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6MARK017W: Digital Marketing, Social Media & Web Analytics

Coursework 02

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BSc (Hons) in Computer Science

Word Count: 2746

26.04.2024

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PART A

Task 01 – Concept of “Events” in GA4

What are GA4 Events?

Google Analytics 4 (GA4) is an essential tool for businesses to monitor website traffic and user interactions. GA4 events are categorized into four types: automatically collected, enhanced, recommended, and custom events, offering insights into user behavior (Duncan, 2023). Each time a user engages with the website—whether it's viewing a page, clicking a button or link, scrolling through the content, or form submission—its logged as an event, providing valuable data for optimizing content (Holmes, 2023).

GA4 Events Examples,

Event	Explanation
Page View Events	Tracks the number of views a page receives (Todorovic, 2022).
Click Events	Tracks user interactions with clickable elements like buttons, links, or images (Miller, 2023).
Scroll Events	Tracks user scrolling behavior to understand engagement with content (Todorovic, 2022).
Form Submission Events	Tracks when users submit forms which assist measuring lead generation (Miller, 2023).

Table 1: GA4 Events

Event Functions & Roles

Events form the cornerstone of GA4 (Duncan, 2023). There are multiple roles and functions of events and a few are explained below,

Function & Role	Explanation
Optimizing User Experience	Events offer insights into user interactions, empowering businesses to enhance the user experience (Holmes, 2023).
Tracking User Interactions	Events track user interactions, allowing businesses to gather valuable data on user engagement with digital properties (Duncan, 2023).
Measuring User Engagement	Events quantify user engagement by measuring interactions that demonstrate active participation and interest (Duncan, 2023).

Table 2: Event Functions & Roles

Event Properties & User Interactions

In GA4, event properties provide context and additional information about the event being tracked (Mangold, 2021).

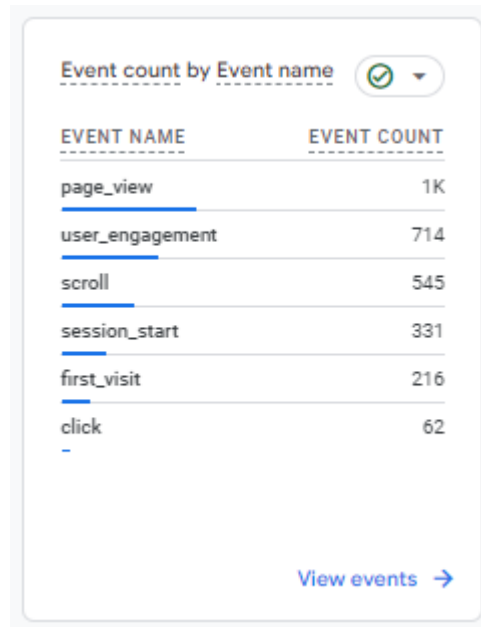


Figure 1: Microsite Events

Following are a list of event properties which were identified based on the microsite.

Event	Event Property	How its Tied to User Interactions
page_view	page_path	The specific URL of the viewed page (e.g., /about, /restaurants, /gallery).
	timestamp	The time the page view occurred
user_engagement	time_spent	The total duration the user spent on the page
	Element_interaction	Specific elements user interacted with
scroll	vertical_scroll_depth	The percentage of the page scrolled vertically
	scroll_speed	The average speed of scrolling
session_start	timestamp	The time the user's session began
	session_id	A unique identifier for the user's session
first_visit	user_id	A unique identifier for the user
click	element_id	The unique identifier of the clicked element
	element_type	The type of element clicked
	timestamp	The time the click occurred

Table 3: Event Properties

In order to understand how users find a microsite, the author tracked trends in new user acquisition by examining session_start events marked with "first_visit". The "source" property within this data point reveals how users discover the site, whether through search engines, social media, or other channels. This information provides valuable insights into the effectiveness of marketing efforts and helps refine user acquisition strategies.

Furthermore, by combining data from page_view events with user engagement metrics like average time spent per page (time_spent), the author was able to identify the most engaging sections of the microsite. High average time spent on a page suggests user interest, while conversely, low time spent indicates areas where content improvement might be necessary. This data-driven approach allowed for continuous optimization of the microsite's content and user experience.

GA4 Events in Dharshan's Microsite

The author enabled multiple GA4 events to track user interactions across the developed site.

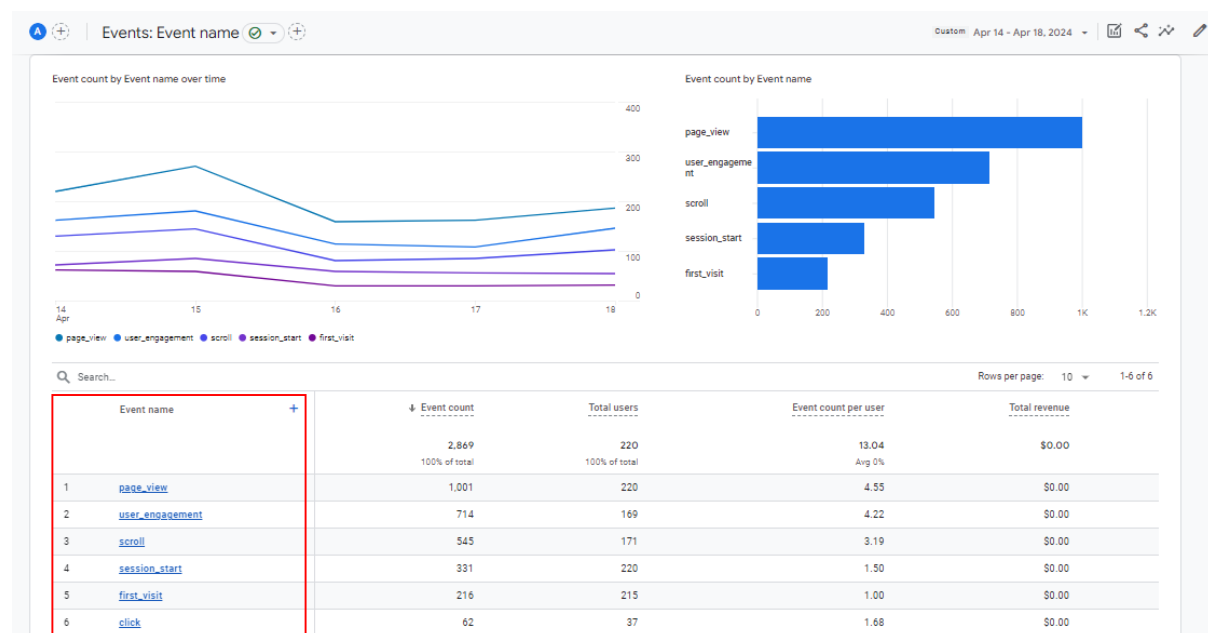


Figure 2: GA4 Events in Dharshan's Microsite

- **Page View Events** – Views were recorded from the pages available in the site. Namely, “Home”, “About”, “Restaurants”, “Gallery” and “Gastronomic Portal”.
- **Click Events** – Clickable elements such as buttons and links were in cooperated. A few are, “Read More”, “Interviews with Dharshan”, “Join Dharshan Munidasa’s Culinary Newsletter”.

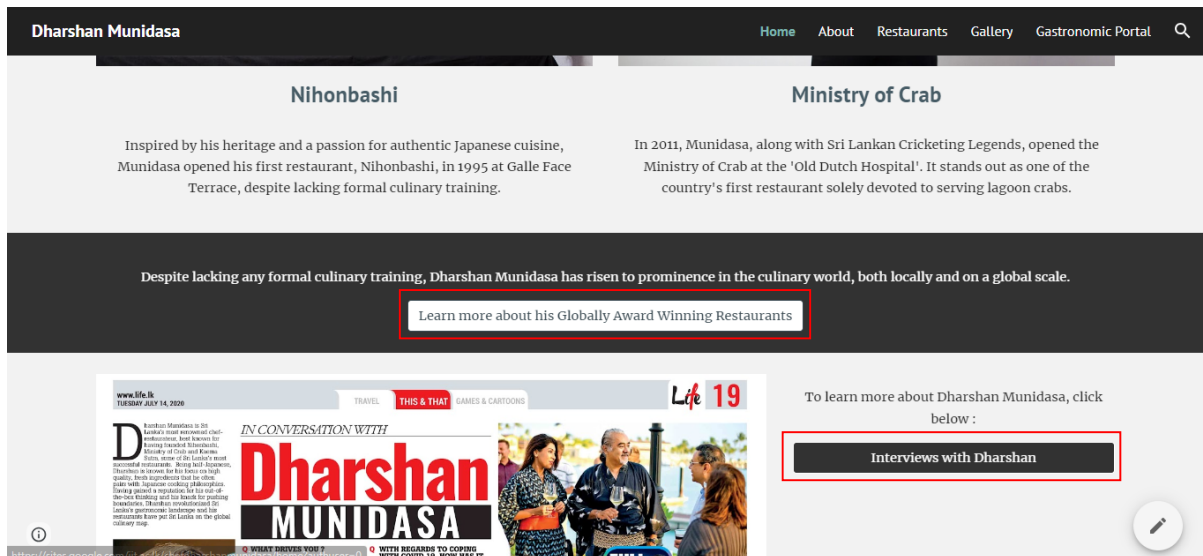


Figure 3: Click Events

- **Scroll Events** – User engagement with the site was identified based on the user's scroll depth.
- **Form Submission Events** – Lead generation and conversion rates were identified based on the responses received.

