

Shaping Societal Impacts of Digital Marketing Campaigns

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This study explores digital marketing by analysing five datasets covering digital campaigns for various business offerings from 2019 to 2024. The analysis focused on the success and engagement of these campaigns, utilising programming tools such as data visualisation and network analysis. These methods were chosen to handle the large datasets involved, with the results showing graphically or statistically which marketing campaigns are most successful based on their clicks, shares, comments, or other interaction metrics. The goal is to help determine each business's optimal platform and audience, aligning with product preferences and search behaviour. In addition, it compares the changes in offers and preferences during this period and discusses them based on the examined theoretical framework. The examination period is significant for the digital marketing sector, as it encompasses the shift to online shopping and inspiration following the COVID-19 lockdown. Exploring how interests have evolved, what has changed, and what has driven these changes. Additionally, this investigation aims to help businesses target and identify their audience and find ways to engage them based on up-to-date data relatable to any business or target group. Businesses can gain a better overview of which target group (by gender and age) is interested in their offerings and which platform to focus on; understanding the reason for this change over the years and why individuals look for something else, they can find ways to approach them and make their product more attractive, as a result in business they will maximise their income and sales and be more successful.

Keywords: Digital Marketing, Online Campaign Analysis, Analytical Tool For Business, Social Network Theory

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1 INTRODUCTION

Exploring the evolution of social networks reveals how external events influence interaction patterns, shaping new dynamics in today's social connections and network expansion over time. Identifying noticeable patterns is crucial as it clarifies how social media influences thoughts, actions, and preferences. Investigating this information and the rise of event-specific information hubs, as discussed in Azzaakiyyah's research; highlighting event characteristics and their impact on individual decision-making [2], aiming to understand how these characteristics influence the variety, volume, and speed of data investigations. This examination extends the understanding of social network ties power and the processes of sharing and seeking information, probing social interactions' complexities.

Recent studies have overlooked comprehensive platform comparisons. Businesses and marketers use traditional methods to specify their interests in one market path, such as finance or society [17]. As a rule, this research's universality coincides with the algorithmic

techniques employed since it shows an alternative perspective to other studies. The outcomes provide valuable insights into targeting specific groups and global societal trends and embrace effective strategies for businesses.

1.1 Research Scope and Context

This study analyses the evolution of social networks in the context of external events, with a particular focus on the effectiveness of marketing campaigns¹. It examines clicks, purchases, and engagement over several years, presented individually or in a graph, targeting specific demographic groups and platforms.

Consequently, it illustrates campaign success over an extended period, emphasizing specific demographics and platforms. Cote and Azzakiyyah explore these changes and their impact on social networking structure, provide a basis for exploration and introduce methods and business plans [7] [2]. The scope lies in using algorithmic tools built on this research as the foundation. Marketing campaigns can cover product and service promotion, support a particular lifestyle, or showcase social media events and business offerings². Analyzing the current marketing synopsis and identifying trends for effective connections between companies and individuals is crucial. By identifying trends in modern marketing, the study seeks to help companies and individuals connect efficiently based on evolving consumer needs and interactions, thus influencing how information is consumed and engaged in today's society³.

1.2 Research Benefits and Criticality

Main benefits of this investigation are the practical insights offers for marketers, feedback on customer behaviours, and predictive models for future success. It also measures social media platforms' user engagement and suggests improvements. Additionally, algorithmic tools address gaps in existing studies and provide a broad understanding of demographics, platform usage, and scope in the digital marketing outline. Similar to Lou's research on social media interactions, it is also underlying the importance of innovative techniques to understand influencer-follower relationships and their impact on advertising effectiveness [13].

The criticality of this research lies in understanding how social networks work, which communication forms are most engaging and what changes have been done over a particular period. As these changes are rapidly evolving, capturing them is challenging. Understanding the impact of these changes on online interactions helps gain valuable insights. These insights can then be used to improve

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¹**Digital Marketing Campaigns:** marketing campaigns that are taking place on digital forms such as video, image, and speech through emails, websites or social media.

²**Business offerings:** Whatever a business may want to advertise/ offer, such as products, services, events etc.

³**Societal Impact:** Notes as the results of individuals behaviour and actions on the society, how something affects individual's lives and what is the outcome and over the goal of it

marketing strategies, offering new recommendations and methods to adapt to the evolving landscape of societal communication.

2 LITERATURE REVIEW

A literature review was critical as it provided insights and verified or denied the results. Various studies were analysed to categorise and understand the numerical and graphical findings of this research, uncover the reason for changes, understand how social media works, and what digital marketing success means. It also served as the basis for identifying potential business strategies and final recommendations.

