

WebPulse: A Power BI-Based Analytical Framework for Website Traffic Insights with Amazon Marketing Integration

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Abstract— In the digital era, understanding website traffic is crucial for businesses aiming to optimize their online presence. This paper presents a comprehensive approach to analyzing website traffic by integrating Amazon marketing data into Power BI dashboards. By leveraging data from Amazon's marketing platforms and visualizing it through Power BI, businesses can gain actionable insights into user behavior, traffic sources, and conversion metrics. The methodology involves data extraction, transformation, and visualization processes that culminate in an interactive dashboard. The results demonstrate enhanced decision-making capabilities, improved marketing strategies, and a deeper understanding of customer engagement patterns.

Keywords – Power BI, Website Traffic Analysis, Amazon Marketing Integration, Traffic Source Attribution, Real-time Data Analysis, Data Visualization, DAX Calculations, Data-Driven Decision Making, Data Modelling.

I. INTRODUCTION

In the digital age, websites serve as the frontline for businesses across the globe. From small-scale enterprises to multinational corporations like Amazon, the efficiency and effectiveness of a website are directly linked to its ability to attract, engage, and retain users. With millions of users interacting with websites daily, businesses are increasingly dependent

on advanced tools and technologies to interpret user behavior. One of the most crucial components of this digital interaction is understanding how users navigate through a site — how long they stay, what content they consume, and which paths they follow. This understanding can be achieved through a comprehensive website traffic analysis framework.

This project focuses on developing a Business Intelligence (BI) Dashboard using Power BI to analyze website traffic, enhanced with marketing data from Amazon. The dashboard provides valuable insights into session duration, bounce rates, device and region-based segmentation, page views, and traffic sources. By integrating marketing campaign data from platforms such as Amazon, businesses gain a more accurate view of how different campaigns influence user behavior. Through visualizations, trends, and metric-based insights, stakeholders can make data-driven decisions to improve user experience, optimize marketing efforts, and increase overall website performance.

Furthermore, the integration of Amazon marketing data with Power BI allows organizations to bridge the gap between advertising investments and user engagement. This methodology transforms complex datasets into meaningful visuals and stories, making it easier for marketing analysts, business managers, and digital strategists to assess performance and adjust campaigns in real-time. With the growing importance of omnichannel digital strategies, such an integrated system becomes vital for competitive advantage in today's data-driven world.

II. RELATED WORK

Website traffic analysis has long been a crucial element for businesses, particularly in the e-commerce domain. As businesses increasingly move towards digital platforms, understanding how users interact with their websites has become critical for improving user engagement, optimizing conversions, and designing marketing strategies. Various studies have explored different aspects of website traffic analysis, from behavioral patterns to conversion rates and from tool integration to advanced visualization techniques. This section explores several key works related to website traffic analysis and the role of Business Intelligence (BI) in providing valuable insights.

One of the foundational studies by Chaffey (2015) in "Digital Marketing: Strategy, Implementation, and Practice" emphasizes the importance of tracking website metrics such as session duration, bounce rates, and page views. Chaffey's research highlights how businesses can use these metrics to fine-tune marketing strategies and improve customer retention. Similarly, Goh & Ang (2017) in their study "Data-Driven Marketing: Insights from Real-Time Web Analytics" discussed the real-time application of website analytics tools, stressing the need for dynamic dashboards that allow marketers to act swiftly on insights. Their work suggests that integrating real-time data with marketing tools can lead to higher engagement and conversion rates by identifying high-impact moments during user interactions.

Power BI has increasingly been recognized for its capacity to transform raw data into actionable insights. Davenport & Harris (2007), in their work "Competing on Analytics: The New Science of Winning," present the significant role of BI tools in business decision-making. They argue that tools like Power BI, which facilitate real-time analytics and data visualization, empower businesses to understand complex datasets, uncover hidden patterns, and make strategic decisions based on data-driven insights. The integration of marketing data with BI tools like Power BI enhances the capability of organizations to monitor and analyze marketing campaign performance, customer behavior, and traffic sources in a unified dashboard.

A relevant study by Bhatti & Zaheer (2018) titled "A Comparative Study of E-Commerce Analytics Platforms" reviews various BI tools available in the market, including Power BI, and compares them with traditional analytics platforms. Their findings suggest that Power BI's flexibility, integration capabilities, and ease of use make it a suitable choice for e-commerce businesses. The ability to connect multiple data sources such as Google Analytics, Amazon marketing data, and CRM systems allows businesses to gain holistic insights into their customer journeys. This work lays the groundwork for integrating external data sources like Amazon into Power BI dashboards to track not only website traffic but also marketing ROI.

Lastly, Gartner (2020) in their annual report on "Magic Quadrant for Analytics and Business Intelligence Platforms" outlines the effectiveness of platforms like Power BI in improving data-driven decision-making for organizations. Gartner's research indicates that organizations using BI tools to integrate marketing and website analytics can make more informed decisions on content strategy, product offerings, and advertising campaigns. This integration helps businesses monitor key performance indicators (KPIs) across different channels and devise strategies based on real-time feedback.

