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Customer Email Engagement Analytics using Microsoft Fabric and Power BI

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***Abstract* – In the modern digital business environment, organizations increasingly depend on customer engagement analytics to improve marketing performance and business decision-making. This research paper focuses on integrating CRM and marketing datasets using Microsoft Fabric and Power BI to analyze customer email engagement behavior. The study integrates customer interaction datasets including Email Sent, Delivered, Opened, Clicked, and Bounced events into a centralized analytical platform using Microsoft Fabric Lakehouse architecture and PySpark notebooks. The research demonstrates the implementation of Bronze, Silver, and Gold layered architecture for organizing and transforming customer interaction datasets. Microsoft Fabric OneLake shortcuts, PySpark notebook transformations, and Power BI dashboards were used for centralized reporting, KPI analysis, and business intelligence visualization. Important marketing KPIs such as Delivery Rate, Open Rate, Click-Through Rate (CTR), and Bounce Rate were analyzed to evaluate campaign effectiveness and customer engagement patterns. The study findings indicate that centralized customer engagement analytics significantly improve reporting efficiency, campaign analysis, and marketing decision-making. The implementation also highlights the effectiveness of Microsoft Fabric in scalable data integration and cloud-based business analytics.**

***Keywords*- Customer Engagement Analytics, Microsoft Fabric, Power BI, PySpark, Lakehouse Architecture, CRM Analytics, Email Marketing Analytics, Business Intelligence**

I. INTRODUCTION

Digital marketing and customer engagement analytics have become critical components of modern business operations. Organizations increasingly use email marketing, CRM systems, and business intelligence tools to communicate with customers and evaluate marketing performance. Customer interaction datasets such as email opens, clicks, deliveries, and bounce activities provide valuable insights into customer behavior and campaign effectiveness.

However, organizations often face challenges in integrating fragmented datasets across multiple systems. Customer records, contact information, and interaction datasets are frequently stored separately, leading to inconsistent reporting and limited analytical visibility. Cloud-based analytics platforms such as Microsoft Fabric have emerged as scalable solutions for centralized data integration, transformation, and reporting. This research paper focuses on Customer Email Engagement Analytics using Microsoft Fabric and Power BI. The study demonstrates the integration of CRM and customer engagement datasets using OneLake shortcuts, PySpark notebooks, Lakehouse architecture, and Power BI dashboards. The project emphasizes centralized analytics, KPI measurement, and business intelligence reporting for evaluating marketing effectiveness.

II. OBJECTIVES OF THE STUDY

- To analyze customer email engagement behavior using customer interaction datasets.
- To build a centralized analytical model using Microsoft Fabric.
- To evaluate campaign performance using marketing KPIs.
- To integrate CRM and customer interaction datasets using Lakehouse architecture.
- To visualize customer engagement insights using Power BI dashboards.

III. REVIEW OF LITERATURE

Previous studies have highlighted the growing importance of customer engagement analytics and business intelligence systems in modern organizations. Kotler and Keller emphasized that CRM systems improve customer relationship management through integrated customer data analysis. Chaffey and Ellis-Chadwick discussed the importance of email marketing metrics such as delivery rate, open rate, and click-through rate for evaluating campaign effectiveness.

Research related to Business Intelligence and cloud analytics platforms indicates that centralized analytical systems improve reporting efficiency and business decision-making. Studies on big data and cloud-based analytics platforms highlight the advantages of scalable storage, integrated data transformation, and centralized KPI reporting. Microsoft Fabric has recently emerged as a unified analytics platform supporting data engineering, data integration, real-time analytics, and business intelligence within a single environment. The literature establishes strong relevance for implementing customer

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engagement analytics using Microsoft Fabric and Power BI.

IV. RESEARCH METHODOLOGY

The study follows a descriptive and analytical research design. Secondary data was collected from Customer Insights and Dynamics 365 (D365) platforms. The datasets included customer account records, contact data, and email interaction datasets such as Email Sent, Delivered, Opened, Clicked, and Bounced. Microsoft Fabric Lakehouse architecture was used for centralized data integration. OneLake shortcuts enabled access to datasets across multiple workspaces. PySpark notebooks were used for data cleaning, transformations, joins, aggregations, and KPI calculations.

The project followed Bronze, Silver, and Gold layered architecture:

Layer	Description	Purpose in the Project
Bronze Layer	Raw customer interaction datasets collected from source systems such as Customer Insights and Dynamics 365 (D365).	Used for storing original unprocessed data including Email Sent, Delivered, Opened, Clicked, and Bounced records.
Silver Layer	Cleaned, transformed, and integrated customer engagement datasets created using PySpark notebook transformations.	Used for data cleaning, merging account and contact tables, standardization, and centralized analytical modeling.
Gold Layer	KPI-based aggregated analytical datasets prepared for business intelligence reporting and dashboard analysis.	Used for Power BI dashboards, KPI calculations, campaign performance analysis, and customer engagement reporting.

Power BI dashboards were developed for KPI reporting and visualization of customer engagement metrics.

V. DATA ANALYSIS AND INTERPRETATION

The implementation involved integrating multiple customer interaction datasets into Microsoft Fabric Lakehouse architecture. PySpark notebooks were used for reading CRM tables, merging datasets, transforming interaction records, and creating centralized analytical tables. The study analyzed important KPIs including:

KPI	Formula	Business Meaning
Delivery Rate	Delivered / Sent	Email deliverability success
Open Rate	Opened / Delivered	Customer engagement interest
CTR	Clicked / Delivered	Interaction effectiveness
Bounce Rate	Bounced / Sent	Data quality & delivery issues

The Power BI dashboard provided centralized visualization of customer engagement metrics, industry-wise engagement analysis, account-level interaction analysis, and job title-wise engagement patterns. The dashboard analysis showed:

KPI Metric	Percentage (%)	Interpretation
Delivery Rate	**95.83%**	Indicates successful email delivery performance and effective customer communication reach.
Open Rate	**37.41%**	Reflects customer interest and engagement with marketing email campaigns.
Click-Through Rate (CTR)	**34.73%**	Shows active customer interaction with email content and campaign effectiveness.
Bounce Rate	**11.94%**	Indicates possible CRM data quality issues such as invalid

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		or outdated customer email records.

VI. FINDINGS

- Microsoft Fabric successfully integrated customer engagement datasets into a centralized analytical environment.
- PySpark notebooks effectively supported data cleaning, merging, and transformation processes.
- Customer engagement KPIs provided meaningful insights into campaign performance.
- Power BI dashboards improved visualization and KPI monitoring.
- Industry-wise engagement analysis supported better customer segmentation and campaign evaluation.
- Centralized analytics improved reporting efficiency and marketing decision-making.

VII. CONCLUSION

The study successfully demonstrated the practical implementation of customer engagement analytics using Microsoft Fabric and Power BI. The project integrated CRM and marketing datasets into a centralized analytical model using Lakehouse architecture, PySpark notebooks, and Power BI dashboards.
The implementation improved customer engagement analysis, KPI reporting, and business intelligence visualization. The research highlights the growing importance of cloud-based analytics platforms and centralized customer engagement analytics in modern business environments.

The study concludes that Microsoft Fabric provides scalable support for data integration, analytical transformation, and business intelligence reporting. The project also demonstrates how organizations can improve marketing effectiveness through integrated customer engagement analytics and data-driven decision-making.

VIII. FUTURE SCOPE

Future research can include predictive analytics, machine learning-based campaign optimization, real-time customer engagement monitoring, and AI-driven recommendation systems. The analytical model can also be extended to social media analytics, web analytics, and customer journey analysis for comprehensive omnichannel engagement reporting.

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