Many studies explored how social media platforms influence consumer behaviour, revealing significant effects on purchasing decisions and brand engagement. Lou (2022) and Ghermandi et al. (2019) agree that social media meaningfully impacts consumer behaviour through visual and interactive content, identifying digital marketing tricks to manipulate potential interests and promote the offerings [13] [10]. Additionally, Chen (2022) suggests that the impact of social media on consumer behaviour varies significantly across different demographic groups, indicating a more nuanced effect. Chen discovered that younger individuals are more swayed by interactive and visually appealing content on social media, and older tend to depend more on reviews, suggestions, and educational content when making purchasing decisions [6]. This aligns with the research goal of examining the differential impacts of social media platforms across various demographic segments to generate a tailored business plan according to age group and gender.

Moreover, many researchers relied on qualitative and quantitative case studies [4] [18]. Qualitative studies are used to generalise results from small sample groups and subjective interactions, while quantitative might overlook insights hidden behind the numbers. Adopting network analysis and statistics leverages databases and theoretical frameworks to explain results, thoroughly understanding social media's impact and achieving insights from a large sample group.

Crucial is understanding the influence of newer social media platforms and broader demographic groups; Purnama (2023) highlights the need for research on platforms like TikTok and their impact on younger audiences, as their "transcended mere utility to become an indispensable and intrinsic component of the quotidian experiences like Facebook, Instagram and others" [15]. Braghieri et al. (2022) emphasise the need to study the effects of social media on diverse age groups beyond younger ones, aiming to bridge these gaps by including data from emerging platforms and analysing a more varied demographic focus on whom and the reason for the influence [3].

In conclusion, the literature review highlights the significant impact of social media on society's behaviour, with varying effects across demographics and differing methodological insights. Also explains the reason, categorises and defines the consequences for each demographic group, and analyses social media strategies connected to and responsible for these results. Since then, it has been imperative to consider this investigation and uncover research objectives.

⁴**Network Dynamic:** How interactions are taking place throughout a network, who or what is the primary influencer factor and what are the main moves

3 RESEARCH OBJECTIVES

3.1 Research Objectives and Goals

The primary motivation is to understand individual differences in social media behaviour and preference over time by exploring the factors driving choices. It also explores the efficiency of digital marketing campaigns on social media and their impact on different demographics, combining algorithmic results with insights from existing studies and reported data.

The investigation emphasises a societal perspective to understand the reasons behind successful campaigns. Through comprehensive analysis of various datasets, the objective is to refine advertising targeting and platform optimisation based on user demographics and marketing strategies. The goal is to increase engagement and maximise campaign impact. This analysis provides valuable insights into the changing viewpoint of online expression and its emphasis on societal discourse and network interactions over the past five years.

The data analysis focuses on optimising advertising and targeting to increase engagement, providing insights into the evolving digital landscape and its impact on society and network interaction over the past five years. It measures how social media marketing influences public decision-making and consumer behaviour, uncovers drivers of successful marketing strategies, and proposes ethical marketing practices [10].

The significance of this research lies in its practical insights for marketers. It optimises future marketing success by enhancing understanding of user engagement and satisfaction with marketing campaigns. It offers data and algorithms for targeting the appropriate demographic group and platform, ensuring culturally relevant and sensitive digital marketing strategies to increase brand loyalty and trust.

3.2 Research Questions

The Digital Marketing sector is rapidly evolving due to continuous innovation and emerging trends. The COVID-19 pandemic accelerated this shift as companies moved their operations and promotions online, a trend that continues today. This examination aims to analyse the development of digital marketing from its onset in 2019-2020, through its peak in 2021-2022, to its current state in 2023-2024.

The primary research question is: *"How have digital marketing campaigns on specific social media platforms (Pinterest, Facebook, Google, Twitter, Instagram) influenced public decision-making and network dynamics over three distinct periods (2019-2020, 2021-2022, 2023-2024), and what insights can coding analysis and methods reveal to inform strategic business recommendations?"* using statistical, network and marketing approach simultaneously. To address this, the question broken into different objectives and subquestions: *How have digital marketing campaigns on social media platforms influenced public decision-making over three distinct periods? How have digital marketing campaigns on social media platforms influenced network dynamics⁴ over three different periods? What insights can coding analysis reveal to inform strategic business recommendations?*

Understanding marketing campaigns' impact requires analysis of their influence on individuals through social media interactions. Lou (2022) and Ghermandi (2019) highlighted the critical role of social

media in shaping consumer behaviour and engagement, providing a foundation for this analysis [13] [10].

To prove the analysis, consider the target audience's demographic factors and platform choice to evaluate campaign effectiveness it is crucial to define and measure 'success' carefully and determine the methods and tools used to identify and analyse each campaign's target audience. The practical implications of these interactions are categorised, mainly focused on analytical changes [1] [15]. Prior literature research was conducted to understand the expected results, existing data, and research [6] [1]. Based on existing theories and frameworks, business strategies corresponding to each case were examined to answer the research questions. This study aims to produce essential insights and business recommendations tailored to specific demographic target groups.