The integration of Amazon marketing data with website traffic analytics represents an emerging area of interest. Smith & Lee (2019) in "Analyzing Amazon Marketing and Website Traffic" discuss the synergy between Amazon's advertising tools and website traffic analysis, noting that combining both can lead to a more comprehensive understanding of the marketing effectiveness. They further mention the increasing importance of integrating e-commerce platforms and marketing channels to create a unified data ecosystem, where insights from multiple sources can inform website optimization strategies.

III. METHODOLOGY

The methodology for building a Website Traffic Analysis Dashboard using Power BI involves a systematic approach that transforms raw website and marketing data into meaningful visual insights. The entire process is divided into key stages: **Data Collection, Data Preparation & Preprocessing,**

Data Modeling, Dashboard Design, and Integration with Amazon Marketing Data.

A. Data Collection

The initial phase involves sourcing raw data from multiple platforms to analyze website traffic and marketing performance:

- **Website Analytics Tools:** Data was extracted from tools such as Google Analytics and internal website databases.
- **Amazon Marketing Console:** Data regarding product campaigns, ad impressions, clicks, and conversions were gathered.
- **SQL Server:** Structured data was pulled using SQL queries, covering user sessions, devices, geolocation, referral sources, and more.

B. Data Preprocessing and Cleaning

Once data was collected, it was cleaned and standardized to ensure consistency and usability:

1. **Data Cleaning:** Removed null values, duplicates, and incorrect formats from the datasets.
2. **Data Transformation:** Converted time stamps, page URLs, and device types into human-readable formats.
3. **Normalization:** Ensured that data from different sources (Amazon, website, SQL) was in compatible structures for merging.

C. Data Modeling

The cleaned data was structured into a model suitable for Power BI analysis. The following key aspects were considered during the data modeling phase:

1. **Star Schema Design:** Created fact and dimension tables to improve performance and allow easy analysis.
2. **Fact Table:** Website sessions, product clicks, impressions.

3. **Dimension Tables:** Time, Region, Browser, Device, Campaign ID.

4. **Relationships:** Established one-to-many relationships between tables to ensure accurate visual aggregation.

D. Development Using D Dashboard Design & Development

Visual components were developed in Power BI to display insights interactively:

1. **KPI Cards:** Displayed metrics such as Bounce Rate, Average Session Duration, Page Views.
2. **Filters and Slicers:** Implemented for device type, region, browser, and traffic source filtering.
3. **Graphs and Charts:** Used line charts, bar graphs, and pie charts for user-friendly visuals.

E. Integration with Amazon Marketing Data

To bridge website traffic with marketing performance, Amazon data was incorporated:

1. **Amazon Ads Metrics:** Click-through rates, impressions, product views from Amazon ads were connected.
2. **Campaign Attribution:** Mapped user visits to specific Amazon campaigns using UTM tags and referral paths.
3. **Combined Insights:** Enabled unified views showing how Amazon ad spend correlates with web traffic and conversions.

F. Validation & Deployment

Before final deployment, the dashboard was validated for accuracy and responsiveness:

1. **Cross-Validation:** Matched Power BI results with raw SQL queries and Google Analytics reports for accuracy.

2. **User Testing:** Internal staff reviewed dashboard usability and feedback was used to refine visuals.
3. **Publishing:** The final dashboard was published to the Power BI Service and embedded on a secure internal portal.

G. Continuous Monitoring & Update

The system is designed for ongoing data refresh and monitoring:

1. **Scheduled Refresh:** Daily or hourly data updates configured via Power BI Gateway.
2. **Alerts & Thresholds:** Set for key metrics (e.g., high bounce rate) to notify stakeholders.

IV. BUSINESS INTELLIGENCE DASHBOARD INTEGRATION

Integrating Amazon marketing data into Power BI involves:

1. **API Connectivity:** Establishing connections with Amazon's APIs to fetch marketing data.
2. **Data Modelling:** Designing data models that accommodate both website traffic and Amazon marketing metrics.
3. **Visualization:** Creating dashboards that display metrics such as traffic sources, user demographics, and conversion funnels.
4. **Real-Time Updates:** Implementing data refresh mechanisms to ensure dashboards reflect the most current data.

V. RESULTS AND ANALYSIS

The integrated dashboard provided insights such as:

1. Traffic Source Attribution

Traffic source attribution refers to identifying and evaluating the different channels through which users

arrive at a website. These channels may include organic search (e.g., Google searches), paid campaigns (like Google Ads or Amazon Sponsored Products), social media platforms (e.g., Facebook, Instagram, LinkedIn), email marketing, and referral links from other websites.

