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Social media usage and perceptions of pop-up advertisements among Universiti Utara Malaysia students: A quantitative analysis

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ABSTRACT

The increasing reliance on digital technology has significantly shaped the media consumption behaviors of young adult students, making them a key demographic in digital engagement and online marketing. This study investigates the digital behavior and media consumption patterns of students at Universiti Utara Malaysia (UUM), with a particular focus on their interaction with social media platforms and responses to digital advertisements. Using a quantitative research approach, participants were selected through convenience sampling, and data were collected from 255 students. Descriptive and correlational analyses were conducted later, and the results were visualized using a Power BI dashboard. The findings reveal that students aged 18 to 25 are the most active digital users, primarily engaging with TikTok (76.5%) and Instagram (62%) while spending an average of 2 to 4 hours daily on social media. However, despite their high digital literacy, these students exhibit strong skepticism toward pop-up advertisements, with over 65% expressing dissatisfaction due to perceived intrusiveness and irrelevance. Moreover, it is highlighted that students with higher education levels are more receptive to advertisements, while those who spend excessive time on social media become increasingly critical of digital ads. This study concludes that young adult students are highly engaged in digital media but require targeted, personalized, and credible advertising strategies to enhance ad effectiveness. Future research should explore evolving digital trends and their long-term impact on young adults' media consumption and purchasing behavior.

Keywords: Digital advertisements, digital behavior, media consumption, social media usage

INTRODUCTION

Background of Study

Digital behavior is the study of how individuals or groups behave and interact in digital environments, such as the social media platforms they use, the time they spend accessing them, and the frequency of their access. This behavior manifests across multiple digital platforms, including the internet, mobile devices, and social media (Hartmann et al., 2021). However, with the advent of technology such as smartphones, tablets, and laptops, the digital environment has become a game-changer and a crucial tool in daily life. These situations have increased digital literacy and indirectly changed people's reactions in the digital environment, especially among those born after the advent of the internet, compared with those living before it.

Nevertheless, statistics show that youth have among the highest levels of digital literacy, influenced by early adoption and adaptation to technology, with 88.70% of Malaysian internet users being youth aged 20 to 49 (MCMC, 2020). This can be explained by the resources and basic training in Information and Communication Technology (ICT) that were provided in the early stages of life. For instance, in 2024, Meltwater stated that Malaysia's digital usage is seeing a consistent 1.1% increase in online engagement, reaching 97.4% of the population. On the other hand, the number of social media user identities has increased by 20%, with a current total of 28.68 million people actively maintaining a social media presence, indicating growth in digital literacy in Malaysia (Howe, 2024).

MCMC (2020) also reported that Malaysian youth are avid users of social media technologies, with the highest engagement observed on Facebook, YouTube, and Instagram. Moreover, a significant portion of users engage with these platforms daily, with WhatsApp and Facebook remaining among the top choices for peer-to-peer communication. In addition, Malaysia's internet penetration rate reached 97.4% of the population in 2024, marking a significant increase in internet users over the years. Among the most active users of digital platforms, young adults, particularly those aged 18 to 24, exhibit a high level of digital literacy (DataReportal, 2024). Despite this, there is a noticeable gap in understanding how young adults engage with digital media, their preferences, and their responses to digital advertising. Therefore, to address this gap, it is essential to gain detailed insights into the digital consumption patterns, preferences, and responses to advertising of young adults. This study aims to contribute to this understanding by analyzing digital media usage among youth at UUM and evaluating students' behavioral responses to digital advertisements.

Problem Statement

The advent of the internet and social media has been a major leap for society in accessing information about everything available on or spread through them. Therefore, without our notice, the digital behavior of young adults has changed compared with that of the previous generation due to the accessibility of social media in this era (Namay & Eh, 2021). Young adults' engagement with social media is distinct from that of other age groups due to their transitional life stage, which includes higher education and early career development. According to Schønning et al. (2020), this age group is particularly susceptible to social media's influence, which can affect their mental health, social interactions, and consumer behavior in ways that differ from those of other age groups. Young adults are often early adopters of new digital platforms and technologies, making them a prime group for understanding current and emerging trends in digital consumption (Lou & Yuan, 2019; Wang et al., 2019). Additionally, previous studies have documented distinct patterns of internet consumption, device use, and digital media engagement among students. However, there is still a gap: studies are only valid in

Sri Lanka, and tailored studies across regional contexts are necessary to understand local nuances better (Thilina et al., 2020).

In this state, there is a gap in understanding the digital behavior and engagement patterns of young adults at UUM, generally aged 18 to 25. Despite the high digital literacy rate and widespread social media use among young adults, information about their social media interactions, content preferences, and responses to digital advertisements remains limited, making it difficult for marketers to reach and engage this demographic effectively. This reflects the rapid adoption of digital technology and the widespread access to information through social media among young adults, with factors such as affordable internet access, the proliferation of smart devices, and high digital literacy contributing to this trend. According to a study by Freberg et al. (2021), social media engagement among youth continues to increase, with young adults among the highest users of digital platforms. This widespread engagement has created a need for a deeper understanding of young adults' responses to digital advertisements. To bridge this gap, it is crucial to gain a comprehensive understanding of young adults' digital consumption patterns, preferences, and responses to advertisements. This can be achieved through a dashboard that visualizes students' digital behaviors at UUM.

Objectives of the Study

1. To analyze digital media usage among students at UUM through data visualization in Power BI.
2. To evaluate the behavioral responses of UUM students towards digital advertisements through statistical analysis using the Statistical Package for the Social Sciences (SPSS).

Significance of Study

The significance of this study lies in its potential to provide valuable insights into the digital consumption patterns and behavior of students at UUM, specifically those aged 18 to 25. In the context of a rapidly evolving digital landscape, understanding the digital behaviors and consumption patterns of young adults is crucial for addressing the gap created by the widespread use of digital technology in society. Therefore, this research addresses the gap in the existing literature regarding how young adults engage with digital media, their preferences, and their responses to digital advertising. Furthermore, this study aims to bridge this gap by offering comprehensive insights into the digital behaviors and media consumption patterns of this demographic.

Next, the study's findings are expected to offer practical benefits for marketers and advertisers. According to Casaló, Flavián, and Ibáñez-Sánchez (2020), social media users, particularly youth, engage more with personalized and interactive advertising formats. These factors have indirectly created a crucial gap in understanding how potential customers, particularly youth, engage with advertisements in digital environments. Therefore, understanding how students at UUM interact with digital media and respond to digital advertisements enables businesses to design more effective marketing strategies tailored to this demographic's preferences and behaviors.

In summary, this could lead to improved engagement and conversion rates, thereby enhancing the effectiveness of digital marketing campaigns targeted at youth. This study not only fills a critical gap in existing research but also offers a practical benefit for businesses and contributes to the broader field of digital media studies.

LITERATURE REVIEW

Digital Behavior in Young Adults

Digital behavior encompasses all activities that consumers engage in utilizing technological advancements such as laptop computers, mobile phones, and tablets. These behaviors include social media interaction, entertainment consumption, digital communication, and membership in online societies (Hartmann et al., 2021). However, for Liu and Huang (2020), the consideration of behavior began with digital academic reading behavior, which examines students' interactions with various interfaces within learning programs and finds that these interactions directly impact academic performance and information literacy. This shows that digital behavior is more than just a way to interact or find amusement, but is also crucial for achieving learning objectives, solving problems, and engaging in mental activity.