4 DATASETS CHARACTERISTICS

The four datasets for this analysis were selected to enable yearly comparisons from 2019 to 2024. These datasets contain almost similar data but refer to different years, providing a comprehensive view: 2019-2020 [14], 2021 - 2022 [16] and 2023 - 2024 [12] [8].

Datasets displayed remarkable similarities and included all the key attributes needed for this study, conducted between the required years, and presented different platforms and campaigns. Another reason for this choice is the commonalities in core attributes crucial for meaningful comparison, including demographic information (age and gender), platform and offering category and engagement metrics (comments, shares etc.), and the categorisation criterion of the record date.

Along with, the examined platforms in this research are Facebook, Instagram, Twitter (owned by X), Google, and Pinterest, and categories include fashion, food, home, health products, and technology, encompassing different business offerings such as items, services, and lifestyles in various advertising formats. Some datasets included additional categories like fitness or platforms like Snapchat; however, these were excluded from the final analysis due to their absence across all datasets.

Using multiple datasets was significant for simultaneously comparing and verifying the findings. This approach was critical to avoid bias by providing results from multiple sources. Although not all datasets included identical data or the same number of records, their similarities allowed statistical clarity. Despite the challenges posed by dataset variations, a diligent approach to statistical analysis enabled accurate results.

5 METHODOLOGIES

The preparatory step involved separating the datasets into three yearly subsets to facilitate comparison over time. Related works and studies applied to this investigation to gain valuable insights. The analytical methodology tree is shown in Figure 1. Data quality was ensured through strict cleaning processes, including removing missing values and normalisation. Validation techniques such as cross-validation and consistency checks were employed to ensure the reliability and accuracy of the data.

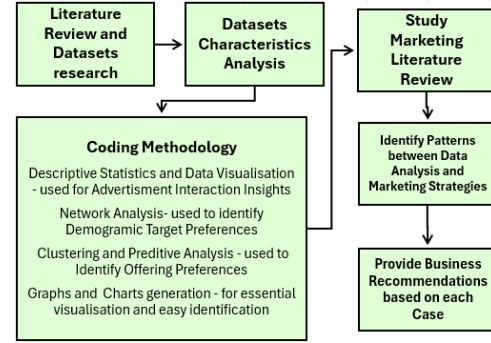


Fig. 1. Methodology Used

Several methods were tested, but the most beneficial for this research were network analysis, descriptive statistics and visualisation, predictive analysis, and clustering. The motivation for that is the graphical or shaping representation that easily enables pattern identification or statistical and mathematical observations. Unlike topic modelling, which was not applicable, these methods allowed for adequate examination and data adaptation.

To begin with, descriptive statistics, providing an overview of engagement, offerings, and platform efficiency through statistical summaries and visual graphs. For example, it calculated the most engaged years or campaigns with the most interactions and clicks.

Network Analysis identified complex relationships and dependencies by visualising connections between variables like platform and age group. The output of this method was a map of two examined variables each time, revealing their connections, for example, the platform and age group that use it. Hence, this method uncovers monopolies, significant differences, and gaps by identifying clear associations between specific points of variables.

Another conducted method was clustering. The k-means algorithm grouped similar data points, uncovering user behaviour patterns across different demographics and platforms. Determinate and visualise the optimal number of clusters to identify homogeneous groups and diverse patterns. This helps to identify homogeneity between groups such as older age fashion and diversity, basing how to navigate and continue the research.

Other methods were also generated on behalf of this research, involving creating different charts and grouping results after mathematical normalisation. An example of this is the determination of the percentage use of each platform and the corresponding percentage of individuals in each age group, which is then used to generate specific charts for this documentation, requiring mathematical knowledge and programming to plot that. The results provided valuable insights, helping to answer the research question.

The goal was to create a universal function for each method, applicable to all datasets in similar future work. This function was designed to handle datasets with similar characteristics, though it might need adjustments for datasets with unique variables or evolving trends.

Limitations of this method include managing unique data, potential inaccuracies with diverse datasets, and the possibility of less

helpful outcomes when applied to data that significantly differs from the original design.

Following this, a theoretical business process was conducted to explain business' results and strategies, aiming to understand their reasons and the advertising plan for each case. Applied marketing and business knowledge and the corresponding literature research formed the basis for the next step.

This examination delivered new and beneficial marketing insights to businesses. The novelty lies in its unique provision of insights and a comprehensive approach, utilising new data visualisation tools and innovative network analysis and clustering techniques. This up-to-date algorithmic marketing analysis satisfies the need for in-depth and current analysis.

6 RESULTS

The results aim to cover all the examined perspectives, starting from media and individuals' preferences, exploring where they spend most of their time and what and where businesses need to seek their audience.

This was separated into three categories: understanding the conversion of advertisements and the audience's engagement to assess digital advertisement efficiency; examining the audience's characteristics and targeting preferences, including categorization based on demographics and resonating advertisements; and categorizing advertisements by where businesses promote them, which platforms they use, and aligning with the target groups engaged by existing methods.