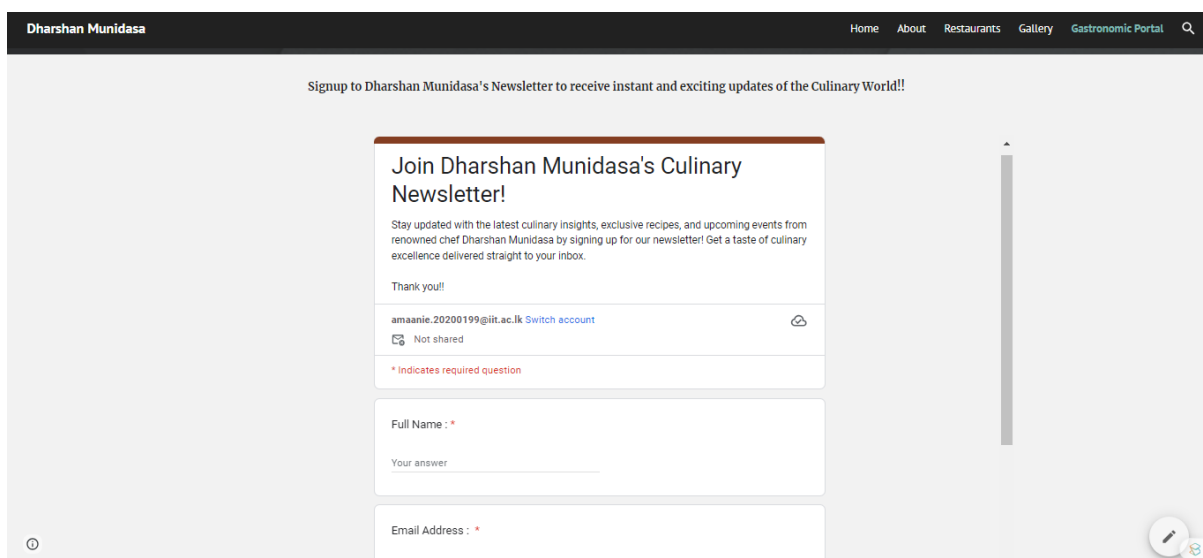


Figure 4: From Submission Event

Task 02 – Steps to Create a GA4 Account

Step 01 - Sign in to Google Analytics:

Go to <https://analytics.google.com/> and sign in with your Google account. Click "Start Measuring" if it's your first visit.

Step 02 - Create & Set up Account:

Name your account and create a property. Provide details like country, currency, and business type.

Step 03 - Select the Reporting Platform:

Choose between website or mobile app tracking.

However, for the microsite created by the author, “website” was selected as it was appropriate.

Step 04 - Enter the Website or App URL:

Enter the website's URL, including the protocol.

The website's URL was provided (<https://sites.google.com/iit.ac.lk/chefdharshanmunidasa>).

Step 05 - Create Stream:

Click "Create Stream" to generate the GA4 property.

Step 06 - Copy the Measurement ID:

Copy the unique Measurement ID displayed.

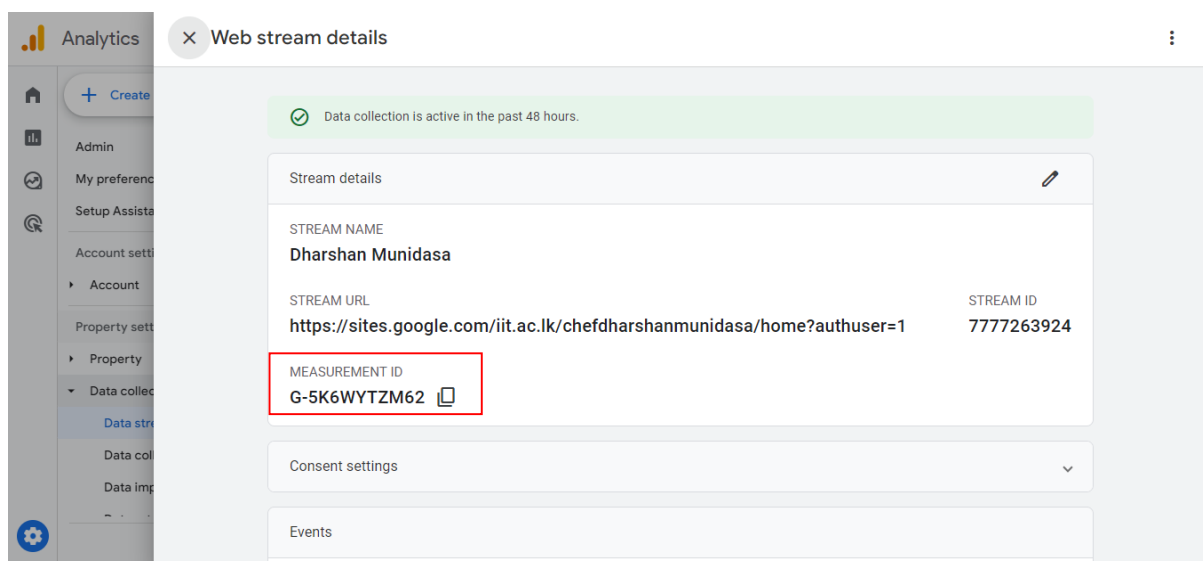


Figure 5: Measurement ID from GA4

Step 07 - Install the Tracking Code:

Paste the Measurement ID into the website's tracking code to start data collection.

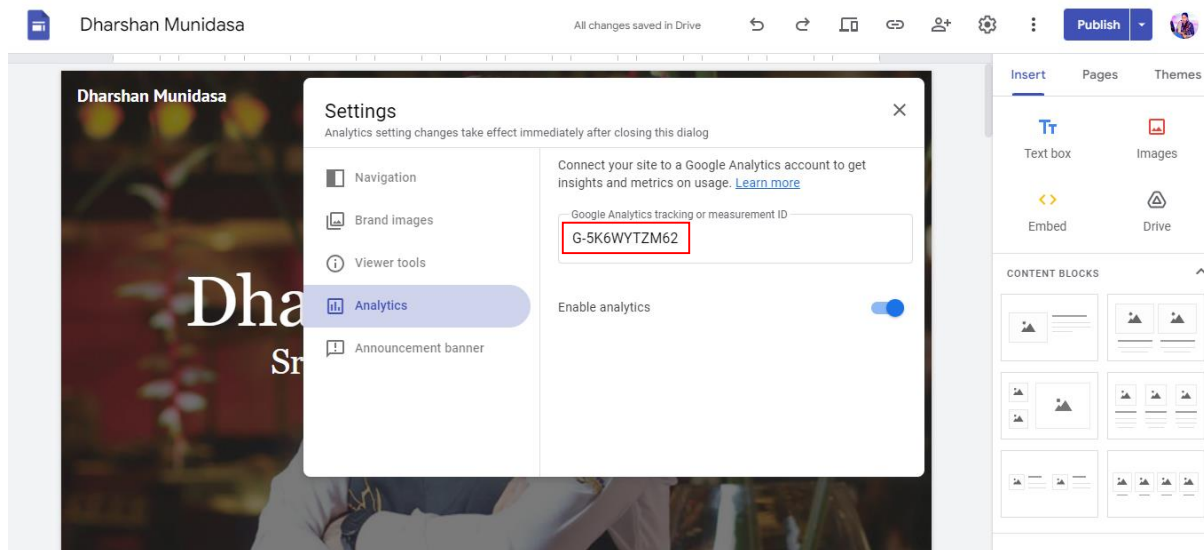


Figure 6: Measurement ID added

Task 03 – HTTP Cookies

What are “HTTP Cookies”?

