THE IMPACT OF 5G TECHNOLOGY ON DIGITAL MARKETING AND E-COMMERCE ECOSYSTEMS

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Abstract

5G or fifth-generation mobile networks holds the promise of higher data rates, low latency, and more data traffic than earlier generations of mobile telecommunications technologies. Its relevance to both digital marketing and the e-commerce industry is such that there is a great shift in the conduct of online marketing of goods and services by businesses, as well as in the conduct of users of the digital space such as online and mobile transactions. The digital marketing ecosystem consists of different tools, platforms, and techniques that help design, implement, and analyze advertising activities in the internet space. As a rule, e-commerce refers to trade and other commercial activities performed via the World Wide Web, including business to consumer (B2C) and business to business (B2B) as well consumer to consumer (C2C) sales. The depiction illustrates how the 5G technology shapes the perspective towards and the functioning of the digital marketing and e-commerce ecosystem center.

Keywords: 5g Technology, Ecosystem, Digital Marketing, E-Commerce.

Introduction

There has been a remarkable growth in the development of Information and Communication Technologies in the past few decades. Growing supply and demand for broadband services and applications makes it important and relevant to implement 5G technology (Shalsabilla & Hadita, 2023). In contrast, the fifth generation mobile network system indicates great advancement in data transmission speed, latency, coverage, and technology reliability.

5G technology, or mobile technology generation number five, is the new invisible mobile communications standard providing notable advantages in bandwidths speed, capabilities, and connectivity over previous generations. Set to enable super-fast connections of up to 20 Gbps, with a response speed of 1 millisecond or lower, and

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support up to 1 million connected devices in a square kilometer, 5G does more than just improving the user experience on mobile phone networks. It also creates markets for such use cases as self-driving cars, massive IoT, VR and AR, interfacing with smart industries, and many more, adopted and improved at industry levels (Anderson & Jones, 2023). These technologies employ hitherto overutilized radio frequency bands and modern antenna designs, bringing drastic improvement in connectivity and the way people interact with the digital ecosystem (Sulistyono, 2023).

This technological advancement also has a similar impact on the area of e-commerce and digital marketing. E-commerce sales are forecasted to generate $6.3 trillion by 2024, according to estimates by eMarketer, an increase from $3.5 trillion in 2019. More so, digital marketing is also gaining ground with growth projections by Yunanik (2023) stating that global spending on digital advertising is expected to hit $517 billion by 2023 (Statista, 2021).

There have been speculations suggesting that the introduction of 5G technology will fast forward the already existing process of digitalization in different sectors-global marketing and e-commerce included. 5G technology's speed and network capacity can trigger the development of new ways of enhancing customer experience, personalising content and improving business processes (Puspitasari & Sutabri, 2023).

Marketing and e-commerce have become indispensable in the current business environment. To be more specific, it positions companies before prospective customers by explaining the benefits of what a company has to offer, increasing brand recognition, and eventually leading to product sales. It is through the various strategies and channels that a company is able to identify the needs of the market, promote and adjust the goods or services they offer, and develop good relations with the customers (Yacub & Mustajab, 2020a). In the present period of social media, marketing is less shotgun and more science, technology allows for 'the right message to the right people at the right time'.

E-commerce, on the other hand, has changed the way that business is done and consumers buy goods. E-commerce eliminates traditional limitations of distance or time by enabling such activities as online shopping, thus expanding the scope of the market. This adds great comfort to the consumers along with giving great scope to companies to increase the size of area covered and improvements in efficiency of operations. There are so a number of overall changes and improvements that e-commerce has had on the traditional practice of marketing (Arif & Habibie, 2022). In this age when the world is moving fully into a digital economy, knowing how to fully apply e-marketing and e-commerce strategies has become critical to business success in order for a company to survive in such a competitive environment whilst fulfilling the changing needs of the market. But with the use of such technologies also comes the adoption of new challenges and alterations in the operations of business and the relationship between businesses and consumers (Arjuna et al, 2024).