6.1 Advertisement Interaction and Conversation

In the following analysis, the key metrics and insights related to the performance of advertisements are examined, as outlined in Figure 2. This pie chart illustrates the percentage of engagement per year set over the whole engagement (see Appendix) of the last five years, showing that the most engagement happened on 2021-2022 with 91.9%. Examining advertisement engagement, not just clicks, is necessary because an advertisement must become popular to influence individuals' lifestyles and encourage interaction. As Seth Godin said, "People do not buy goods and services. They buy relations, stories, and magic." [11].

This analysis is mainly based on descriptive statistics, examining any interaction a person has with each advertisement. Starting with measuring the results by interaction, it is noticeable that only 26.1% of the advertisements were clicked in the first year set. Of these ads, 50% received 0 to 2 clicks, under 40% received fewer than 13 clicks, and 25% received more than 64 clicks.

The limitation of the results indicated in Figure 2 is that the data for 2023-2024 needs to be revised as it is a very recent time frame, the collected data is significantly less than in the previous two years, and the dis-analogy of the dataset records and datasets accuracy and sample. The exploration of these results shows a rise between the first and second years, attributed to the impact of COVID-19 [6]. Before the pandemic, people were not accustomed to online shopping or digital marketing, and companies did not prioritise these areas, apart from major online retailers like Amazon. However, the pandemic led people to adopt these methods, aligned with many new

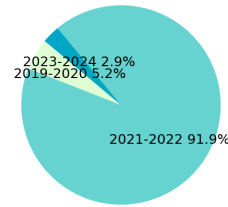


Fig. 2. Pie chart displaying the percentage of engagement for each year within the total engagement over the entire period

online shops opening recently and becoming increasingly reliant on them, to the extent that many now prefer online shopping over physical stores due to the broader range of options and convenience [1]. The shift in consumer behaviour, as the novelty wears off and with numbers not as high as before, is contributing to the decrease in clicks and engagement shown in the graph over the years [15].

The subsequent years of the research witnessed the implementation of new marketing strategies, leading to a rise in all metrics, such as impressions and clicks around 2000% more than the previous yearset each. Supporting this is the shift online due to COVID-19, the many online stores that opened, collaboration with influencers, social media shopping features (such as Facebook Marketplace), and exclusive offers promoted only there. Nevertheless, descriptive statistics analysis show that advertisements used to receive an average of 33 clicks, each seen 56,000 to 186,000 times in the most recent year-set, indicating a decrease in the perceived value of digital marketing where the numbers remain high compared to five years ago. Each user sees the same advertisement around five times, with a 50% chance of clicking on it every time they watch it, showing improved targeting over the years. Five years ago, an individual's chance to click on an advertisement was 10%, with more users interacting with the product, proving that current marketing strategies and targeting work much better. These numbers were calculated using statistical tools, specifically descriptive statistics and compare each yearset's results.

Financial analysis was also part of this research since this information was available in the examined datasets [14] [16]. Regarding financial performance, spending remained stable over the last two yearsets, with average expenditures around \$50-\$60. However, only 25% of the advertisement receivers made a purchase, and 35% did not interact with the advertisement. Statistical calculations comparing the total records of individuals who watched the advertisement, those who bought things, or those who clicked on the advertisement and bought something revealed that 25% of customers who clicked spent below \$39, and another 25% spent above \$81. Customer ratings averaged 3.75, with 75% of ratings between 3.1 and 4.4, indicating high customer satisfaction. Furthermore, about 25% of customers made more than 38 previous purchases, demonstrating strong loyalty and repeat purchasing behaviour. To calculate this metric, data on individual accounts, number of orders, and clicks (or new accounts that result from clicks and remain loyal to the company) were used.

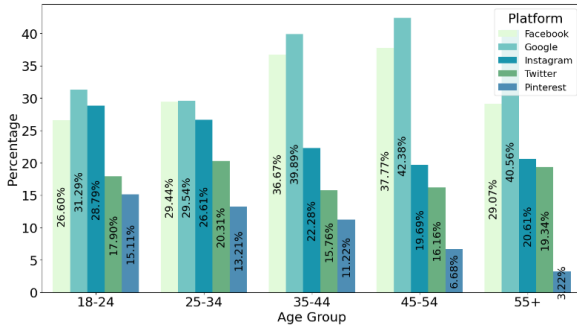


Fig. 3. Usage of Platforms by Age Groups Across years: 2019 - 2024

In the middle of the observed period, 2021-2022, a significant uptick was noted in the correlation between metrics and engagement satisfaction, coinciding with peak online marketing activities. Subsequently, these metrics declined over the following years, 2023-2024, reflecting changing dynamics in online marketing effectiveness.

6.2 Demographics and Targeting Preferences

Similar analysis conducted from a different point of view by analysing the preferences of each demographic group over the years. Figure 3 reveals a general overview of the most used platforms for searching and potential offerings by each age group. The percentage shows a person’s chance to search on this platform; an individual record could choose more than one favourable shopping platform since that percentage may yield some anomalies.