HTTP cookies are small data files stored in a user's devices by a web browser while browsing a website. These are also identified with terms “web cookies” or “browser cookies” (Mridul, 2023). These cookies are sent back and forth between the user's browser and the web server with each HTTP request and response, allowing websites to remember user-specific information and to track their interaction over time (Nguyen, 2024).

Problems Overcome by HTTP Cookies

Cookies serve several purposes and contains multiple benefits. They have overcome multiple challenges in web browsing and website functionality. A few of the challenges overcome by cookies along with an explanation follows,

- **Session Management** - Cookies maintain user sessions, enabling seamless navigation across pages and visits without requiring repeated authentication (Zanini, 2024).
- **Personalization** - By storing user preferences and settings, cookies enhance the browsing experience by delivering personalized content and services (Zanini, 2024).
- **Tracking & Analytics** - Cookies facilitate the tracking of user behavior and provide valuable data for analytics purposes, allowing businesses to understand visitor demographics, engagement metrics, and conversion rates (Ahn, 2021).
- **Target Advertising** - Cookies are used to track user interests and browsing history, allowing advertisers to deliver targeted ads based on users' preferences and behaviors (Ahn, 2021).

Cookies in relation to the Stateless Web

The “stateless web” refers to the HTTP protocol as it does not retain any information of previous interactions between the web server and browser (Kumar, 2024). Each request from the client to the server is independent and since the server does not maintain information of past requests, this poses several challenges for dynamic and interactive web application (Copes, 2018). However, technologies such as cookies and session management have surmounted this challenge, enabling tailored user experiences.

Limitation of Cookies

- **Privacy Concerns** - Cookies can be used to track user behavior across websites. This tracking may lead to privacy concerns as users may not be aware of the extent to which data is being collected and used for target advertising or other purposes (Riserbato, 2023).
- **Limited Storage** – Cookies are limited to 4KB is storage size. This can pose challenges for websites that reply heavily on cookies for session managements (Zanini, 2024).
- **Browser Compatibility** - Browser variations in handling and implementing cookies can result in compatibility issues and inconsistencies across different browsers (Copes, 2018).
- **Limited Persistence** - Cookies have expiration dates, leading to automatic deletion by browsers, which can present challenges for long-term tracking or storing user preferences beyond their lifespan (Kumar, 2024).

Key Stages of the HTTP Process & Data Flows Between Client & Server

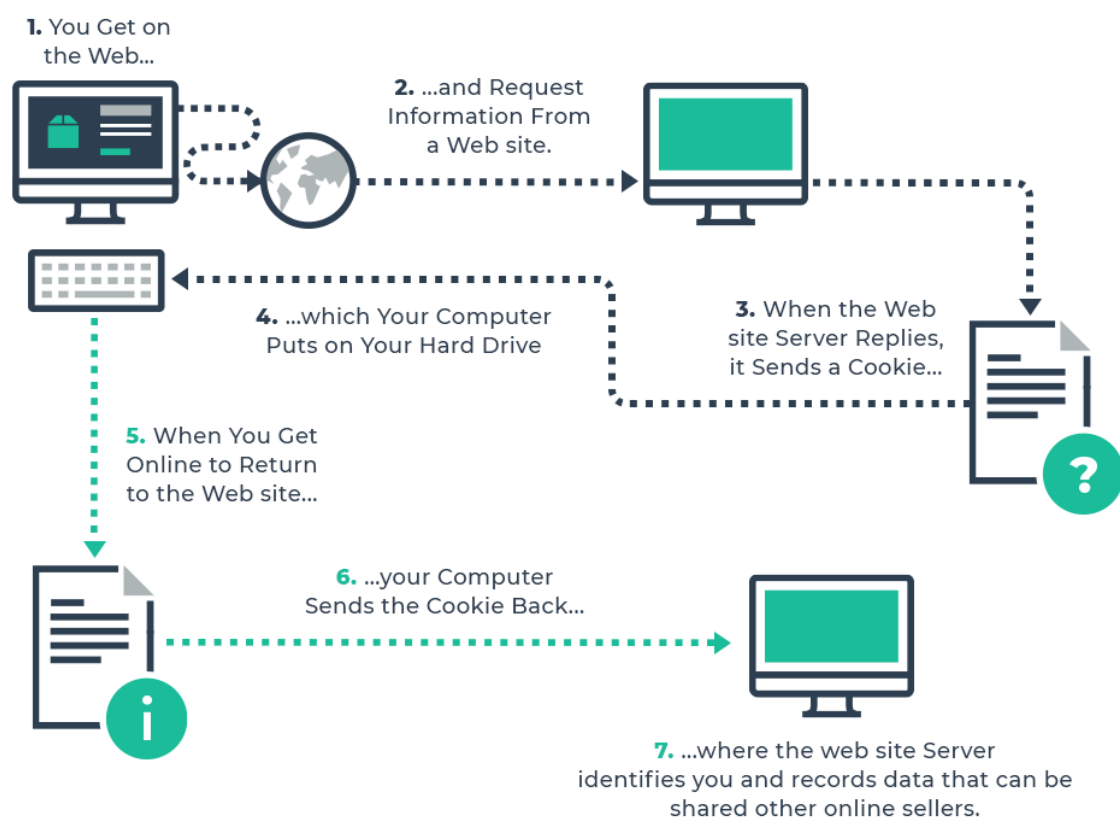


Figure 7: Dataflow: Client-Server (arvindpdmn, 2020)

Task 04 – Traffic Generation to the Microsite

The microsite was shared and monitored for five days from April 14 to April 18, 2024. The results, depicted in diagrams, offer insights into the site's performance over this period.

Report 01 – Users by Browser Over Time

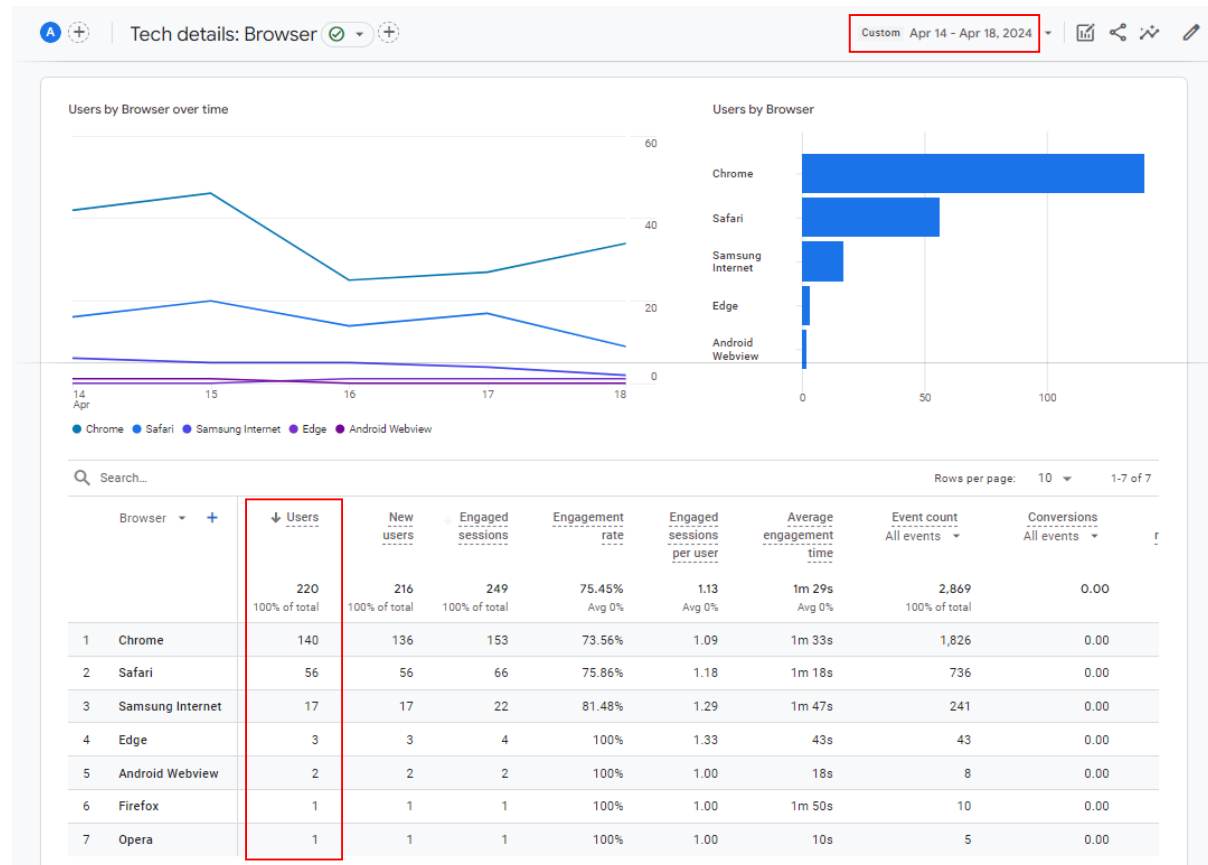


Figure 8: Users by Browser Over Time

The report covers user activity across different web browsers from April 14th to April 18th, 2024, with a total of 220 users visiting the microsite. Google Chrome was the most commonly used browser, with 140 users, followed by Safari with 56 users. Overall, users utilized seven different web browsers. Despite Chrome's popularity, Firefox had the highest engagement rate, with 100% and an average engagement time of 1 minute and 50 seconds.