Considering the potential wide ranging and profound influence of the 5G technology on the digital marketing and e-commerce environment, the importance of this undertaking is justifiable. Being able to grasp the way in which marketing, consumers, and e-business operations will be affected by the 5G system will be beneficial to businesses, the government and scholars in preparing for and taking advantage of the changes to come (Nurhayaty et al., 2022).

Accordingly, this study aims at investigating in greater depth how 5G technology is likely to influence digital marketing and e-commerce.

Research Methods

The study in this research uses the literature method. The literature research method, also known as a literature study or literature review, is a systematic approach to collecting, analysing and synthesising information from a variety of written sources relevant to a particular research topic. (Firman, 2018); (Suyitno, 2021); (Jelahut, 2022).

Results and Discussion
Impact of 5G Technology on Digital Marketing

5G, or the fifth generation of mobile technology, is the latest wireless communication standard designed to deliver faster, more reliable and more efficient connectivity than its predecessor, 4G. The technology was developed to support dramatic improvements in data transfer rates, network capacity, and reduced latency. 5G aims to meet the growing needs in digital communications, including the Internet of Things (IoT), autonomous vehicles, smart cities, and industrial applications that require real-time connectivity (Marchyta, 2022).

Key characteristics of 5G include much higher peak data rates, with the potential to reach up to 20 Gbps, extremely low latency (less than 1 millisecond), and the ability to connect a large number of devices in a dense area. 5G also uses a wider spectrum of frequencies, including millimetre waves, which enables greater bandwidth but requires denser infrastructure (Sriminarti & Arfan, 2024). The technology supports network slicing, which allows operators to create customised virtual networks for specific use cases within the same physical infrastructure. In addition, 5G is designed with a focus on energy efficiency and enhanced security, making it an ideal platform for future technological innovation (Z. Li, 2022).

Digital marketing is a marketing approach that utilises digital technologies and online platforms to reach and engage target audiences. The concept encompasses a variety of tactics and channels, including social media, search engine optimisation (SEO), content marketing, email marketing, online paid advertising, and web analytics (Y. Li & Wang, 2021). The main goal of digital marketing is to increase brand visibility,

generate leads, increase sales, and build long-term relationships with customers in a dynamic digital environment. In contrast to traditional marketing, digital marketing offers the ability to target audiences more precisely, measure results in real-time, and adjust strategies quickly based on data and feedback (Makkonen et al., 2022).

An effective digital marketing strategy starts with a deep understanding of the target audience, including their online behaviour, preferences, and digital touchpoints. This involves developing buyer personas and mapping the customer journey to design relevant and engaging content and experiences at different stages of the marketing funnel (Duraichamy & Srinivasan, 2020). The key to success lies in an integrated multi-channel approach, where messaging and branding are consistent across all platforms. The strategy should also be flexible and responsive, leveraging data analytics to continuously optimise campaigns and improve ROI. Personalisation, marketing automation and the use of AI technologies to improve decision-making and customer experience are becoming increasingly important in the competitive digital marketing landscape (Yacub & Mustajab, 2020b).

5G technology has the potential to revolutionise digital marketing by significantly increasing data transfer speeds and capacity. The higher speeds and lower latency of 5G allow marketers to deliver richer and more interactive content to consumers, including high-quality video, virtual reality (VR), and augmented reality (AR) without buffering or lag. This opens up new opportunities for more immersive and engaging brand experiences, enabling more innovative and immersive marketing campaigns. For example, retailers can offer more realistic 'try before you buy' experiences using AR, or brands can create 360-degree virtual tours of their products or locations (Qian, 2021).

The increased connectivity offered by 5G will also accelerate the growth of the Internet of Things (IoT), which has significant implications for digital marketing. With more connected devices, marketers will have access to richer and more contextual data about consumer behaviour and preferences. This will enable more sophisticated personalisation and more effective real-time marketing (Liu, 2022). For example, adverts can be dynamically customised based on a user's location, current activity, or even local weather conditions. In addition, 5G can increase the effectiveness of beacons and other location-based technologies, enabling more targeted hyperlocal marketing (Rahman, 2021).