According to Figure 3, the young - middle-aged group is the most active on social media, while older people prefer Google. Current advertisements attract a diverse audience interested in fashion, home products, technology, health, and food. Notably, viewers now maintain a stable age distribution compared to previous years. The dominant platform is undoubtedly Google, with younger age groups interested in various categories such as home products, fashion, or technology and the oldest focusing on health, mainly receiving Facebook or Google Ads. At the same time, middle-aged individuals were seen as receivers of technology product ads, mainly shown on Google or YouTube.

Through network analysis and k-means clustering on several datasets [14][12], Google was identified as the most effective platform for brand awareness across all age groups. Applying this, with cluster size of k=3 and grouping the data by engagement levels revealed that Google consistently appeared as the primary platform for high engagement across all age groups. The average engagement rate for Google ads was 27.8% higher than the next leading platform, indicating its effectiveness in brand awareness campaigns. However, verifying these findings is limited due to the need for uniform data regarding campaign purposes across all datasets. The peak of this platform was during 2019-2020, but the emergence of other platforms, such as Facebook, Twitter, and Instagram, later eroded its monopoly. In subsequent years, all platforms contributed equally; Twitter replaced Google in brand awareness and Instagram for advertisements. A similar method was also applied for language

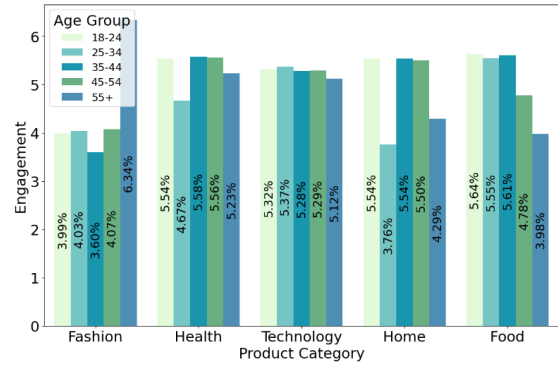


Fig. 4. Most Popular Offering by Age Group Engagement

efficiency in each platform, while similar limitations occurred. Facebook and Twitter, at the same time, were the most efficient platforms for English and Spanish advertising, while Instagram and Pinterest were versatile.

Five years ago, rapid engagement revealed on newer platforms for newer campaigns, which are not assisted anymore. According to this analysis, Instagram and Pinterest are the most promising for higher engagement of younger people, with Instagram defeating as the best conversation-driven platform among all ages. Predictive analysis using linear regression established a relationship between time and engagement rates and projected future engagement levels based on past data. Time series analysis ARIMA was employed to model the temporal dynamics of engagement, identifying seasonal patterns and trends. Instagram is expected to maintain the highest engagement rates among younger demographics, with interactions projected to grow by 25% over the next two years due to its conversation-driven features and user-friendly interface. Similarly, Pinterest is predicted to see a 15% increase in engagement among younger users, making it the second most promising platform.

Individuals show a high preference for Google. This is likely due to several factors. Google used to be the primary platform to promote digital marketing since it was a market leader; the other platforms did not have the shopping features they have now. While social media platforms are still making incremental progress, Google has been dominant for many years. Its extensive services, including Google Search, YouTube, and Google Shopping, provide users with a seamless and integrated experience, making it the go-to choice for many consumers.

Additionally, Google’s sophisticated algorithms and targeted advertising capabilities offer businesses an unparalleled ability to reach potential customers [1]. With many other platforms, such as Facebook and Instagram, making significant strides in implementing their shopping features, people often turn to Google or its affiliated websites to buy or search for their favourite items. This entrenched user behaviour and trust in Google’s ecosystem further reinforce its dominance in digital marketing [3][9].

6.3 Offering Preference and Seasonal Insights

Insights of this category have yielded consumer preferences, providing a clear understanding of the most purchased offerings categories

Product Category	Gender	Age Group	Platform	Engagement
Fashion	Male	55+	Twitter	6.71%
Fashion	Female	55+	Instagram	5.96%
Fashion	Male	25-34	Google	5.74%
Fashion	Women	25-34	Instagram	5.66%
Fashion	Men	45-54	Instagram	5.64%
Food	Women	35-44	Facebook	5.65%
Food	Women	18-24	Instagram	5.64%
Food	Women	25-34	Instagram	5.59%
Food	Men	35-44	Instagram	5.57%
Food	Men	25-34	Facebook	5.52%
Health	Women	45-54	Google	5.60%
Health	Men	18-24	Instagram	5.58%
Health	Women	35-44	Twitter	5.58%
Health	Men	45-54	Twitter	5.57%
Home	Men	18-24	Facebook	5.59%
Home	Women	35-44	Instagram	5.54%
Home	Men	35-44	Facebook	5.53%
Home	Men	45-54	Facebook	5.50%
Home	Women	18-24	Facebook	5.49%
Technology	Women	25-34	Twitter	5.62%
Technology	Men	25-34	Instagram	5.57%
Technology	Women	45-54	Facebook	5.51%
Technology	Male	18-24	Instagram	5.33%
Technology	Female	18-24	Google	5.31%

Table 1. Engagement rates for different product categories across various demographics and platforms

classified by age and gender over the last five years. This data focuses on customer loyalty and reveals the profound impact of online advertisements. Table 1 and Figure 4 illustrate product preferences by age and engagement score, presenting all interactions with the advertisement across all categories in the analyzed datasets (see Appendix).