Moreover, technology affects cognitive development, social relationships, and psychological well-being in different ways. One significant area is virtual fandom communities. The existing literature suggests that being active in online communities helps reduce loneliness and increase social support during times of isolation, such as the COVID-19 pandemic (Kim et al., 2023). As Lou and Yuan (2019) suggest, adolescents shape their perceptions, attitudes, and even purchasing decisions based on the perceived trustworthiness of social media influencers. This shows that digital behavior encompasses much more than engaging with content; it also includes participation in identity development and active choices.

Next, digital communication can significantly impact mental health. As noted by Everson-Rose and Lewis (2023), the social quality of interactions, whether virtual or face-to-face, matters greatly for social connectedness and mental health. Analyzing these factors in young adults' digital behavior is important for educators, parents, and policymakers. Recognizing the signs of digital overexposure can help craft policies that promote better study habits and, ultimately, educational achievement. Woliba (2023), for instance, speaks of students regaining control over their devices and attention through "digital detoxes," neutral breaks aimed at redistributing focus and reducing distractions for better concentration.

To summarize, emerging adults' online behavior interacts with their psychological well-being, social life, and academic achievement in various ways. The platforms provide suitable avenues for learning and socialization. However, overindulgence can have dire outcomes. It is essential to strike a balance between engaging in digital activities and taking necessary precautions.

Digital Literacy and Its Impact on Behavior

The term 'digital literacy' encompasses the competencies needed to access, assess, produce, and disseminate information using digital technologies. Compared with other age groups, the level of digital literacy among young adults in higher education varies across several factors, including gender, maternal education level, and socioeconomic class. Gender differences in the digital space are well documented, with some male and female students displaying differing levels of digital literacy (Karagul et al., 2021). Several studies note a gap in self-assessed digital literacy, with females reporting lower levels than males and with less advanced tools available to them.

Apart from gender considerations, university students face major challenges in digital literacy, particularly in assessing the credibility of information available online. Dadaczynski et al. (2020) reported that students had serious difficulties distinguishing between genuine and pseudo-factual sources of information, especially regarding healthcare data during the COVID-19 pandemic. This highlights the impact of low digital literacy on public health and further underscores the need to teach the evaluation of digital information in higher education. On the other hand, individuals with limited digital literacy are more likely to engage in reckless behavior online, such as sharing sensitive

information or falling victim to fraud (Htay et al., 2022). This demonstrates the growing demand for digital literacy programs that equip learners with the skills and information needed to navigate online spaces safely and responsibly.

Digital literacy skills vary from person to person owing to their socioeconomic status. Inan et al. (2021) explain that students from higher socioeconomic backgrounds tend to have greater access to digital resources, which aids in the development of their digital skills at a younger age. Bridging the gap requires measures to improve funding and access to digital resources and internet connectivity, as well as targeted educational policies that enable all learners, regardless of socioeconomic background, to acquire crucial digital skills (Inan et al., 2021). A similar trend is noticed with younger adults with disabilities around the world. Cullen et al. (2020) highlighted the barriers to digital literacy that other disabled students face in Canada.

The success of young people in all aspects of information technology is measured by their digital literacy, which includes the ability to assess information found online, navigate the internet safely, and participate in online learning. However, inequalities in digital literacy, regardless of gender, economic status, or disability, pose a serious challenge. Digital discrimination, such as unequal access to education and digital resources, and policies that promote inclusivity pose challenges to addressing these gaps. Enhancing the digital skills of young adults ensures they can responsibly and effectively engage in various digital activities.

Digital Media Consumption Patterns

Social media platforms such as WhatsApp, Facebook, YouTube, and Instagram remain highly relevant to Malaysian youth, facilitating communication, social networking, and content consumption. The use of digital media among Malaysian youths reflects global trends and adapts to unique local needs. The Malaysian Communications and Multimedia Commission (MCMC, 2020) reports that 94.4% of youths in Malaysia are active on social media, and a significant number spend more than 3 hours a day on it.

Another notable feature of digital media consumption in Malaysia is the emphasis on text communication. Unlike the broader world, which is tilting towards visual and video content, Malaysian youths still engage with each other textually, particularly on Facebook and WhatsApp. As stated by MCMC (2020), Facebook remains the leading digital platform, with 91% of young adults in Malaysia considering it a mainstream social media outlet. On the other hand, widely studied fragments of visual communication also show activity around the globe. YouTube and Instagram are popular among users who want to watch videos, be entertained, or view photos. The recent trend of short video clips, especially on TikTok, reflects increased demand for active participation in media.

Social media is a primary news source for over 70% of Malaysian youths (MCMC 2020), raising concerns about digital literacy and misinformation. The availability of content on digital platforms demands the ability to evaluate information critically, addressing global concerns about misinformation (Dadaczynski et al., 2020). Digital media consumption has also influenced education, e-commerce, and activism, with youth using digital tools for learning, shopping, and promotions. Malaysian youth blend traditional text-based communication with emerging visual trends, a dynamic that is crucial to consider for digital literacy, online safety, and economic opportunities, revealing the need for effective policies and initiatives.

Behavioral Responses Towards Digital Advertisements

The impact of digital advertisements largely depends on how young adults engage with and respond to them. It was shown that customized and interactive marketing approaches elicit greater user participation, including clicking and sharing on social media platforms, compared to standard ads (Lou & Yuan, 2019). Adjusting advertising strategies based on user preferences is vital to effectiveness, as advertisements tailored to users' interests, browsing history, or demographics are more likely to capture their attention. Specifically, younger people respond more positively to marketing messages that reflect their interests, further demonstrating the effectiveness of data-driven advertising strategies.

The use of skippable ads is a notable behavioral response of young adults towards digital advertising. Younger users are especially fond of the option to skip video ads after a few seconds. Users report a greater sense of control over ads because they are not frustrated by lengthy video ads they cannot skip. According to Casaló et al. (2020), skippable ads ensure that only relevant content is watched, as users tend to watch ads that interest them. Therefore, advertisers need to craft captivating opening sections to capture attention in the first few seconds and ensure users do not skip the ad.

Also, the content of advertisements plays an important role in the purchasing decisions of young adults. Humorous ads that tell an emotional story or provide useful information are more effective than commercials that solely focus on selling. Young consumers are more engaged and more likely to recall advertisements with emotional appeals, as argued by Bartsch and Oliver (2020). Humorous adverts also tend to go viral on social media, increasing the brand's visibility. Though engaging advertisements foster positive perceptions about a brand, those ads need to be authentic to avoid coming off as manipulative or deceptive. Regardless of the anticipated tone of interactions, ad avoidance remains a major problem in digital advertising. Many young people actively try to avoid advertisements they deem unhelpful or irrelevant. Redondo and Azanor (2021) noted that the use of ad blockers is particularly pronounced among young adults. This suggests that younger adults feel the need to control their interaction with online content. The evolution of ad-blocking technologies prompts marketers to shift from conventional digital advertising practices to marketing that is less susceptible to censorship, such as sponsorships and unpaid brand endorsements.

Equally important to young adults' reactions to digital advertising is trust and credibility. Young adults tend to respond positively to advertisements of brands that are already part of their lives. Therefore, the marketing credibility of this influencer augments that of the ad, since these personalities are perceived as ordinary individuals with meaningful relationships with their audience (Freberg et al., 2021). When influencers endorse products in an unscripted way, their fans are more likely to trust those recommendations, which makes influencer marketing effective. On the other hand, too many sponsorships will inevitably lead people to believe that this kind of marketing is disingenuous, reducing the impact of social media advertising.

In conclusion, for marketers hoping to create effective campaigns directed at young adults, understanding their online behavior, media consumption, and responses to digital ads is of paramount importance across all areas of marketing. Custom-tailored solutions in advertising, texting, creativity, reliability, or trust also require adapting to ad avoidance and integrating ad-blocking technology. Through authentic connections with their customers, brands can use data intelligently and adapt their digital advertising campaigns to make them more appealing to the younger demographics.