Report 02 – Views by Page Title & Screen Class Over Time

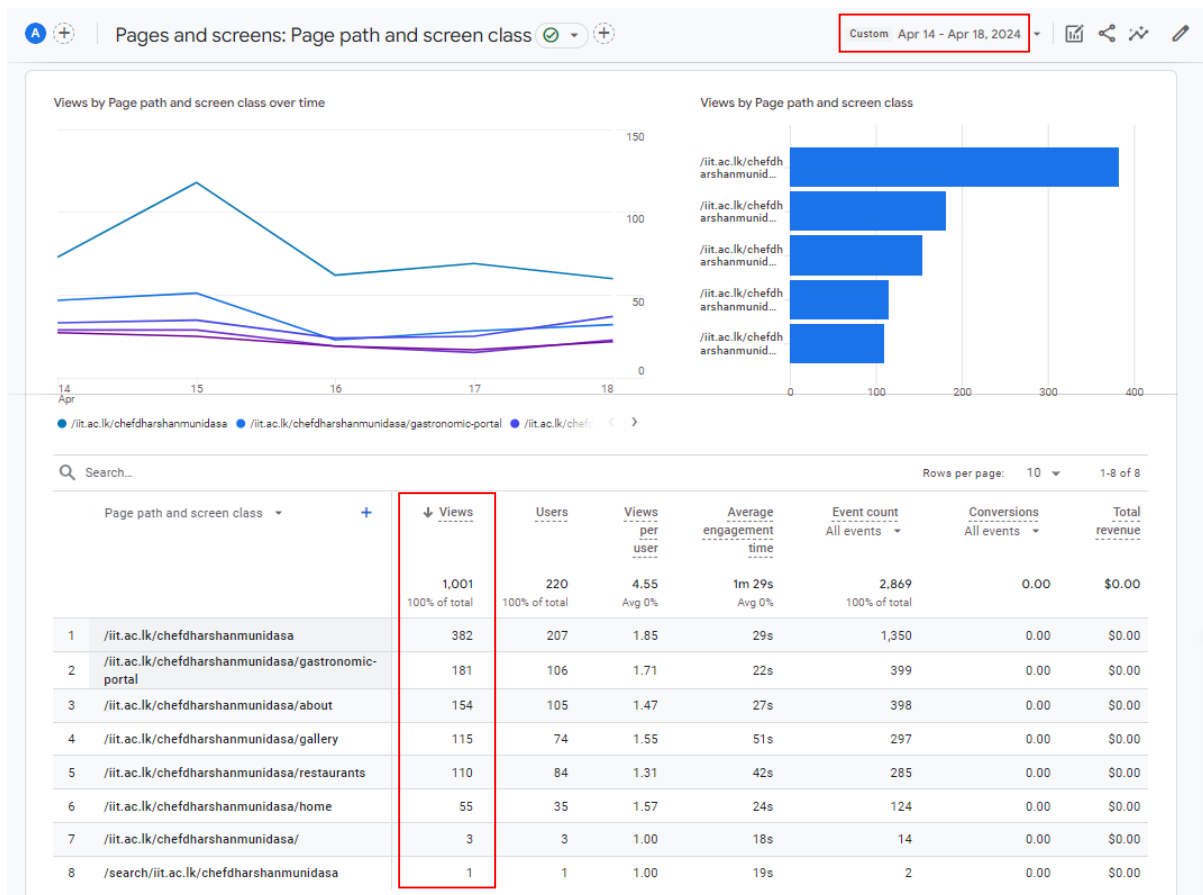


Figure 9: Views by Page Title & Screen Class Over Time

The report reveals insights on five screen classes, with the "Dharshan Munidasa" homepage garnering the highest views of 440 out of a total of 1001 views recorded over five days from April 14th to April 18th, 2024. The "Gastronomic Portal" follows as the second most viewed page with 181 views. However, there is a notable decrease in page views for other pages apart from the homepage. To address this, the author aims to optimize content to enhance visitor engagement.

Report 03 – Sessions by ‘Session Default Channel Grouping’

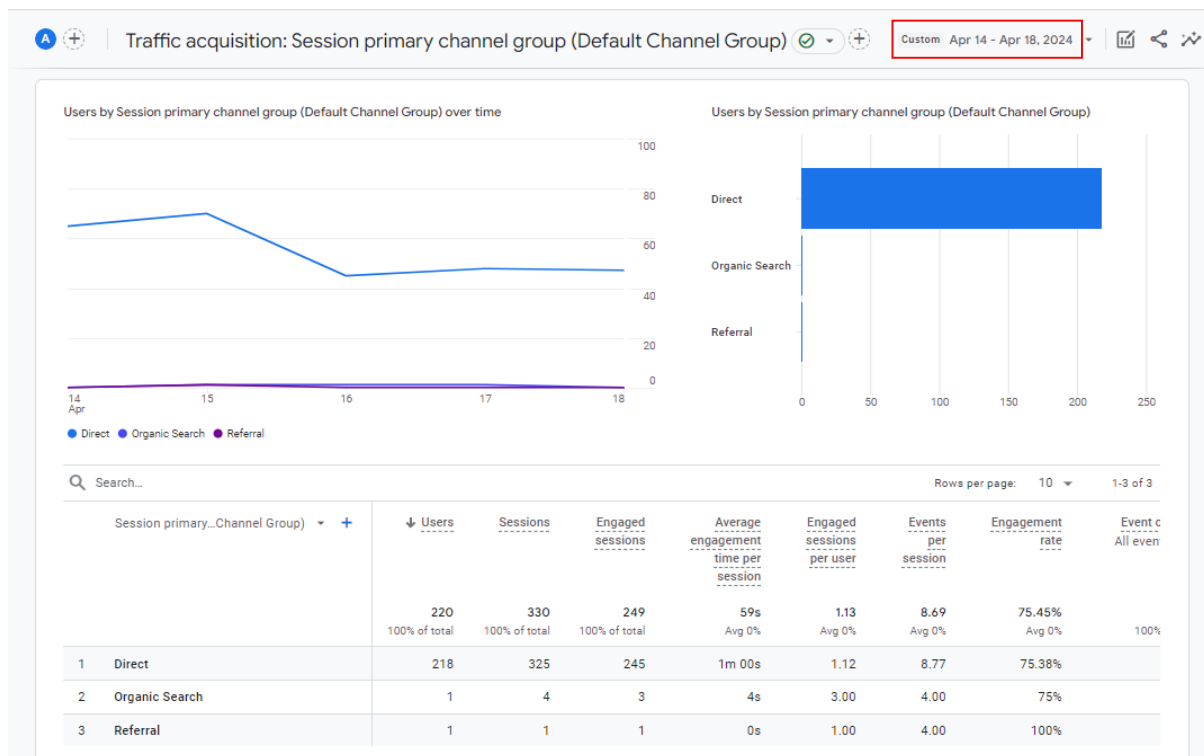


Figure 10: Sessions by "Session Default Channel Grouping"

The report highlights user sessions across three channels: direct, organic, and referrals. Despite all three channels being utilized, the direct channel stands out as the most effective, with 218 out of 220 users accessing the site through it. This channel also leads in engaged sessions. The high number of direct visitors is attributed to marketing campaigns via email and WhatsApp. However, the author aims to optimize the website to increase traffic through other search channels as well.