The data encompasses details from recent years [16] [8] and is presented in Table 1. It contains a complete triangle between product preferences, demographic categories, and platform engagement percentages, crucial as it reveals the advertisement's audience and indicates where businesses should focus.

Results are explained in ascending age order for clarity, though they are presented in the table by engagement order to highlight higher engagement among platforms and offerings. Beginning from the youngest to oldest group, for ages 18 - 24, it is evident that the Instagram platform increasingly influences both genders, followed by preferences for Facebook and Google. Males tend to prefer health offerings while females lean towards food, each accounting for approximately 5.6% of purchases each. However, for pricier and more technological and fashion products, individuals search for Instagram or Google.

In the age group 25 - 34, data reveals consistent numbers regarding fashion and technology, with Facebook (females) and Instagram (males) being the dominant platforms. These digital advertisements contributed to 5.57% and 5.66% of engagement, respectively, underlining their impact on marketing strategies and sales trends.

Ages 35-44 tend to spend most of their time on Google and Facebook, although tending to make their purchases on Facebook, Instagram, and Twitter. Females are interested in the home and health categories through Instagram and Twitter, each accounting for a 5.59% engagement score, while males prefer Twitter for Fashion and Instagram for Food, reaching around 5.57% each.

The 45-54 age group shows a clear preference for Google, followed by Facebook and Instagram, particularly for fashion⁵. Despite the platform differences, all offerings, except nutrition-related advertisements, gained similar engagement at similar percentages, ranging from 5.2% to 5.6%, where they did not get the same engagement.

The older age group colouring the most noteworthy engagement with 6.7% for clothes on Twitter and Instagram; however, males and females are less interested in digital commerce, preferring platforms like Twitter and Google, with males engaging with technology and fashion offerings while females having similar interest on platforms like Instagram and Google with percentage striking around 5%, while other categories show dramatically lower engagement.

The insights from data analysis are not just numbers; they are keys to understanding customer behaviour and shaping marketing strategies. For instance, successful campaigns often feature home entertainment products prominently in Google or YouTube advertisements. Another conclusion shows that sales are heavily influenced by the season, with customers likely to make repeat purchases during sales. Applying these research conclusions has become crucial.

7 RESEARCH AND BUSINESS DISCUSSION

Based on the merge of the results and the literature review, exemplified various valuable strategies and recommendations. Over the past five years, the digital marketing outline has significantly altered and been influenced by evolving social media platforms, demographics, and behaviours. Comparing current trends with those from five years ago provides an overview of the network dynamics and targeted business recommendations.

Acceding the business strategies by demographics. Age group 18-24, showed a strong interest in health and fashion offerings through Instagram. This demographic is highly visual and influenced by peers and trends, which aligns with Lou's findings, emphasising the impact of visual platforms on younger audiences. To maximise engagement, companies should employ high-quality visuals and influencer partnerships to enhance the appeal and trustworthiness of products [13]. Leveraging Instagram Stories and interactive content such as polls and Q&A sessions can further engage this demographic [10]. Five years ago, young males were primarily interested in similar products on Facebook for cultural exchanges and inclusive interactions, enhancing community trust in purchasing decisions [2]. In contrast, females of similar age used Instagram and Pinterest to look for fashion inspiration and Facebook for social connections. Explaining shift transformation, Instagram offers a more dynamic and real-time platform for engagement, upgrading its shopping features [5].

Males aged 25-34 shifted their preference from fashion and technology to home offerings, still interested in all of them now. This

⁵Since Figure 4 reveals an overall percentage and Table 1 is about specific platforms, it is possible to be conducive for this result.

change reflects an increased interest in creating comfortable, tech-enhanced living spaces driven by lifestyle changes such as remote work and the impact of the global pandemic [6]. Businesses should provide detailed and informative content about home offerings on Google, including demonstrations, customer reviews, and in-depth articles about their features. Targeting Google Ads featuring product highlights and user testimonials can enhance credibility and engagement [15]. Same-age women show interest in fashion offerings through Facebook. Trends declined through the years, although they remain among this demographic group's top preferences. Chen also supports creating visually appealing content using high-quality images and videos, leveraging Instagram Stories and Reels for behind-the-scenes looks and styling tips, and collaborating with popular fashion influencers stay necessary [5].