Digital Behavior Analysis Methods and Tools

An array of methods and tools is used in digital behavior analysis to track user interactions, engagement patterns, and trends. These include descriptive analysis, machine learning, sentiment and evaluative methods, data visualization, GIS, and network analysis tools, all of which enhance the understanding of digital behavior. Without a doubt, descriptive analytics is the complementary tool for interpreting information when analyzing behavior associated with data and technology. The mean, median, and standard deviation are among the simplest measures of central tendency and variability in descriptive statistics for a dataset and its components. On the other hand, large datasets can be analyzed for relationships, and hypotheses can be formulated and tested using regression analysis, t-tests, and ANOVA, which fall under inferential statistics (Hartmann et al., 2021). Howe (2024) explained that dashboards track participation and engagement patterns on various platforms, providing essential analytics.

The growing ecosystem of big data analytics has expanded the scope for applying machine learning algorithms to analyze digital behavior. Liu and Huang (2020) utilized a decision tree, Random Forest, and Support Vector Machine (SVM) to analyze digital media consumption, user participation, and engagement. Their study showcased the persistence of robust accuracy in machine learning models for predicting user-initiated actions relative to prior actions in the digital sphere. On the other hand, sentiment analysis, which evaluates emotional sentiment in user-generated content, is increasingly used in digital marketing to refine targeted ads (Kim et al., 2023). Evaluative methods like surveys and qualitative tools, including interviews and focus groups, provide in-depth insights into user behavior (Dadaczynski et al., 2020).

Data visualization techniques, using tools like Tableau and Power BI, simplify complex datasets, highlighting trends through visual representations. Wang et al. (2019) used exploratory data analysis (EDA) to illustrate trends in students' digital media consumption. GIS technology augments digital behavior analysis by tracking movements and interactions across spatial dimensions, helping to analyze regional variations in digital activity (Sprout Social, 2024). Network analysis tools like Gephi and Cytoscape examine virtual communities and user interactions, providing insights into brand marketing and information dissemination (Freberg et al., 2021).

In summary, this paper presents a descriptive analysis and applies the dashboard approach in Power BI to visualize data and enhance understanding of digital behavior patterns among UUM students. Dashboards are considered efficient due to their comprehensive, interactive capabilities for visualizing trends in digital engagement and usage across social media platforms. Thus, the Power BI application can present dynamic visualizations that go beyond simply conveying the vital elements, enabling analysis through interaction at different levels.

METHODOLOGY

Phase 1: Problem Identification

The research begins by identifying the core problem and conducting a literature review on digital behavior and media consumption patterns among students. This review helps clarify existing trends, challenges, and issues regarding digital engagement, specifically pop-up ads. Gaps in current research are identified, which justify the need for this study. Based on the findings, clear research objectives are defined, establishing the direction for the subsequent phases of the study.

Phase 2: Data Collection and Preprocessing

In this phase, data were collected through a survey administered to 255 students at Universiti Utara Malaysia. The survey consisted of closed-ended questions that measured key variables, including demographics (age, gender, education level, and income), social media usage patterns, and behavioral responses to pop-up ads. The survey used a 5-point Likert scale (1 to 5) for responses. Next, data preprocessing was conducted to ensure the accuracy, consistency, and reliability of the dataset collected from 255 students at Universiti Utara Malaysia. Initially, missing data were identified using statistics and visual diagnostic techniques. For variables with minimal missing data, imputation was performed to restore completeness. Numerical variables were imputed using the mean or median, depending on the data distribution, while categorical variables were handled using the mode or forward/backward fill methods.

Phase 3: Data Analysis

The collected data were analyzed using SPSS version 23.0, while Power BI was employed to develop the dashboard. To evaluate the dataset, a quantitative descriptive analysis was executed. Raw data points were aggregated and summarized using key statistical parameters, specifically frequencies, percentage representations, mean score ranges corresponding to low, moderate, or high levels, and standard deviations. In addition, pie charts and bar charts were used to present the respondents' demographic profile. A boxplot was applied to identify substantial variability in students' perceptions, and the normality test indicated that the data were not normally distributed. Consequently, a correlation analysis was conducted to examine relationships among media consumption patterns, age, education level, time spent on social media, and digital behavior. Finally, Power BI facilitated the development of an interactive dashboard that visually presented these relationships and trends, thereby enhancing the interpretation and overall understanding of the data.

Phase 4: Interpretation of Results

Finally, the interpretation of results phase involved synthesizing the data analysis to draw conclusions that address the research questions. This phase plays a pivotal role in translating statistical findings into meaningful insights. By examining the relationships between key variables such as age, education level, and time spent on social media, the study provides a deeper understanding of students' digital behavior and their responses to pop-up advertisements. The results are validated to confirm their accuracy and align with research objectives. If necessary, refinements in the data analysis process are made to enhance precision. This phase ultimately ensures that the conclusions drawn are reliable and contribute to a deeper understanding of students' digital behavior and media consumption.

RESULTS

Demographic Analysis

The study comprised 255 respondents with a fairly balanced gender distribution. Table 1 shows that the study comprised 51.4% females (131 respondents), slightly higher than males at 48.6% (124 respondents). This balance reflects the diversity within the student population. Meanwhile, the majority of respondents (81.6%) were between 18 and 25, reflecting the student body's primary demographic (see Table 2). The smaller proportions are in older age groups (26-35: 12.2%, 36-55: 5.1%).

Table 1

Gender Distribution

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	131	51.4	51.4	51.4
	Male	124	48.6	48.6	100.0
	Total	255	100.0	100.0	

Table 2

Age Distribution

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18–25 years	208	81.6	81.6	81.6
	26–35 years	31	12.2	12.2	93.7
	36–55 years	13	5.1	5.1	98.8
	Over 55 years	3	1.2	1.2	100.0
	Total	255	100.0	100.0	

Table 3 shows that a significant portion of respondents (52.9%) held a bachelor's degree, with the remainder distributed across other levels, including Diplomas (31%), master's degrees (13.7%), and PhDs (2.4%). This distribution indicates that the sample includes both undergraduate and postgraduate students, with most being undergraduates. Meanwhile, the majority (71.8%) had a monthly income of less than RM3,000, which aligns with the typical income level for full-time students, as summarized in Table 4. This finding highlights the financial diversity within the student body, with some respondents in higher income brackets (6.7% earning RM7,000–RM14,999).