Report 04 – New Users by ‘First User Default Channel Grouping’

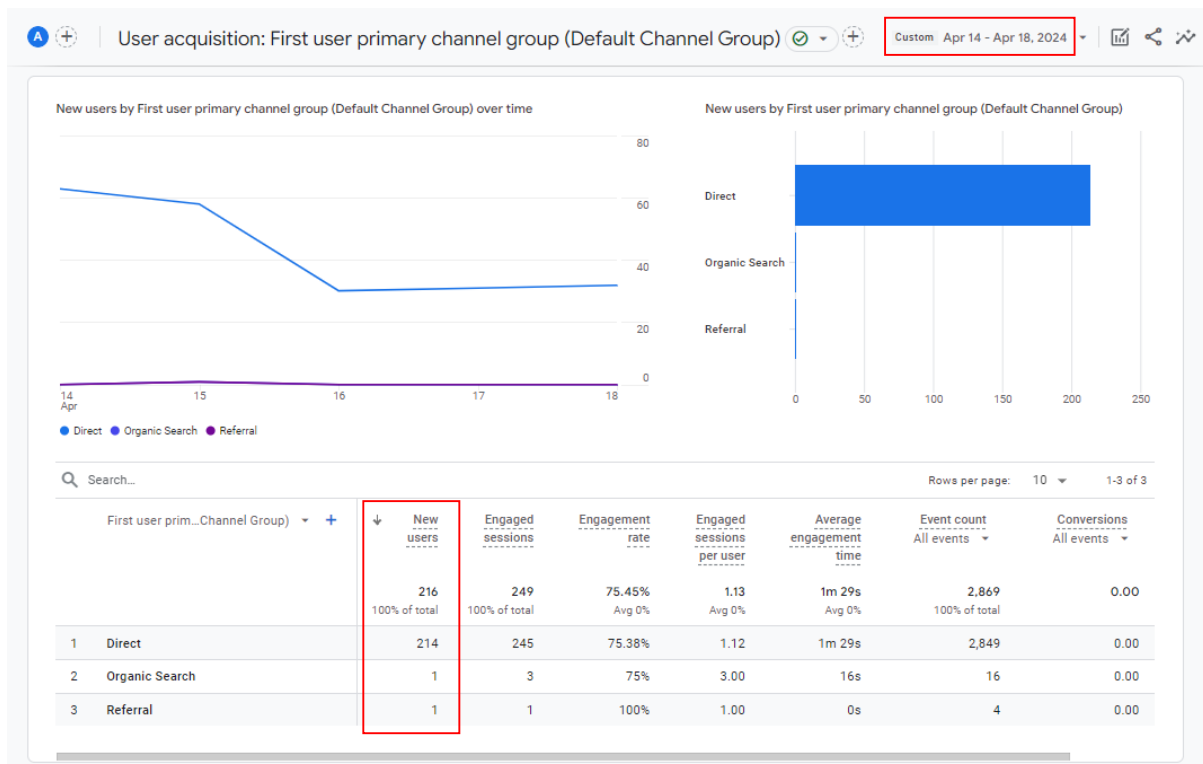


Figure 11: New Users by "First User Default Channel Grouping"

The report findings indicate that the most successful acquisition method for the developed microsite is the Direct channel, with 214 out of 216 new users arriving via this method. The email and marketing campaigns by the author have proven effective, driving user engagement. However, there is a need to develop strategies to enhance user acquisition through other channels.

Report 05 – User Engagement (Overview)

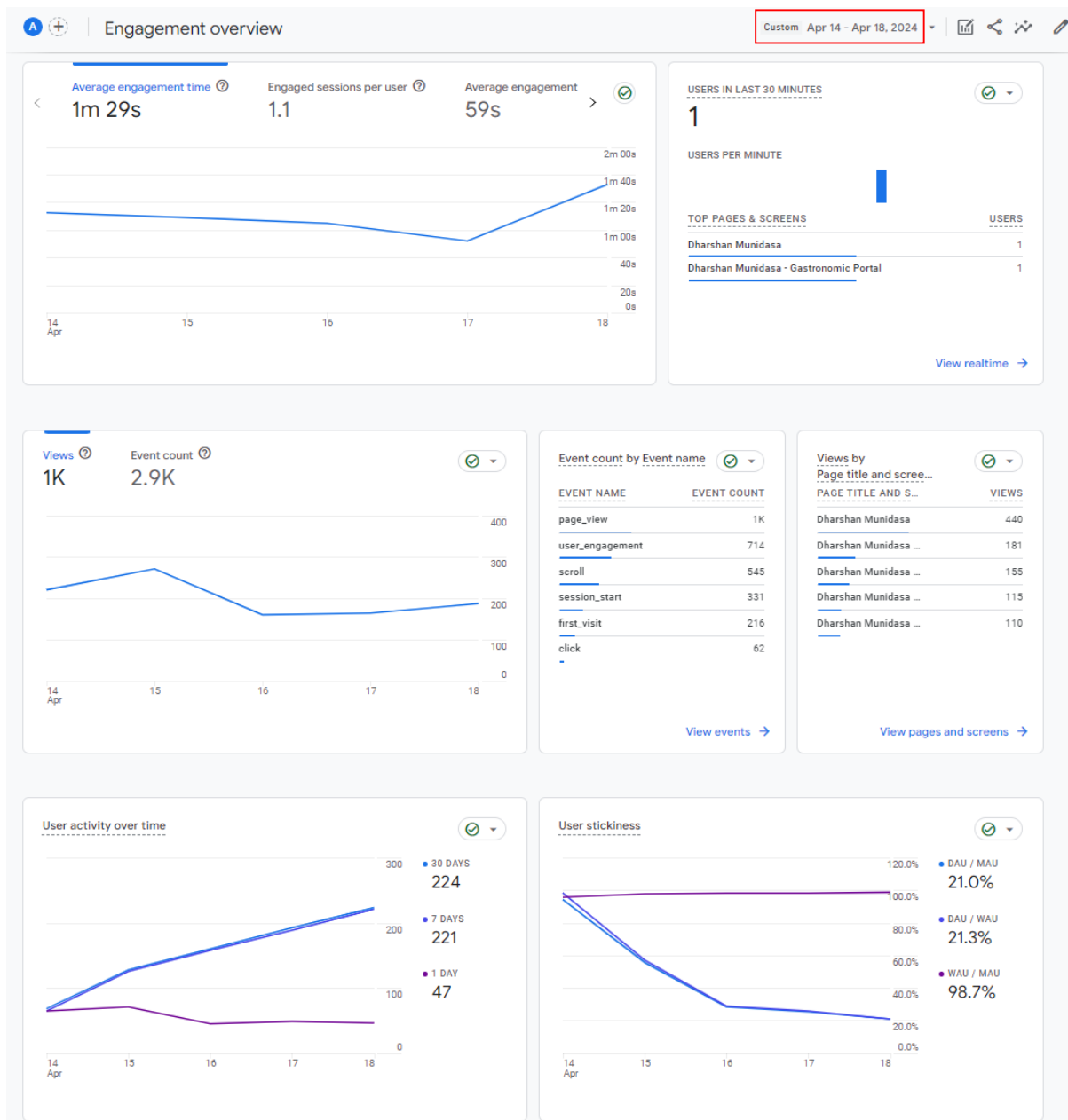
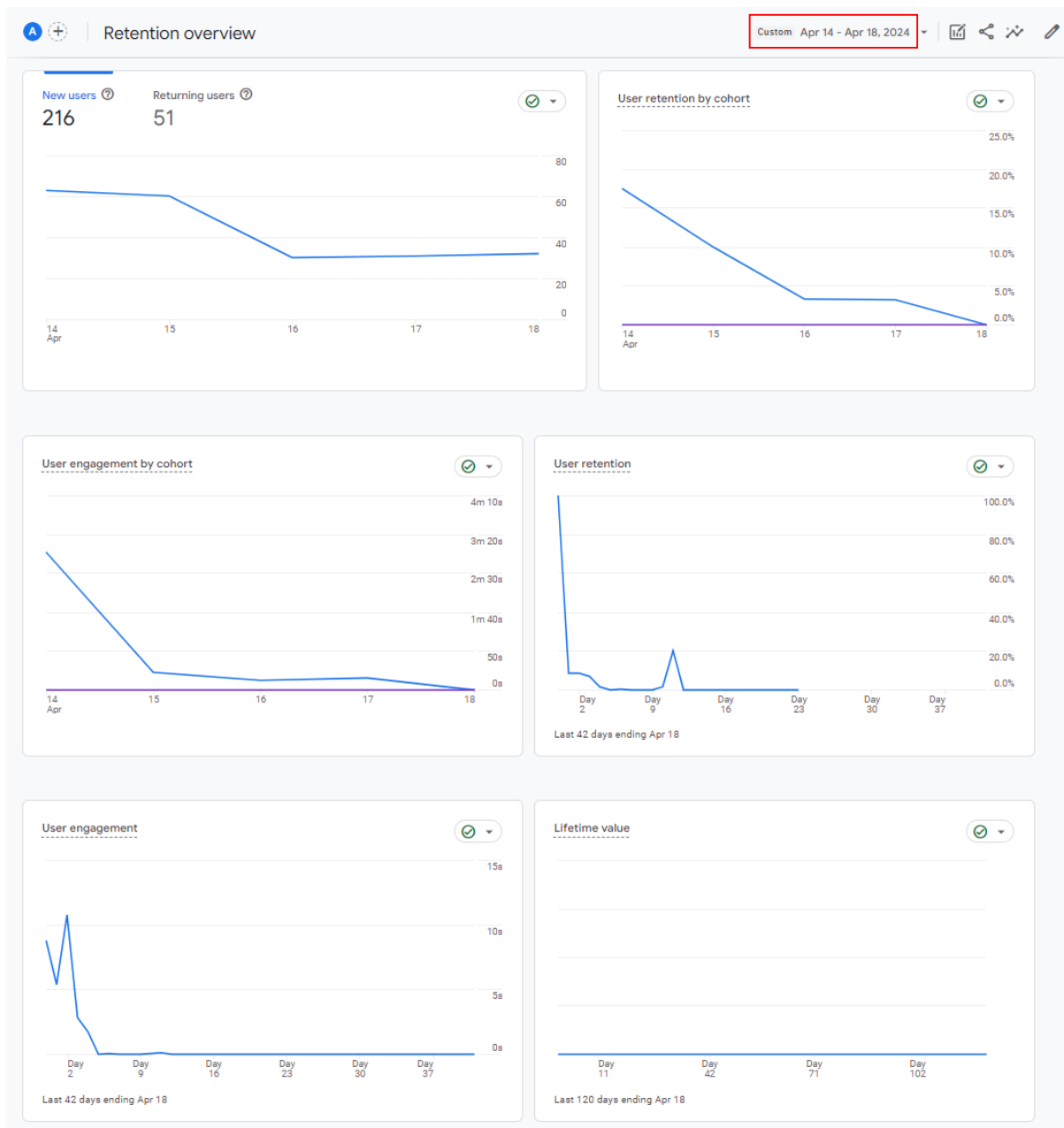