The 35-44 age group shows interest in health, nutrition, and fashion offerings through Facebook. They were notably drawn to traditional advertising channels such as TV, print media and in-store experiences, as their engagement with social media was limited five years ago. At that time, Facebook was primarily used for personal connections rather than product discovery. However, they had a keen interest in similar categories five years later, online, driven by their desire for detailed information and reviews, reflecting the growing importance of informative and trustworthy content [6]. The shift towards digital platforms is motivated by the ease of accessing comprehensive product information and peer reviews online. Recommendations for businesses to focus on creating content such as video demonstrations, customer reviews, and interactive sessions [6].

Age groups 45-54 have historically gravitated towards fashion and health offerings traditionally in physical stores, perceiving them as more reliable. As the options were more extensive, assistance and questions could be asked, and most importantly, trust was built. Nevertheless, the credibility of online information and reviews, particularly those authored by professionals, has increased [15]. As a result, this age group have shifted towards using Google, Twitter and Instagram to search for their interests and make online purchases [3]. Therefore, search engine content should be optimised to enhance product information's visibility and effectively target this group [9]. Instagram's shopping features and partnerships have reinforced its position as a leading platform, creating visually appealing content that drives engagement and sales [13], while interactive content like giveaways and lives enrich user interaction and brand loyalty [10].

The older age group indicate a growing interest in Google's fashion. Five years ago, people aged 55+ primarily relied on traditional media, similar to the previous age group, since their online activity was limited. Nonetheless, the current trend within this group reveals a strong preference for fashion on Google. The shift towards digital platforms like Google is driven by increased digital literacy and the demand for reliable information at their convenience [18]. The global pandemic has accelerated the adoption of digital tools and services, making seniors more comfortable and reliant on online platforms for information and shopping [6]. In this case, businesses should prioritise Google Ads, emphasising wearables' practical benefits and reliability, focusing on further building trust and credibility

[6]. Given the growing voice search trend, optimising content for voice-activated devices can also enhance engagement [1].

Over the past five years, digital marketing has undergone significant changes in individual preferences and how advertisements must be presented to engage the audience. Google remains a leading player, although other social media shopping features have evolved, creating competition for Google's dominance [3]. Furthermore, more people used to making purchases and orders online; many new online shops, digital influencers, and promotions have entered the game and are making their footprints, especially after the pandemic [6]. Online shopping is now not only for young people but for everyone [1], making it more challenging for business to stay abreast of new trends and evolving consumer needs [15].

The results of this study have meaningful implications for industry practices. Future research can delve deeper into understanding the underlying factors driving these changes by highlighting the evolving consumer preferences and the dominant role of platforms like Google in digital marketing, comparing future results, and interviewing Google's single vending [3], involving individuals' psychological aspects and the effectiveness of different digital marketing strategies across various demographics. Policymakers can also use these insights to craft regulations that ensure fair competition among social platforms, promote transparency in online advertisements, and protect consumer privacy [9]. For industry practices, the findings suggest a need for businesses to continually adapt to the digital structure by leveraging advanced analytics, optimising content for search engines, and staying ahead of emerging trends. Companies should also invest in building trust with consumers through authentic and reliable online content. Overall, these results provide a road map for stakeholders to navigate the dynamic field of digital marketing, ensuring they remain relevant and effective in engaging their target audiences. Additionally, products must be promoted as sophisticated, making it challenging for companies to stay abreast of new trends and evolving consumer needs [15].

8 CONCLUSION

To conclude, this research introduces a novel approach to digital marketing and its societal implications, focusing on how users influence digital marketing campaigns through social media platforms, spanning three periods and using Python programming tools and custom-developed codes to identify patterns and trends, offer insights into practical business strategies and target audiences, and provide fresh perspectives and understanding social network dynamics [7].

The originality of this work lies in the up-to-date results achieved through innovative network analysis, statistical techniques, and literature study. This combination of new data visualization tools and current data provides companies with distinctive analytical insights and strategies.

Advances in understanding digital marketing's social impact and customer behaviour-based strategies are the main benefits of this investigation, aligned with practical business strategies.

The main limitations of this study are the time frame that restricts future applicability, the unspecified region, lies to the global approach, and the capture of overall trends but not regional specifics.

By understanding examined trends, businesses can optimize marketing strategies to better engage with target demographics and improve customer satisfaction and loyalty. The comprehensive approach and up-to-date analysis provide valuable insights to guide future strategies, ensuring they remain relevant and effective in a rapidly changing digital landscape [6].

This research underscores the practical implications of integrating advanced coding methodologies with digital marketing strategies. It analyses social media campaigns from 2019 to 2024, exploring various demographics, offerings and platforms. The rise of online activities, especially during the pandemic, has made people more comfortable with digital solutions, creating a new opportunity for digital technologies, leading to these findings.

