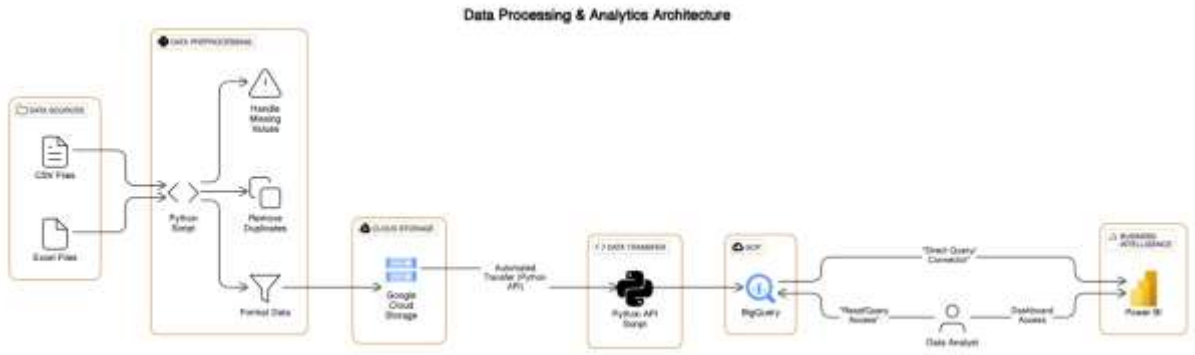
- They organize customers according to similar traits and provide information about the most valuable customers.
- Churn Prediction Models : Historical data can be used with logistic regression and decision trees to forecast customer churn. Personalized
- Marketing Campaign Insights: The approach makes it possible to personalize advertising for a chosen customer community (such as offers or loyalty plans).

3.7 Automation Layer Scheduled Data Processing

- Automating the process, Airflow or Google Cloud Functions help the system handle the main tasks of ETL. So, information is checked, prepared, and set up for regular reporting whether it is once daily, once weekly, or once monthly.
- Automated Reporting: Because of Power BI's link with BigQuery, data is automatically refreshed on reports and dashboards at the set intervals, making it ready for users at all times.

3.8 User Interface and Accessibility Layer Web Interface

- The easy-to-use web interface lets stakeholders open Power BI dashboards and reports, helping them interact with the information and make personal reports.
- Access Control: It uses RBAC so that only the right people can have access to sensitive information and analytics.



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4. METHODOLOGY

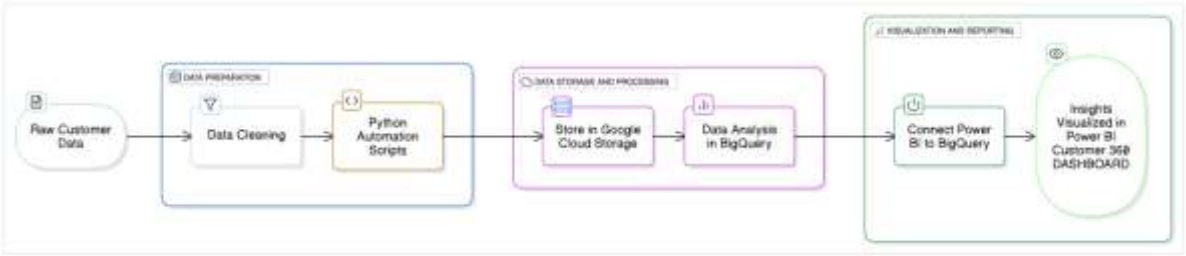
The method used here is as follows:

Data Cleaning: Raw customer data is rst cleaned with Python, where any missing or unnecessary information is taken out, and the way the numbers or words are laid out is made more uniform. The data is then split up into separate groups so you can go through it step by step and understand what you are seeing.

Data Transformation: After cleaning, the data is organized so it can easily be moved to a cloud storage system like BigQuery. The data is also provided with more information so the analysis can be improved.

Cloud Storage and Data Processing: The processed data is stored in Google Cloud Storage and then also added to BigQuery so people can store it and use it for analysis later. BigQuery is used when you have to work with a lot of data and when you want to run more complicated analyses on it.

Visualization and Reporting: Power BI connects straight to BigQuery, so you can build dashboards to quickly see things like how customers are shopping, which products they choose, and how they interact with your website.



5. RESULTS

The implementation of the Customer 360 View Insights project has made it easier for us to see how customers behave and how they deal with the company. The following main results happened:

Data Integration: Multiple data sources were put in one place so that there was no repeating information, and that made it easier to get a clear view of every customer.

Real-time Analytics: The use of BigQuery made it much easier for us to work with all the data, so we were able to set up dashboards that kept everyone up to date with current information.

Enhanced Decision-Making:With the ability to track and analyze customer behavior across multiple touchpoints, business users can make data-driven decisions that improve customer engagement and operational efficiencyy.

6. CONCLUSION

Process automation and cloud technology, as explored in the "Customer 360 View Insights Using Process Automation and Cloud" project, have the ability to make customer data much more comprehensive. Thanks to Google Cloud, BigQuery, and Power BI, companies can easily compile, work with, and examine their customer data to help with decision-making. With the platform, businesses are able to fine-tune their strategies focused on customers and engage them with real-time insights. Currently, the solution deals well with key issues in data aggregation and visualization, but it could still improve in several aspects. The introduction of Machine Learning (ML) tools could lead to better predictions of customer actions, more reliable customer grouping, and offering unique recommendations to cufirstomers based on trends in their data. Furthermore, using real-time information from social platforms, service calls, and IoT devices helps companies get the latest information about their customers' habits and tastes. Besides, using advanced techniques, such as encrypting data and authenticating users, will play a key role in caring for customer privacy. This becomes increasingly necessary since there is more focus on data privacy regulations such as the GDPR. It would also be benecial to improve the ways compliance is handled so that the system remains secure and information safe. All in all, the project illustrates how process automation and cloud tools can help turn raw customer data into something useful for the business. Real-time analysis and cloud storage help businesses to react quickly and wisely to new information. With the ability to grow over time, the solution enables companies to use more relevant customer data, making everything more convenient and enjoyable for the users of their services.

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