Figure 12: User Engagement(Overview)

The graphs depict the microsite's engagement rate, views, and event count over a five-day period. The average engagement time is 1 minute and 29 seconds, with 1.1 sessions per user. While there is a decline in engagement observed from the 3rd day, there is a peak increase on the final day. The microsite garnered 1k views with 2.9k event counts, although there is a decline noted from day 2. The report also provides a breakdown of event count by event name and views based on page title. Furthermore, user activity and stickiness are illustrated in line charts, demonstrating user interaction with the microsite.

Report 06 – User Retention (Overview)*Figure 13: User Retention (Overview)*

The graphs provide an overview of user retention over the specified period, indicating that 51 out of 216 new users have returned to the site, accounting for 23.61% retention. User engagement measures the average time spent by users during the engagement period. Additionally, user engagement and retention by cohort are depicted, showing the time spent by new users on the site each day.

Report 07 – Users by City

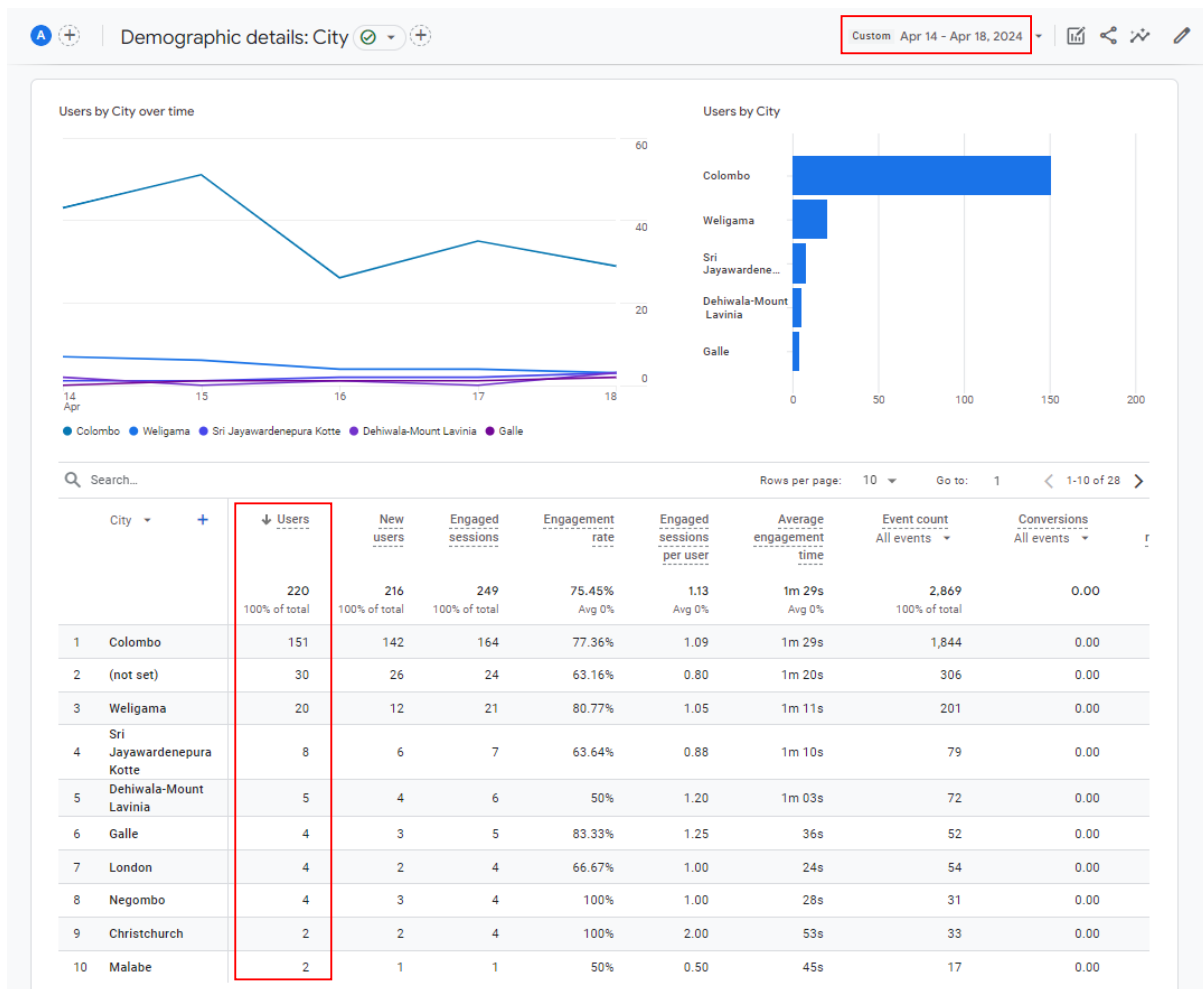


Figure 14: Users by City

The report provides insight into the geographic distribution of users accessing the microsite. The majority, 151 out of 220 users, are from Colombo, followed by 20 users from Weligama. Outside of Sri Lanka, London has the highest representation with 4 users, although this number is relatively small compared to the total user count. The category "not set" represents users whose IP addresses were not captured.