Table 3

Education Level Distribution

Educational Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma or Its Equivalent (STPM, Foundation Studies, Matriculation, A-Level, Malaysian Skills Diploma - Level 4, Malaysian Advanced Skills Diploma - Level 5)	79	31.0	31.0	31.0
	Bachelor's Degree	135	52.9	52.9	83.9
	Master's Degree	35	13.7	13.7	97.6
	PhD	6	2.4	2.4	100.0
	Total	255	100.0	100.0	

Table 4

Monthly Income Distribution

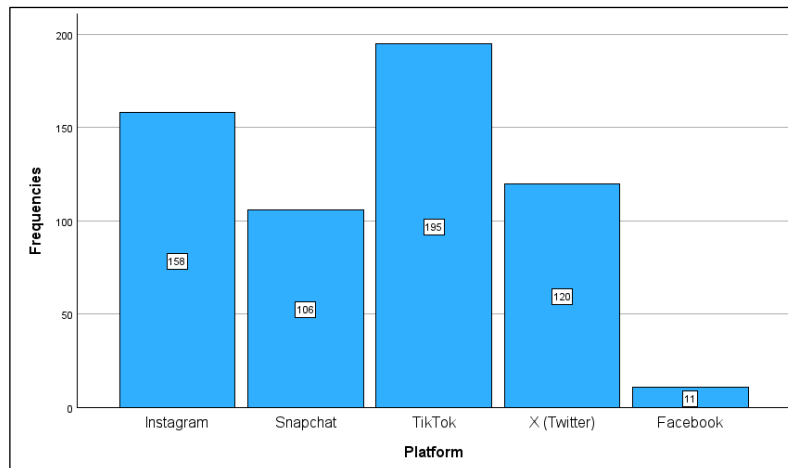
		Monthly Income			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than RM3,000	183	71.8	71.8	71.8
	RM3,000 - RM6,999	52	20.4	20.4	92.2
	RM7,000 - RM14,999	17	6.7	6.7	98.9
	RM15,000 and above	3	1.2	1.2	100.0
	Total	255	100.0	100.0	

Social Media Usage Patterns

It was found that 76.5% of respondents used TikTok, with Instagram (62%) and X (47.1%), as illustrated in Figure 1, reflecting the strong preference for short-form and visual content.

Figure 1

Type of Platform



Meanwhile, Table 5 shows that daily social media use was high, with 39.6% spending over 4 hours online, underscoring the central role of digital platforms in students' lives.

Table 5

Hours Spent on Social Media

		How many hours do you spend on social media daily?			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 hour	18	7.1	7.1	7.1
	2 hours	71	27.8	27.8	34.9
	3 hours	65	25.5	25.5	60.4
	More than 4 hours	101	39.6	39.6	100.0
	Total	255	100.0	100.0	

Digital Behavior toward Pop-Up Ads (Likert Scale 1–5: 1=Strongly Disagree to 5=Strongly Agree)

Interestingly, a significant 33.3% strongly disagreed, and 31.4% disagreed, accounting for 64.7% of the total responses, as indicated in Table 6. Only 10.2% had a neutral stance, and 21.6% found pop-up ads somewhat fun, while just 3.5% strongly agreed. The mean score of 2.31 indicates that most students view pop-up ads unfavorably, with moderate variability in the responses (standard deviation = 1.236), suggesting some diversity in attitudes.

Table 6

Perception of Pop-Up Ads

I find pop-up ads fun.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	85	33.3	33.3	33.3
	2	80	31.4	31.4	64.7
	3	26	10.2	10.2	74.9
	4	55	21.6	21.6	96.5
	5	9	3.5	3.5	100.0
	Total	255	100.0	100.0	

Meanwhile, Table 7 shows that 43.9% strongly disagreed and 27.5% disagreed, for a total of 71.4% of responses. Only 10.2% were neutral, while 15.7% actively sought to retain pop-up ads, indicating a small minority found them appealing. The mean score of 2.19 further emphasizes that most students do not find retaining pop-up ads desirable, with moderate variability (standard deviation = 1.427) reflecting some differing opinions.

Table 7

Preferences of Pop-Up Ads

I always look for a way to keep pop-up ads.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	112	43.9	43.9	43.9
	2	70	27.5	27.5	71.4
	3	26	10.2	10.2	81.6
	4	7	2.7	2.7	84.3
	5	40	15.7	15.7	100.0
	Total	255	100.0	100.0	

In addition, significant dissatisfaction is evident in the ad content, with 36.5% strongly disagreeing and 29.4% disagreeing, collectively accounting for 65.9% of responses, as shown in Table 8.

Table 8

Perception of Pop-Up Ads

The content that appears in the ad is very attractive.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	96	37.6	37.6	37.6
	2	56	22.0	22.0	59.6
	3	31	12.2	12.2	71.8
	4	37	14.5	14.5	86.3
	5	35	13.7	13.7	100.0
	Total	255	100.0	100.0	

Only 8.6% were neutral, indicating indifference, while 20% expressed moderate satisfaction (rating “4”), and 5.5% strongly agreed (see Table 9). The mean score of 2.29 further supports the general dissatisfaction with pop-up ads, with a standard deviation of 1.292 indicating moderate variability, suggesting that while most students are dissatisfied, there is some diversity in opinions.

Table 9

Satisfaction with Pop-Up Ads

I am satisfied with pop-up ads on social media.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	93	36.5	36.5	36.5
	2	75	29.4	29.4	65.9
	3	22	8.6	8.6	74.5
	4	51	20.0	20.0	94.5
	5	14	5.5	5.5	100.0
	Total	255	100.0	100.0	

On the other hand, most students believe pop-up ads do not meet their needs, as exhibited in Table 10. A significant 44.7% strongly disagreed, and 21.2% disagreed, totaling 65.9% of respondents expressing negative sentiment. Only 10.2% were neutral, while 20% rated the ads as somewhat beneficial (rating “4”), and just 3.9% strongly agreed. The mean score of 2.17 highlights overall dissatisfaction, with a standard deviation of 1.296 indicating moderate variability, yet a clear dominance of negative responses suggests a mixed perception among students.

Table 10

Apps Meeting Needs and Expectations in Pop-Up Ads

The level of ads that pop up from apps meets my needs and expectations.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	114	44.7	44.7	44.7
	2	54	21.2	21.2	65.9
	3	26	10.2	10.2	76.1
	4	51	20.0	20.0	96.1
	5	10	3.9	3.9	100.0
	Total	255	100.0	100.0	

Significantly, 28.2% strongly disagreed, and 21.6% disagreed, together accounting for 49.8% of responses, suggesting skepticism about the perceived superiority of brands in pop-up ads as summarized in Table 11. A smaller 9.8% were neutral, while 18% rated the statement as somewhat true (rating “4”) and 22.4% strongly agreed (rating “5”), indicating that a notable group believes the brands featured in pop-up ads are superior. This suggests a divided opinion: a significant portion of students is skeptical, while a notable group perceives these brands positively.

Table 11

Recommended Brands in Pop-Up Ads

Top brands recommended in pop-up ads are better than other brands.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	72	28.2	28.2	28.2
	2	55	21.6	21.6	49.8
	3	25	9.8	9.8	59.6
	4	46	18.0	18.0	77.6
	5	57	22.4	22.4	100.0
	Total	255	100.0	100.0	

Table 12 shows a significant 36.1% strongly disagreed, and 27.5% disagreed, making up 63.6% of the responses, reflecting widespread distrust toward products promoted through pop-up ads. Only 14.5% were neutral, and 18.8% somewhat agreed (rating “4”), suggesting some level of trust in these ads. A minimum of 3.1% strongly agreed, indicating that only a small group finds pop-up ads trustworthy. The mean score of 2.35 reinforces the general skepticism, with a standard deviation of 1.217 suggesting moderate variability in responses. While most students are skeptical, a small minority remains receptive to the credibility of pop-up ads. The figure also shows a more balanced distribution compared to trust. While 23.9% strongly disagreed and 27.5% disagreed, indicating skepticism, these two groups

accounted for 51.4% of responses. A smaller portion, 14.5%, remained neutral, suggesting some ambivalence.

Table 12

Trust in Products Advertised in Pop-Up Ads

I trust products that advertise in pop-up ads.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	92	36.1	36.1	36.1
	2	70	27.5	27.5	63.5
	3	37	14.5	14.5	78.0
	4	48	18.8	18.8	96.9
	5	8	3.1	3.1	100.0
	Total	255	100.0	100.0	

However, 24.3% agreed that purchasing through pop-up ads is feasible, and 9.8% strongly agreed, indicating that a subset of students finds it plausible (see Table 13). The mean score of 2.69 suggests an overall tendency toward doubt, but with mixed perceptions. The standard deviation of 1.332 reflects variability, indicating that while some students are open to engaging with products through pop-up ads, others remain hesitant.