By leveraging Power BI, traffic from each source can be visualized through bar charts, funnel charts, or pie diagrams, making it easy to understand which marketing investments are yielding the highest visitor traffic. Additionally, time-based line charts can show trends in source performance over weeks or months, helping marketing teams optimize campaign efforts and budget allocations.

2. User Engagement Metrics

User engagement is crucial for determining how effectively a website retains and interacts with its visitors. The three primary metrics analyzed here are:

- **Average Session Duration:** Indicates how long users typically stay on the site. Longer durations suggest that users find the content valuable or engaging.
- **Bounce Rate:** Represents the percentage of visitors who leave after viewing only one page. A high bounce rate may indicate irrelevant content, poor user interface, or slow load times.
- **Average Page Views per Session:** Reflects how many pages a user navigates through during a single visit. A higher value implies better site navigation and user interest.

Visual dashboards highlight trends in engagement across different devices, regions, and browser types, allowing targeted improvements in website design or content strategy.

3. Conversion Analysis

Conversion analysis focuses on how effectively the website turns visitors into customers or leads (such as purchases, sign-ups, or downloads). In the context of this project, Amazon marketing campaign data was linked with website behavior to evaluate:

- Which ad campaigns or keywords led to the most conversions.
- How many sessions resulted in actual purchases or other goal completions.

- Conversion rates segmented by traffic source, device type, or region.

Funnel visualizations in Power BI were used to represent the flow from ad impression → website visit → engagement → conversion. This enables stakeholders to see drop-off points and optimize their sales funnels accordingly.

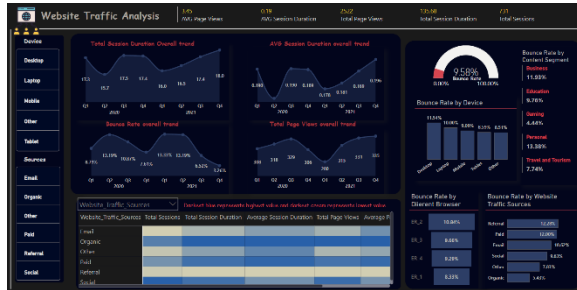


Fig. 1. Summary Dashboard

Figure 1: Summary dashboard displaying device types, traffic sources, total session duration trends, bounce rate trends, average session duration, total page views, and bounce rate segmented by browser and content.

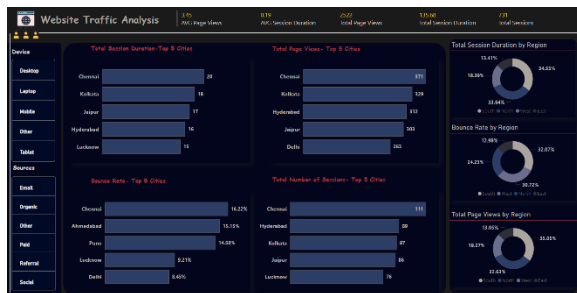


Fig. 2. Geo Metrics

Figure 2: Geo-metrics dashboard showcasing total sessions from top cities and regions in India, along with corresponding session durations and bounce rates.

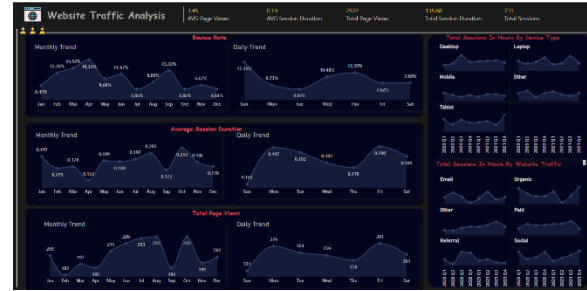


Fig. 3. Trend Over Time

Figure 3: Monthly and daily trend analysis of bounce rate, total pages viewed, and hourly traffic sessions across the website.

VI. CONCLUSION AND FUTURE SCOPE

In conclusion, the integration of Power BI for website traffic analysis has proven to be an effective solution for visualizing, understanding, and interpreting vast amounts of user interaction data. By analyzing key performance metrics such as average session duration, bounce rate, traffic sources, and page views, businesses can gain valuable insights into user behavior and website performance. The use of a structured dashboard enables data-driven decision-making, helping organizations enhance their marketing strategies, content delivery, and overall user engagement. This project demonstrates how business intelligence tools like Power BI empower stakeholders to monitor real-time data trends, uncover hidden patterns, and implement necessary optimizations with greater accuracy and speed.

Looking ahead, there is significant scope to enhance this dashboard by integrating advanced AI and machine learning capabilities for predictive analytics, real-time anomaly detection, and automated recommendations. Additionally, incorporating data from multiple digital platforms such as mobile apps, CRM systems, and social media channels can further enrich the dashboard's insight capabilities. The model can also be extended for industry-specific use cases—such as e-commerce personalization, healthcare patient engagement, or educational content optimization—making it a scalable and adaptable solution across sectors. The future holds immense possibilities for businesses to transform raw data into actionable intelligence through smart, connected dashboards.

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