Report 08 – Returning Users by Device Category

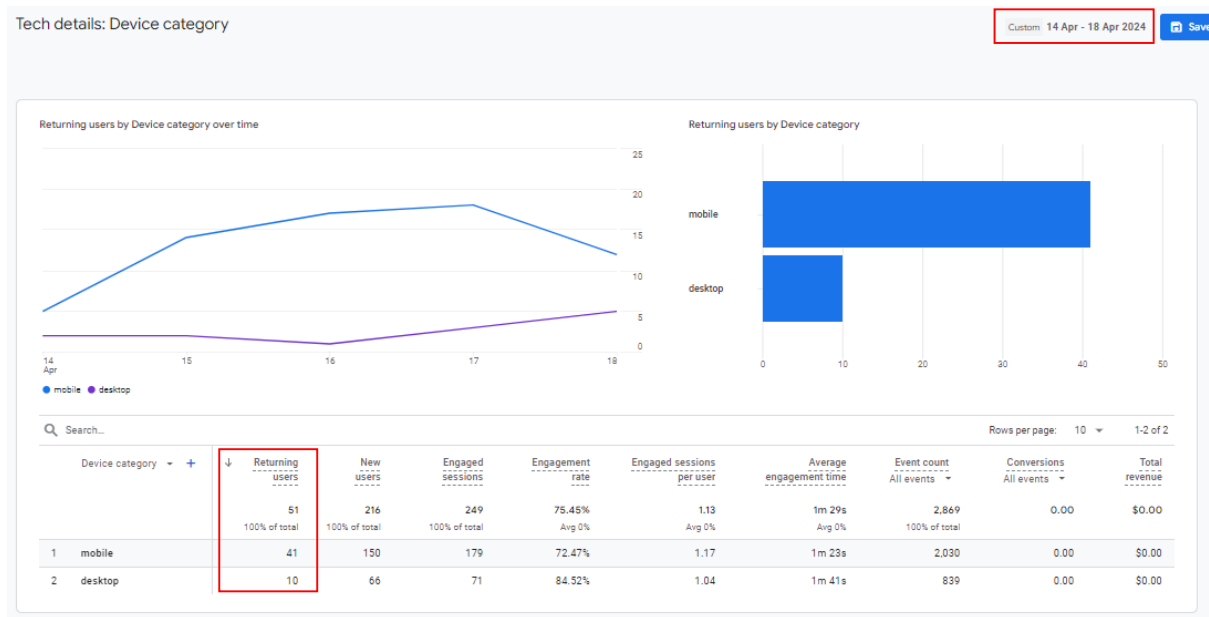


Figure 15: Returning Users by Device Category

The given report provides insight on the devices utilized by the returning users. The developed microsite has been viewed via mobile as well as desktop devices. However, according to the report generated by GA4, of 51 returning users, 41 have viewed the site via their mobile device while the remaining 10 has used their desktop for this purpose. In conclusion, majority of the returning users have visited the site via their mobile device.

Report 09 – New Users by Screen Resolution

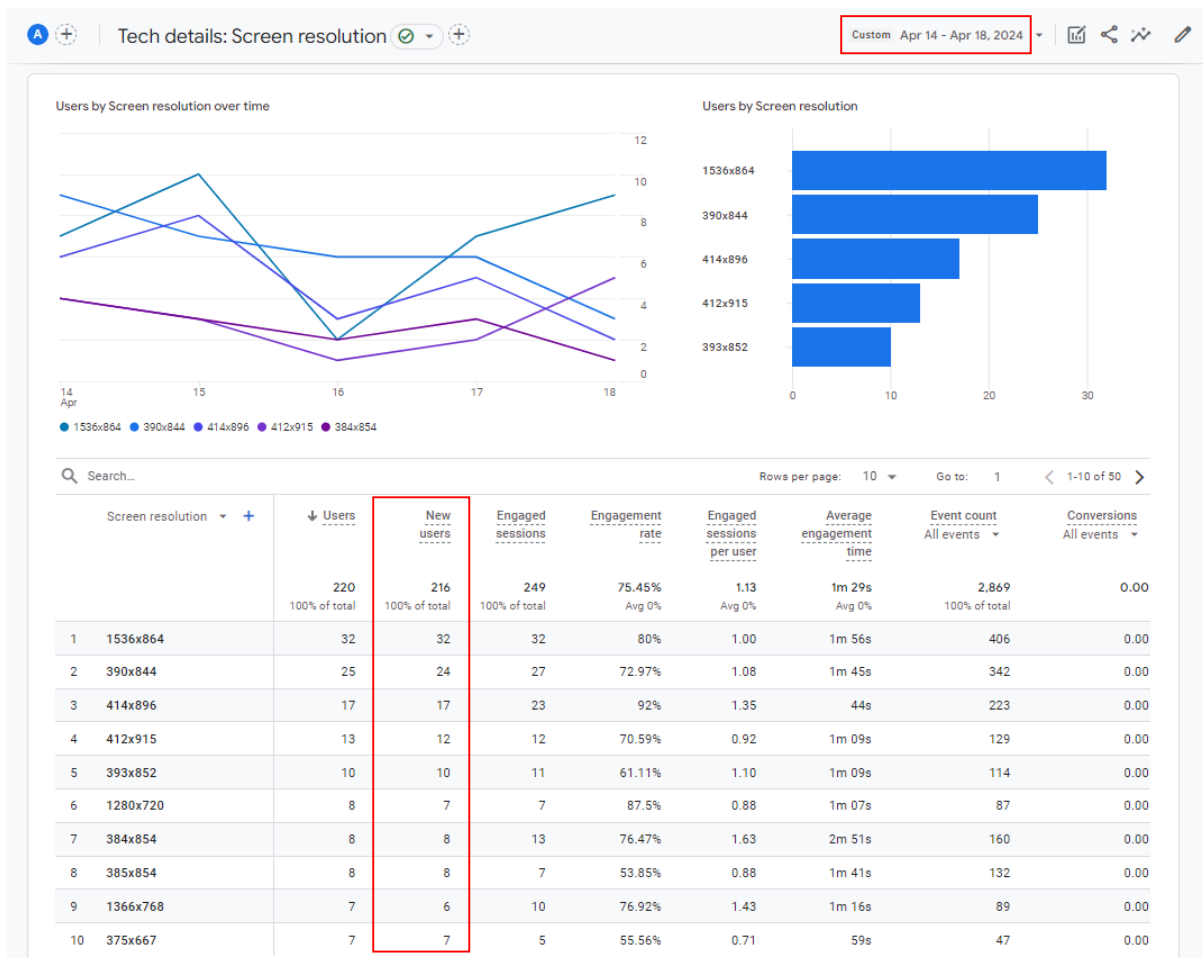


Figure 16: New Users by Screen Resolution

The generated results provide insight on the screen resolution of the devices used by the users. Of the 216 new users, 32 users have used the standard desktop resolution which is 1536x864 to view the microsite while 24 users have accessed the site using the resolution 390x844, which is one of the 5 common screen resolutions for mobile devices.

Task 05 – Define KPIs using the BSA

KPI Stated

Increase user retention by 50% and build long-term user engagement.

Justification based on Task-04 Analysis

Using insights from GA4 reports on User Retention, the author aims to integrate this KPI into the balanced scorecard approach. By analyzing retention patterns and engagement levels, data-driven decisions can enhance user experience and cultivate a loyal user base for the microsite.

Justification of KPI with Appropriate Values

Brief Description	Enhance user retention and engagement across the website following a decline indicated by GA4 reports.	
% Change	Increase the average engagement rate by 15% and user retention by 50%.	The current average engagement time ranges from 52s to 1m33s, with an average of 1m29s. A 15% increase aims to maintain consistency. Additionally, the current retention rate of 23.61% necessitates a 50% increase, which would be a substantial improvement.
Time Period	4 months	The chosen timeframe is suitable for the author's goal of enhancing user retention by 50%. It provides ample opportunity to observe trends and implement necessary improvements to achieve the desired outcome.
Actions to be Taken	<ul style="list-style-type: none"> • Loyalty programs. • Personalized content. 	<p>Update users with the latest and easy-to-make recipes.</p> <p>Offer discounts to Chef's restaurants.</p>
Monitoring Period	Bi-weekly	Consistent monitoring and data accumulation are crucial for identifying trends and making adjustments as needed. Therefore, monitoring progress every two weeks would be an effective approach.

Table 4: Justification of KPI

Task 06 – Email Marketing

The campaign aims to achieve a 50% increase in user retention and foster long-term engagement. Exclusively sent out bi-weekly to the subscribed user base, it aims to keep users engaged while also focusing on boosting brand awareness and generating leads (Riserbato, 2023).