Table 13

Possibility to Buy from Pop-Up Ads

It is possible to buy a product from pop-up ads.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	61	23.9	23.9	23.9
	2	70	27.5	27.5	51.4
	3	37	14.5	14.5	65.9
	4	62	24.3	24.3	90.2
	5	25	9.8	9.8	100.0
	Total	255	100.0	100.0	

Table 14 shows that 27.5% strongly disagreed and 38% disagreed, together accounting for 65.5% of responses, indicating that most students are unlikely to recommend products seen in pop-up ads. Only 13.3% were neutral, and 18.4% agreed to some extent (rating “4”), suggesting that a small group may occasionally recommend such products. 2.7% fully agreed (rating “5”), further emphasizing the general reluctance. The mean score of 2.31 reinforces the tendency not to recommend, with a standard deviation of 1.141 showing that most responses are concentrated at the lower end of the scale, indicating less variability in opinions.

Table 14

Recommendations of Products or Services from Pop-Up Ads

I generally recommend products or services from pop-up ads.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	70	27.5	27.5	27.5
	2	97	38.0	38.0	65.5
	3	34	13.3	13.3	78.8
	4	47	18.4	18.4	97.3
	5	7	2.7	2.7	100.0
	Total	255	100.0	100.0	

Moreover, significant variability in students' perceptions of pop-up ads is evident, with responses mostly clustering around negative or neutral views, as summarized in Table 15. Students generally do not find pop-up ads engaging, as reflected in low mean scores for statements like "I find pop-up ads fun" (mean: 2.31) and "I always look for a way to keep pop-up ads" (mean: 2.19). Trust in pop-up ads and products advertised through them is also low (mean: 2.25), with limited willingness to recommend such products (mean: 2.31). However, there is greater variability in responses regarding the feasibility of purchasing through pop-ups (mean: 2.69) and the perceived superiority of brands in pop-up ads (mean: 2.85). This suggests that, while skepticism prevails, some students see the potential value of well-targeted pop-up ads. The high standard deviations across these statements highlight the diverse opinions, indicating that personalized, relevant ads may have a greater impact on certain students. These findings suggest that improving the credibility and relevance of pop-up ads could enhance engagement.

Table 15

Survey Responses on Pop-Up Ads

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
I find pop-up ads fun.	255	1	5	2.31	1.236
I always look for a way to keep pop-up ads.	255	1	5	2.19	1.427
The content that appears in the ad is very attractive.	255	1	5	2.45	1.457
I am satisfied with pop-up ads on social media.	255	1	5	2.29	1.292
The level of ads that pop up from apps meets my needs and expectations.	255	1	5	2.17	1.296
Top brands recommended in pop-up ads are better than other brands.	255	1	5	2.85	1.551
I trust products that advertise in pop-up ads.	255	1	5	2.25	1.217
It is possible to buy a product from pop-up ads.	255	1	5	2.69	1.332
I generally recommend products or services from pop-up ads.	255	1	5	2.31	1.141
Valid N (listwise)	255				

Correlation Analysis (Convergent Behavior)

In this study, non-parametric methods were used in correlation analysis because the data were not normally distributed across all items, and non-parametric tests are more appropriate for hypothesis testing. Kendall's tau-b was used to analyze correlations, revealing significant relationships among age group, education level, and time spent on social media (HourSpend). Table 16 shows that age and education level are strongly positively correlated (Kendall's tau-b: 0.536, Spearman's rho: 0.569, $p < 0.001$), suggesting that older students tend to have higher education levels. However, age group and time spent on social media are weakly negatively correlated (Kendall's tau-b: -0.131, Spearman's rho: -0.144, $p < 0.05$), suggesting that older students tend to spend slightly less time on social media. Education level and hours spent on social media also have a moderate negative correlation (Kendall's tau-b: -0.339, Spearman's rho: -0.383, $p < 0.001$), implying that students with higher education levels spend less time on social media. These findings highlight the potential influence of both age and education on social media usage patterns, with more educated or older students tending to engage less with social media.

Table 16

Demographics and Spending Correlation

Correlations			AgeGroup_num	EducationLevel_num	HourSpend
Kendall's tau_b	AgeGroup_num	Correlation Coefficient	1.000	.536**	-.131*
		Sig. (2-tailed)	.	<.001	.021
		N	255	255	255
	EducationLevel_num	Correlation Coefficient	.536**	1.000	-.339**
		Sig. (2-tailed)	<.001	.	<.001
		N	255	255	255
	HourSpend	Correlation Coefficient	-.131*	-.339**	1.000
		Sig. (2-tailed)	.021	<.001	.
		N	255	255	255
Spearman's rho	AgeGroup_num	Correlation Coefficient	1.000	.569**	-.144*
		Sig. (2-tailed)	.	<.001	.021
		N	255	255	255
	EducationLevel_num	Correlation Coefficient	.569**	1.000	-.383**
		Sig. (2-tailed)	<.001	.	<.001
		N	255	255	255
	HourSpend	Correlation Coefficient	-.144*	-.383**	1.000
		Sig. (2-tailed)	.021	<.001	.
		N	255	255	255

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Table 17 further illustrates the correlation between Age and digital behavior, revealing key insights into the interrelation among various factors in students' perceptions of pop-up ads. Notably, age has a small but significant positive correlation with certain perceptions, such as finding pop-up ads fun ($r = 0.214$, $p < 0.001$) and trusting products advertised through pop-ups ($r = 0.151$, $p = 0.007$), suggesting that older students might be more receptive to pop-up ads compared to their younger counterparts. This indicates

a slight generational shift in students' engagement with digital marketing, with age potentially influencing overall perceptions of pop-up ads.

More compelling relationships emerge between factors like content attractiveness and ad satisfaction. There is a strong positive correlation between the attractiveness of the ad content and student satisfaction with pop-up ads on social media ($r = 0.719$, $p < 0.001$), highlighting that when the content is deemed appealing, students are more likely to be satisfied with these ads, especially on platforms like social media. Similarly, the content attractiveness correlates with trust in the products being advertised ($r = 0.707$, $p < 0.001$), implying that visually appealing and well-designed pop-up ads foster greater trust in the products they promote.

In terms of behavior, purchase potential from pop-up ads is moderately correlated with students' likelihood to recommend these products ($r = 0.590$, $p < 0.001$). This suggests that when students perceive pop-up ads as a viable purchasing channel, they are more inclined to share their positive experiences with others. However, recommendation and purchasing intent are still somewhat disconnected from factors like fun or entertainment value, which remain less significant in driving engagement (with correlation values such as 0.087 and 0.123).

These findings highlight the complexity of students' perceptions of pop-up ads. Positive perceptions of the content, attractive and trustworthy as the ads appear, are strongly tied to satisfaction, trust, and purchase intentions. In contrast, product recommendations from pop-up ads are less influenced by these factors, suggesting that students may be less likely to endorse pop-up ads actively, even when they find them trustworthy or engaging. Overall, these correlations underscore the importance of focusing on content quality, relevance, and trust-building strategies to improve the effectiveness of pop-up ads for this demographic.