The findings offer valuable insights into optimizing digital marketing strategies and understanding evolving social network dynamics. The research also addresses how digital marketing campaigns influence public decision-making and demonstrate significant advancements in targeting and engagement over the past five years [3]. This work provides businesses with practical strategies for effective digital marketing in today's rapidly changing technological framework [18].

9 LIMITATIONS

Limitations of this analysis include the specific time frame or focus on particular platforms and offerings and unspecified regions, which makes the trends general and not specific; this is aligned with the limited time frame between 2019 and 2024, which may limit the applicability of the results for future research as the findings may not be accurate in the hereafter. The specific time frame is a limitation because trends in digital marketing and user behaviour evolve rapidly, making the findings potentially outdated. However, a global approach was necessary to capture overall trends and developments, given the rapid change in user behaviour and perspectives. Another limitation could be the specification of two genders and sexes, excluding the other ones. An additional limitation is the inhomogeneity of the six datasets since not all of them include all the expected characteristics, and particular analyses were needed for results to be aligned with the examined product categories, making it impossible for other categories to be recognised. Recognising these limitations can inspire the audience to further explore and improve upon these findings in future analyses.

10 AI TOOLS USAGE

The AI tools that aim to be used in this investigation are Grammarly and ChatGPT. Respectively, the purpose of using the first mentioned one is for a more academic way of expressing the results, fixing grammar mistakes and, in some cases, vocabulary improvement. On the other hand, the second one has a programming and analysing assisting role that applies to help solve some programming errors that may occur in the code or even to understand some of the results if any difficulties were observed.

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11 APPENDIX

A RESULTS CALCULATIONS

The engagement score was already taken from the datasets, although to be more understandable, this is how it was calculated for this research:

$$\frac{\text{Interaction methods of } ProductCategory_y_1}{\sum \text{Interaction methods of } ProductCategory_y_x}$$

This engagement forms includes clicks, click links, purchases, shares, comments, likes, conversation values

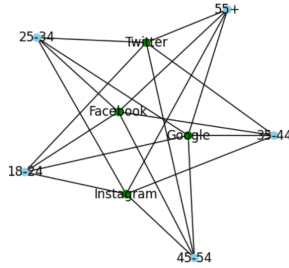


Fig. 5. Network Graph Showing Age Group and Platform Preferences

B METHODOLOGIES SAMPLES FOR EACH RESULT

B.1 Advertisement Interactions

Results in this section were primarily implemented using descriptive statistics, which provided clear statistical summaries and data visualization to identify patterns. Example functions were generated to calculate impressions, clicks, and interactions or to visualize them:

	Clicks	Impressions	Engagement_Score
mean	18153.670370	56034.236387	4.369217
std	11027.023294	32583.136334	3.156492

B.2 Demographic Target Preferences

Two primary analysis methods that were used in this section were Network Analysis and Data Visualisation. They help understand how different demographic groups interact with various platforms, revealing critical insights into user behaviour and preferences. For example, the graph shows a strong connection between the age group 18-24 and Instagram. The heatmap shows that younger age groups (18-24) have a high preference for Instagram, while older age groups (35-44) prefer Facebook. Supporting this, a network analysis map (Figure 5) visualises the preferences related to the platform and age of the examined records.

B.3 Product Preference

The results in this section were mainly gathered from Clustering and Predictive Analysis. K-means clustering helps group similar data points, making it easier to identify distinct segments within the data. Predictive Analysis allows for forecasting future trends based on historical data. Data Visualization was also helpful. For example, Cluster 1 shows higher average engagement among users aged around 35, suggesting a strong preference for specific offerings (home) in this demographic. At the same time, predictive analysis indicates that Google is expected to have high engagement rates in the future, particularly for brand awareness campaigns.

Cluster Summary:
 Cluster 0: Average Age - 25, Average Engagement - 300
 Cluster 1: Average Age - 35, Average Engagement - 500
 Cluster 2: Average Age - 45, Average Engagement - 200

Predictive Analysis:
 Predicted Engagement for Google Cluster: 550

C FIGURE 3 AND TABLE 1 RELATION

To avoid confusion between Figure 3 and Table 1, Figure 3 indicates where individuals of each age prefer to spend their time. However, Table 1 demonstrates where businesses target to engage the audience. These findings are possibly contradictory, as they illustrate where individuals focus (Figure 3) and where the company tends to make the most sales (Table 1). A thorough comparison of these viewpoints will be presented in the subsequent business discussion.

D OFFERING CATEGORIES

These categories cover a wide spectrum of current individual interests.

Home Products: furniture, smart home devices, interior tips, decorations, etc.

Food: ordering food online, nutrition tips, recipes, cooking books, and diet suggestions.

Fashion: clothes, accessories, styling tips, trends, and fashion shows.

Technology: technological products, gadgets, gaming competitions, events such as robotic exhibitions.

Health: medicines, fitness exercises and tips, online doctors or psychologists, including items and services.