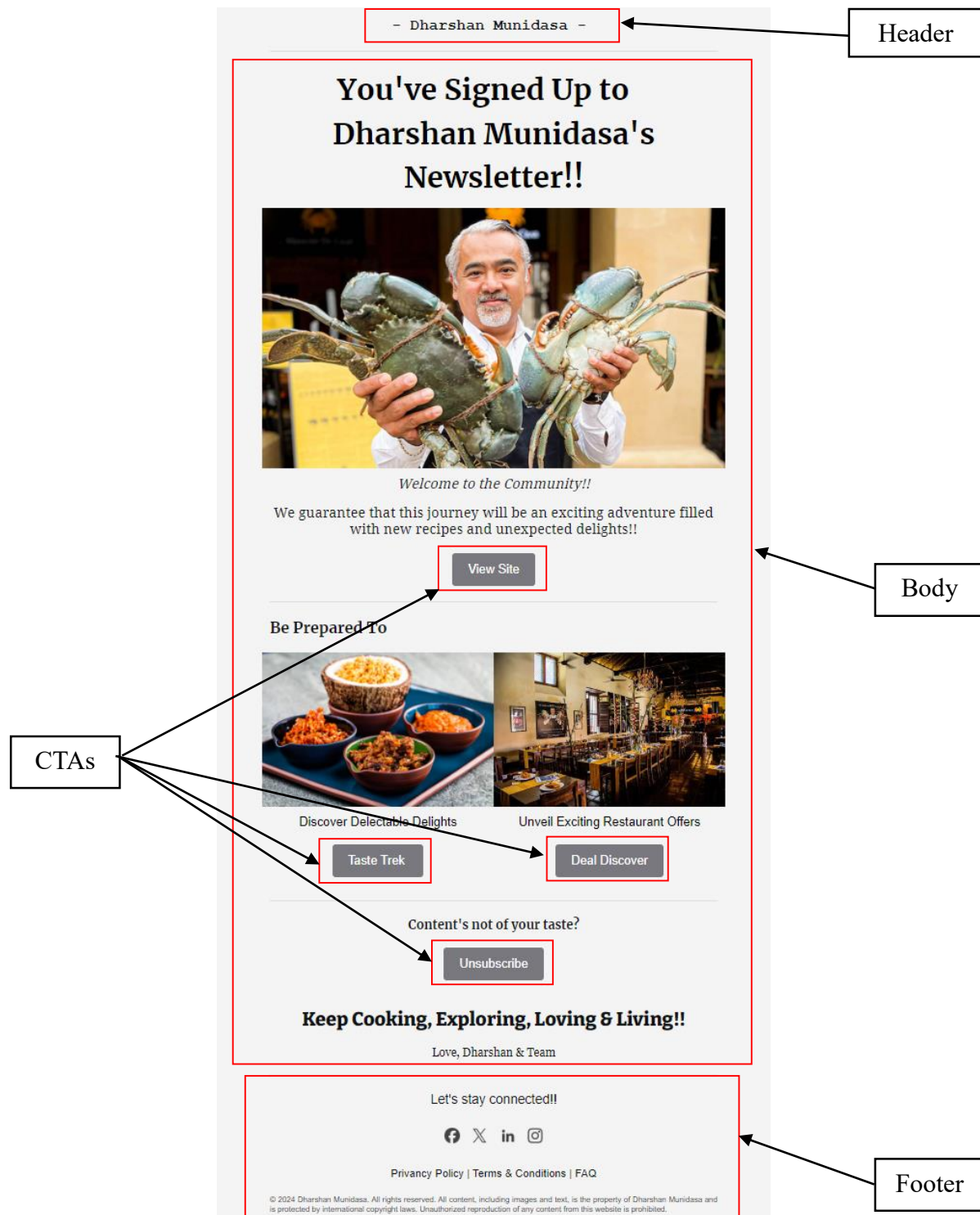


Figure 17: Email Marketing Campaign

PART B

Task 07 – Problems & Issues Faced When Collecting & Interpreting Data on User Activity on the Web

Challenges Related to the Calculation of Unique Visitors

A visitor's uniqueness on a website is determined by cookies, which store their distinct browser identification. However, accurately measuring unique visitors is challenging due to several factors:

- **Cookie deletion & blocking** - Tracking repeat visits accurately becomes challenging as many users routinely delete cookies or employ browsers that block them (AgencyAnalytics, 2024).
- **Multiple devices** – A single user may access the site from various platforms/devices. This could lead to an overestimation of counts (SimilarWeb, 2021).
- **Dynamic IP addresses** – IP addresses that can change frequently. Hence, may result in a single user being considered as multiple visitors (SimilarWeb, 2021).
- **Shared devices** – Multiple users are able to share a single device. This would lead to a count underestimation since; multiple visitors may be accounted for a single visitor (AgencyAnalytics, 2024).

Differences between Visitors, New Visitors & Unique Visitors

Visitors	New Visitors	Unique Visitors
The total number of visits made to a website within a given period of time. Includes both new and returning site visitors (Fitzgerald, 2023).	Users visiting the website for the initial time within a specific time period. These users are identified based on IP addresses or cookies (Fitzgerald, 2023).	The total number of distinct individuals who have visited the website within a given time. These users are counted individually, regardless of the number of visits made (Fitzgerald, 2023).

Table 5: Visitors, New Visitors & Unique Visitors

Challenges with Measuring Session Duration

Session duration is the measure of how much time a visitor spends on a single site visit/session. This provides the business a broad view of the overall engagement level across the website (Keating, 2024).

Challenge	Explanation
Inactive Window	Users may leave a tab or window open without actively engaging with the content, leading to inaccuracies in session duration metrics (Keating, 2024).
Single-Page Sessions	Sessions consisting of only one-page view, known as bounce session, pose challenges for quantifying time spent on a page. Without additional page views or interactions, accurately measuring the duration of user engagement is difficult. This could be misleading as it leads to an underestimation of session timing calculation (Munro, 2024).
Session Reinstatement	Some analytics platforms reinstate expired sessions if users return to the site within a certain time frame. While this may provide a more accurate representation of user behavior, it can also lead to double counting and inaccuracies in measuring session duration (Munro, 2024).
Misinterpretation of data	High session engagement can indicate engaged visitors; however, it can also suggest that the visitors may have trouble finding relevant content. Similarly, low session duration may not always mean poor content but, that visitors might have found relevant content at the get-go for the site. Hence, understanding the numbers are crucial (Schneider, 2024).

Table 6: Measuring Session Duration

Challenges with Quantifying Time Spent on a Web Page

Quantifying time spent on a website focuses on the duration of user engagement with a single/particular page. This offers a focused view of the engagement on individual pages (Keating, 2024).

Challenge	Explanation
Page Abandonment	Users may navigate away from a page without triggering a new page load or interaction, making it challenging to determine the exact moment of abandonment and accurately quantify the time spent on the page (Keating, 2024).

Browser Compatibility	Differences in browser behavior and device performance can affect the accuracy of time measurement. For example, browser extensions or settings that block scripts may interfere with tracking mechanisms, leading to underestimation of time spent on a page (Munro, 2024).
Inactive Tab	Time spent on a web page may be overestimated if the page is open but not actively viewed. Similarly, if the user switches between tabs during a single session, it could lead to inaccuracies in quantifying user engagement (Keating, 2024).
Technical Limitations	Technical issues, such as network latency or browser performance, can affect the accuracy of time tracking mechanisms, impacting the reliability of time spent data (Cohen, 2020).

Table 7: Quantifying Time Spent

The “Hotel Problem”

The “Hotel Problem” is a hypothetical scenario which refers to the problem where the number of unique visitors for each day in a month don’t add up to the same total as the unique visitors for that month (Lynchpin, 2015). In order to understand and further explain this concept, the “hotel” system was introduced and will be demonstrated below.

	Day-01	Day-02	Day-03	Total
Room-A	John	John	Mark	2 Unique Users
Room-B	Mark	Anne	Anne	2 Unique Users
Total	2	2	2	3

Table 8: Hotel Problem (Web analytics, 2024)

As depicted in the table above, the hotel consists of two rooms and two unique visitors each day for three days. Hence, the sum of the totals for the three days totals up to six. While, during the period, each room has two unique visitors each, which therefore, totals up to four.

However, in reality, during the three-day period the total number of unique visitors was three.

This problem occurs due to duplication of visitors. Since an individual who stays in a room for two nights will be counted twice if they are counted by the day but will be counted as one if the entire time period is considered (Lynchpin, 2015).

Similarly, this same problem applies to web analytics as well.

Hypothetically, if a user who visits the site, switch between devices, similar to the “hotel problem” where rooms were switched amongst the guest, or multiple users use the same devices over a period of time, as seen in the hotel problem, web analytics will not be calculated accurately.

Hence, the key takeaway from the “hotel problem” with regard to web analytics is data misinterpretation. This highlights the importance of knowing how analytics tools track data, the difference between total visitors and unique visitors, reasons that causes misinterpretation will assist in clearly understanding user engagement and count.

Problems related to Data Misinterpretation in Web Analytics

- **Data Overload:** Analysts can become overwhelmed by excessive data, leading to selective interpretation and skewed insights into user behavior and website performance (Dugan, 2022).
- **Incomplete Data:** Inaccurate or incomplete data collection, such as improperly implemented tracking codes or user cookie blocking, can result in misinterpretation of trends and patterns (Sharma, 2024).
- **Misaligned Metrics with Goals:** Focusing on metrics that do not align with business objectives can lead to misinterpretation of data. For instance, prioritizing traffic increase over user engagement may misdirect efforts (Dugan, 2022).
- **Sampling Bias:** Skewed conclusions may arise from data collected from non-random subsets of the population, such as specific geographic or demographic groups, resulting in sampling bias (7wData, 2015).
- **Lack of Context:** Misinterpretation can occur without proper contextual understanding. For example, an increase in website traffic may not signify genuine user interest but rather temporary marketing campaigns or bot activity (7wData, 2015).

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