Table 17

Correlation Matrix of Digital Behavior based on Age Group

Correlations												
		AgeGroup_num	I find pop-up ads fun.	I always look for a way to keep pop-up ads.	The content that appears in the ad is very attractive.	I am satisfied with pop-up ads on social media.	The level of ads that pop up from apps meets my needs and expectations.	Top brands recommended in pop-up ads are better than other brands.	I trust products that advertise in pop-up ads.	It is possible to buy a product from pop-up ads.	I generally recommend products or services from pop-up ads.	
Kendall's tau_b	AgeGroup_num	Correlation Coefficient	1.000	.214**	.118*	.299**	.218*	.177*	.364**	.151*	.309**	.087
		Sig. (2-tailed)		<.001	.037	<.001	<.001	.002	<.001	.007	<.001	.123
		N	255	255	255	255	255	255	255	255	255	255
	I find pop-up ads fun.	Correlation Coefficient	.214**	1.000	.402**	.669**	.604**	.740**	.345**	.580**	.484**	.495**
		Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	I always look for a way to keep pop-up ads.	Correlation Coefficient	.118*	.402**	1.000	.453**	.553**	.476**	.544**	.529**	.457**	.643**
		Sig. (2-tailed)	.037	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	The content that appears in the ad is very attractive.	Correlation Coefficient	.299**	.669**	.453**	1.000	.719**	.788**	.619**	.707**	.516**	.427**
		Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	I am satisfied with pop-up ads on social media.	Correlation Coefficient	.218*	.604**	.553**	.719**	1.000	.805**	.551**	.852**	.408*	.537**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	The level of ads that pop up from apps meets my needs and expectations.	Correlation Coefficient	.177*	.740**	.476**	.788**	.805**	1.000	.508**	.778**	.492**	.499**
		Sig. (2-tailed)	.002	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	Top brands recommended in pop-up ads are better than other brands.	Correlation Coefficient	.364**	.345**	.544**	.619**	.551**	.508**	1.000	.571**	.666**	.561**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	I trust products that advertise in pop-up ads.	Correlation Coefficient	.151*	.580**	.529**	.707**	.852**	.778**	.571**	1.000	.444**	.614**
		Sig. (2-tailed)	.007	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001
		N	255	255	255	255	255	255	255	255	255	255
	It is possible to buy a product from pop-up ads.	Correlation Coefficient	.309**	.484**	.457**	.516**	.408*	.492**	.666**	.444**	1.000	.590**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001
		N	255	255	255	255	255	255	255	255	255	255
	I generally recommend products or services from pop-up ads.	Correlation Coefficient	.087	.495**	.643**	.427**	.537**	.499**	.561**	.614**	.590**	1.000
		Sig. (2-tailed)	.123	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
		N	255	255	255	255	255	255	255	255	255	255
** Correlation is significant at the 0.01 level (2-tailed).												
* Correlation is significant at the 0.05 level (2-tailed).												

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 18 provides valuable insight into how students' education levels influence their perceptions and interactions with pop-up ads, revealing a clear pattern in which higher education correlates with more favorable attitudes toward these advertisements. Notably, education level is positively associated with students' enjoyment of pop-up ads ($r = 0.415$, $p < 0.001$), suggesting that those with higher education may be more receptive to digital marketing, possibly due to greater media literacy or familiarity with online advertising strategies. This openness extends to content attractiveness, where students with higher education are more likely to find pop-up ads engaging ($r = 0.419$, $p < 0.001$) and to be satisfied with pop-up ads on social media ($r = 0.241$, $p < 0.001$), indicating that well-designed and relevant content resonates more with this group.

The relationship between content quality and satisfaction with pop-up ads is particularly striking. When students find the ads visually appealing and relevant, they are significantly more likely to express satisfaction, especially with ads on social media platforms. A strong positive correlation exists between content attractiveness and social media ad satisfaction ($r = 0.719$, $p < 0.001$), underscoring the importance of effective ad targeting. Similarly, the extent to which ads meet expectations strongly correlates with both content attractiveness ($r = 0.788$, $p < 0.001$) and trust in products ($r = 0.778$, $p < 0.001$), underscoring the crucial role that ad relevance and credibility play in shaping students' perceptions.

Importantly, trust in advertised products is a major driver of student behavior, influencing both their purchase intentions ($r = 0.444$, $p < 0.001$) and their likelihood to recommend the products ($r = 0.590$, $p < 0.001$). The data show that students who trust the products promoted through pop-up ads are not only more willing to make purchases but also more likely to share positive recommendations with peers, thus creating a ripple effect. Recommendation behavior is further linked to satisfaction with pop-up ads, with those who are more satisfied with ads on social media also more inclined to recommend them ($r = 0.537$, $p < 0.001$).

In sum, the findings suggest that students with higher levels of education tend to engage more positively with pop-up ads, especially when the content is perceived as attractive and relevant. This demographic values trustworthiness and ad relevance, which significantly affect their likelihood of purchasing and recommending advertised products. To optimize the effectiveness of pop-up ads, marketers should focus on improving content quality, aligning it with students' expectations and preferences, and building trust to foster both engagement and positive word-of-mouth within this group.

Table 18*Correlation Matrix of Digital Behavior based on Education Level*

Correlations											
		EducationLevel_num	I find pop-up ads fun.	I always look for a way to keep pop-up ads.	The content that appears in the ad is very attractive.	I am satisfied with pop-up ads on social media.	The level of ads that pop up from apps meets my needs and expectations.	Top brands recommended in pop-up ads are better than other brands.	I trust products that advertise in pop-up ads.	It is possible to buy a product from pop-up ads.	I generally recommend products or services from pop-up ads.
Kendall's tau_b	EducationLevel_num	Correlation Coefficient	1.000	.415**	.162**	.419**	.241**	.300**	.459**	.235**	.563**
		Sig. (2-tailed)		<.001	.003	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I find pop-up ads fun.	Correlation Coefficient	.415**	1.000	.402**	.669**	.604**	.740**	.345**	.580**	.484**
		Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I always look for a way to keep pop-up ads.	Correlation Coefficient	.162**	.402**	1.000	.453**	.553**	.476**	.544**	.529**	.457**
		Sig. (2-tailed)	.003	<.001		<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	The content that appears in the ad is very attractive.	Correlation Coefficient	.419**	.669**	.453**	1.000	.719**	.788**	.619**	.707**	.516**
		Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I am satisfied with pop-up ads on social media.	Correlation Coefficient	.241**	.604**	.553**	.719**	1.000	.805**	.551**	.852**	.408**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	The level of ads that pop up from apps meets my needs and expectations.	Correlation Coefficient	.300**	.740**	.476**	.788**	.805**	1.000	.508**	.778**	.492**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	Top brands recommended in pop-up ads are better than other brands.	Correlation Coefficient	.459**	.345**	.544**	.619**	.551**	.508**	1.000	.571**	.666**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I trust products that advertise in pop-up ads.	Correlation Coefficient	.235**	.580**	.529**	.707**	.852**	.778**	.571**	1.000	.444**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001
		N	255	255	255	255	255	255	255	255	255
	It is possible to buy a product from pop-up ads.	Correlation Coefficient	.563**	.484**	.457**	.516**	.408**	.492**	.666**	.444**	1.000
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
		N	255	255	255	255	255	255	255	255	255
	I generally recommend products or services from pop-up ads.	Correlation Coefficient	.308**	.495**	.643**	.427**	.537**	.499**	.561**	.614**	.590**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
		N	255	255	255	255	255	255	255	255	255

**. Correlation is significant at the 0.01 level (2-tailed).

Results of a correlation analysis that represents a fascinating look at how the amount of time students spend online (HourSpend) influences their attitudes toward pop-up ads are shown in Table 19. Notably, the data reveal a consistent negative trend: as students spend more time online, their perceptions of pop-up ads tend to become more skeptical. This is evident in the negative correlation between HourSpend and the likelihood of finding pop-up ads fun ($r = -0.198$, $p < 0.001$), suggesting that prolonged exposure to digital content leads to a diminishing sense of enjoyment from pop-up ads. The same pattern emerges when examining satisfaction with pop-up ads on social media ($r = -0.178$, $p < 0.001$), where more time spent online is linked to lower satisfaction levels. It seems that the more students interact with digital media, the less they appreciate pop-up ads, potentially due to ad fatigue or an increased awareness of marketing strategies.

This growing skepticism is also reflected in students' trust and behavior towards products promoted through pop-up ads. For example, the negative correlation between HourSpend and trust in advertised products ($r = -0.166$, $p = 0.002$) indicates that students who spend more time online are less likely to trust products advertised via pop-up ads. Similarly, as students' online hours increase, their willingness to purchase or recommend products from pop-up ads decreases (purchase intent: $r = -0.216$, $p < 0.001$; recommendation behavior: $r = -0.246$, $p < 0.001$). These findings suggest that prolonged exposure to digital ads may lead to skepticism and a sense of disconnection from the products being marketed, possibly due to perceived overexposure or an understanding of digital marketing tactics.

However, not all correlations are negative. Interestingly, HourSpend correlates positively with certain aspects of pop-up ad effectiveness, such as content attractiveness ($r = 0.174$, $p < 0.001$) and the perception that top brands recommended in pop-up ads are better than others ($r = 0.217$, $p < 0.001$). This indicates that while students may become more critical of pop-up ads over time, they still find value in ads featuring attractive, relevant content, particularly when those ads feature well-known,

trusted brands. This suggests that even as students grow more discerning, they are still receptive to pop-up ads that align with their expectations for high-quality, relevant content.

Table 19

Correlation Matrix of Digital Behavior Based on Time Spent on Social Media

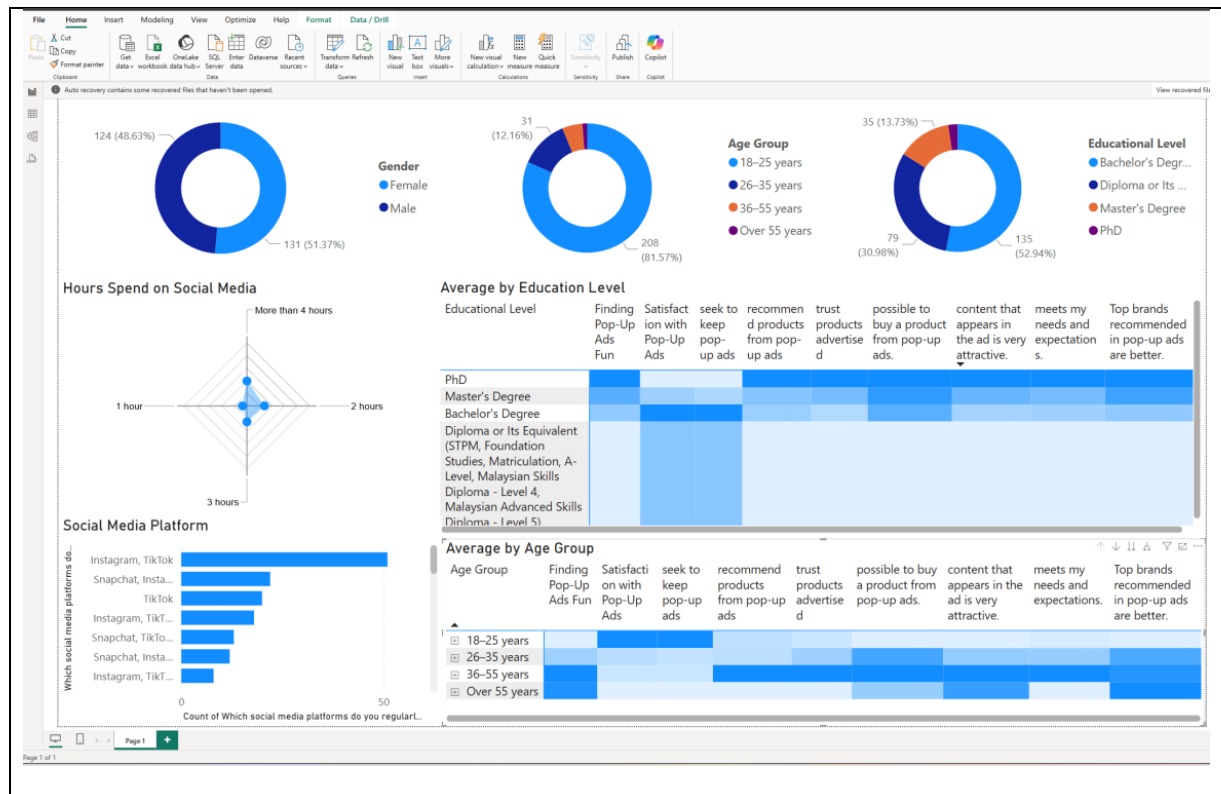
Correlations											
		HourSpend	I find pop-up ads fun.	I always look for a way to keep pop-up ads.	The content that appears in the ad is very attractive.	I am satisfied with pop-up ads on social media.	The level of ads that pop up from apps meets my needs and expectations.	Top brands recommended in pop-up ads are better than other brands.	I trust products that advertise in pop-up ads.	It is possible to buy a product from pop-up ads.	I generally recommend products or services from pop-up ads.
Kendall's tau_b	HourSpend	Correlation Coefficient	1.000	-.198**	-.206**	-.174**	-.178**	-.117*	-.217*	-.166**	-.216**
		Sig. (2-tailed)	.	<.001	<.001	<.001	<.001	.029	<.001	.002	<.001
		N	255	255	255	255	255	255	255	255	255
	I find pop-up ads fun.	Correlation Coefficient	-.198**	1.000	.402**	.669**	.604**	.740**	.345**	.580**	.484**
		Sig. (2-tailed)	<.001	.	<.001	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I always look for a way to keep pop-up ads.	Correlation Coefficient	-.206**	.402**	1.000	.453**	.553**	.476**	.544**	.529**	.457**
		Sig. (2-tailed)	<.001	<.001	.	<.001	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	The content that appears in the ad is very attractive.	Correlation Coefficient	-.174**	.669**	.453**	1.000	.719**	.788**	.619**	.707**	.516**
		Sig. (2-tailed)	<.001	<.001	<.001	.	<.001	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I am satisfied with pop-up ads on social media.	Correlation Coefficient	-.178**	.604**	.553**	.719**	1.000	.805**	.551**	.852**	.408**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	.	<.001	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	The level of ads that pop up from apps meets my needs and expectations.	Correlation Coefficient	-.117*	.740**	.476**	.788**	.805**	1.000	.508**	.778**	.492**
		Sig. (2-tailed)	.029	<.001	<.001	<.001	<.001	.	<.001	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	Top brands recommended in pop-up ads are better than other brands.	Correlation Coefficient	-.217*	.345**	.544**	.619**	.551**	.508**	1.000	.571**	.666**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	.	<.001	<.001
		N	255	255	255	255	255	255	255	255	255
	I trust products that advertise in pop-up ads.	Correlation Coefficient	-.166**	.580**	.529**	.707**	.852**	.778**	.571**	1.000	.444**
		Sig. (2-tailed)	.002	<.001	<.001	<.001	<.001	<.001	<.001	.	<.001
		N	255	255	255	255	255	255	255	255	255
	It is possible to buy a product from pop-up ads.	Correlation Coefficient	-.216**	.484**	.457**	.516**	.408**	.492**	.666**	.444**	1.000
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	.
		N	255	255	255	255	255	255	255	255	255
	I generally recommend products or services from pop-up ads.	Correlation Coefficient	-.246**	.495**	.643**	.427**	.537**	.499**	.561**	.614**	.590**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	.
		N	255	255	255	255	255	255	255	255	255

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

In conclusion, the data reveal a nuanced relationship between time spent online and perceptions of pop-up ads. While extended time spent online is associated with greater skepticism and reduced engagement with pop-up ads, students still recognize the value of well-targeted, brand-conscious advertising.

Dashboard Analysis

Consequently, the Power BI dashboard was developed as demonstrated in Figure 2, enabling quick analysis of the research. Power BI offers a comprehensive and powerful suite of features for data analysis and visualization. Its combination of intuitive charts, heatmaps, and interactive capabilities allows for an in-depth exploration of complex data sets. These tools not only facilitate the identification of trends but also enable a customized, detailed examination of the data, making Power BI an invaluable tool for both academic research and practical data analysis.

Figure 2*Power BI Dashboard***CONCLUSION**

This study explored digital media usage and behavioral responses to pop-up advertisements among students at UUM. Those aged 18–25 are the most active users of platforms like TikTok (76.5%) and Instagram (62%). Around 40% of students spend over 4 hours daily on social media, underlining its significance in their daily lives. Despite high engagement, students expressed negative perceptions of pop-up ads, with 65% finding them intrusive and irrelevant. However, well-designed and engaging content improved satisfaction. Trust in advertised products was positively correlated with higher engagement, including increased purchase intent and recommendations. Students with higher education levels showed more openness to digital ads, suggesting that media literacy influences ad perception. The study's limitations include a sample confined to UUM students, which limits generalizability, and a lack of exploration of psychographic factors, such as personality traits. Overall, the findings emphasize that digital advertising targeting young adults must focus on relevance, engagement, and trust to improve effectiveness.

In summary, pop-up advertisements are often perceived as an unavoidable inconvenience of the World Wide Web. However, research over the last 20 years supports the common assumption that they are irritating to internet users. The current study finds that while age and education appear to foster positive attitudes towards pop-up ads, the amount of time spent online creates a paradoxical effect, where students become more critical over time. Therefore, future research could address limitations by including a more diverse sample from various universities and countries to improve external validity. A longitudinal approach could track students' evolving digital habits and responses to ads over time.

Integrating psychographic profiling techniques, such as focus groups or sentiment analysis, is also recommended to better understand intrinsic motivations and cognitive responses to pop-up advertisements. Additionally, research could address limitations by including a more diverse sample from various universities and countries to improve external validity. Lastly, future studies could explore different forms of digital ads, including video, banner, and native ads, to provide a more comprehensive view of students' engagement with advertisements.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF GENERATIVE AI USE

I acknowledge the use of AI for performing analyses.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

- Bartsch, A., & Oliver, M. B. (2020). Health-related entertainment, mood management, and mood adjustment in response to the COVID-19 pandemic. *Psychology of Popular Media*, 9(4), 433–450.
- Casaló, L. V., Flavián, C., & Ibáñez-Sánchez, S. (2020). Influencers on Instagram: Antecedents and consequences of opinion leadership. *Journal of Business Research*, 117, 510–519.
- Cullen, J. P., Gregory, J. L., & Noto, L. A. (2020). Digital Literacy, Access to Technology, and Inclusion for Young Adults with Developmental Disabilities. *Journal of Developmental and Physical Disabilities*.
- Dadaczynski, K., Okan, O., Messer, M., Leung, A. Y. M., Rosário, R., Darlington, E., ... & Rathmann, K. (2020). Digital health literacy and web-based information-seeking behaviors among university students in Germany during the COVID-19 pandemic: A cross-sectional survey. *PLOS ONE*, 15(12), e0243683.
- DataReportal. (2024). Digital 2024: Malaysia. Retrieved from <https://datareportal.com/reports/digital-2024-malaysia>
- Everson-Rose, S., & Lewis, T. (2023). Satisfaction with online/in-person social interactions and psychological well-being: The mediating role of social connectedness. *Current Psychology*.
- Freberg, K., Graham, K., McGaughey, K., & Freberg, L. A. (2021). Who are the social media influencers? A study of public perceptions of personality. *Public Relations Review*, 47(1), 101983.

- Hanbazazh, A., & Reeve, C. (2021). Pop-up ads and behavioral patterns: A quantitative analysis of perceptions among Saudi users. *International Journal of Marketing Studies*, 13(4), 31–41.
- Hartmann, T., Zirbel, I., Schneider, F. M., & Huber, B. (2021). Learning to use digital technologies: How digital competence fosters digital behavior. *Frontiers in Psychology*.
- Howe, S. (2024, May 6). *Social Media Statistics for Malaysia [2024]*. Meltwater. <https://www.meltwater.com/en/blog/social-media-statistics-malaysia>
- Htay, M. N. N., Parial, L. L., Tolabing, M. C., Dadaczynski, K., Okan, O., Leung, A. Y. M., & Su, T. T. (2022). Digital health literacy, online information-seeking behavior, and satisfaction with COVID-19 information among the university students of East and Southeast Asia. *PloS One*, 17(4), e0266276.
- Inan, B. I., Seker, M., & Aykut, C. (2021). Digital Literacy Levels during Online Education Due to the COVID-19 Pandemic. *Sustainability*, 13(21), 11878.
- Karagul, B. I., Seker, M., & Aykut, C. (2021). Investigating Students' Digital Literacy Levels during Online Education Due to the COVID-19 Pandemic. *Sustainability*, 13(21), 11878.
- Kim, M. S., Wang, S., & Kim, S. (2023). Effects of online fan community interactions on well-being and sense of virtual community. *Behavioural Sciences*, 13(11), 897.
- Krejcie, R. V., & Morgan, D. W. (1970). "Determining Sample Size for Research Activities". *Educational and Psychological Measurement*, 30, 607–610.
- Liu, Q., & Huang, X. (2020). Study on factors influencing college students' digital academic reading behavior. *Frontiers in Psychology*.
- Lou, C., & Yuan, S. (2019). Influencer marketing: How message value and credibility affect consumer trust of branded content on social media. *Journal of Interactive Advertising*, 19(1), 58–73.
- Malaysian Communications and Multimedia Commission (MCMC). (2020). Internet Users Survey 2020.
- Namay, T., & Eh. (2021, October 30). *Internet Usage among Malaysian Youth and Its Effects on Positive Youth Development*. <https://www.globalmediajournal.com/open-access/internet-usage-among-malaysian-youth-and-its-effects-on-positive-youth-development.php?aid=90269>
- Redondo, I., & Aznar, E. (2021). Factors affecting students' learning performance: The impact of digital technologies in the classroom. *Education and Information Technologies*, 26(2), 2085-2102.
- Schønning, V., Hjetland, G. J., Aasan, M., Birkeland, M. S., Skogen, J. C., & Sivertsen, B. (2020). Social media use and mental health and well-being among adolescents: A scoping review. *Frontiers in Psychology*, 11, 1949.
- Sprout Social. (2024). Social Media Demographics to Inform Your 2024 Strategy.
- Thilina, S., Chamari, P., & Raveendra, H. (2020). Digital media usage patterns and needs of youth in Sri Lanka. *Asian Journal of Communication*, 30(2), 142-158.
- Wang, Z., Tchernev, J. M., & Solloway, T. (2019). A dynamic longitudinal examination of social media use, needs, and gratifications among college students. *Computers in Human Behaviour*, 105, 106208.
- Woliba. (2023). Disconnect to reconnect: The 7-Day Digital Detox Challenge. *Woliba*. <https://www.woliba.io/digital-detox-challenge>