The impact of 5G on analytics and decision-making in digital marketing will also be significant. With the ability to collect and process large amounts of data in real-time, marketers can make faster and more informed decisions about their campaign strategies. Predictive analytics and machine learning will become more powerful, enabling more sophisticated campaign optimisation and more accurate forecasting of consumer trends. In addition, 5G will support the wider use of AI-powered chatbots and virtual assistants, improving customer service and brand interaction (Wang, 2021). However, with this increase in data speed and volume, marketers must also pay more

attention to data privacy and security, ensuring that they comply with regulations and maintain consumer trust (Akhmaeva, 2022).

Development of Augmented Reality (AR) and Virtual Reality (VR) Technology

The improvement of augmented and virtual reality (AR/VR) technologies in recent years has also led to good exploitation of these tools in many sectors. The AR technology that overlays virtual objects and information into the real world has been widely used in mobile apps such as photo filters in social networks and the game Pokémon GO. On the other hand, VR technology that is revolved around computer generation of an entirely virtual environment has permeated the gaming and entertainment industries. The enhancement of hardware attributed to the lighter and more stronger VR headsets as well as the increased screen resolution had a considerable impact on the improvement of the user experience (Serman, 2020).

To this end, there is much to be gained by employing the use of AR and VR in learning and training. Medical institutions and educatory establishments are starting to use these technologies for training purposes using medical scenarios, technical fields or for trips around a place on the globe or history. In the area of shopping, AR makes it easy for the client to see how a dress would look on them without trying it on, while VR creates interactivity that provides customers with an innovative shopping opportunity. This two technologies are also used in the architecture and design fields for the visualization of projects and virtual models allowing clients to walk through buildings or products even before they are built (FAYVISHENKO & YATSIUK, 2022).

The latest trends in AR and VR have also progressed towards the integration of both technologies, popularly known as Mixed Reality (MR). For example, Microsoft HoloLens promotes the interaction of virtual objects with the real world by incorporating both AR and VR features (Wolny, 2022). Moreover, their combination with other technologies such as AI and IoT creates a new dimension of AR or VR applications which are smart and contextually more oriented. For instance, with the help of AI, an AR system can virtually see the user's environment and their preferences, using that information to bring up more appropriate data or notifications to the user.

Despite these successful advances in AR and VR development trajectory, there are still some issues that need to be addressed. This includes improving the portability and ease of use of the device, reducing the chances of a user getting motion sickness while in the VR mode, and developing more efficient and appealing content. A good number of issues are also related to data privacy & security when using AR and VR since they are likely to reasonably target and collect sensitive data relating to the environment and user movement. However, with constant support through funding from large technological companies and creative startups, the advancement of AR and VR seems to have a good forecast. It is expected that such technologies will be adopted

in most people's lifestyles leading to a reshaping of how people access information, entertain themselves, and communicate with others (Hermawan & Indriani, 2023).

Internet of Things (IoT) and Marketing

The Internet of Things (IoT) has revolutionised the marketing world by creating an ecosystem of interconnected devices, providing new opportunities for marketers to collect data and engage with consumers. IoT devices, ranging from smartwatches to smart home appliances, generate a vast amount of data on consumer behaviour, preferences and habits. Marketers can leverage this data to create more personalised and effective marketing strategies (Maxsudovna, 2024). For example, a beverage company can use data from a smart fridge to send appropriate beverage promotions when consumers are running low on stock, or a sportswear brand can send product recommendations based on physical activity data collected from fitness trackers (Lola & Bakeev, 2022).

IoT also enables marketers to create more interactive and contextualised customer experiences. Beacon technology, for example, can be used in retail stores to send notifications and special offers to customers' smartphones as they walk around the store. At home, virtual assistants such as Amazon Alexa or Google Home open up opportunities for voice-based marketing, where consumers can interact with brands and make purchases with just a voice command (Müller, 2021). In addition, IoT allows marketers to optimise their supply chain and inventory, ensuring products are always available when consumers need them, which in turn increases customer satisfaction and brand loyalty (Bharadwaj & Yeo, 2020).

However, the utilisation of IoT in marketing also brings new challenges and responsibilities. Data privacy and security are major concerns, as IoT devices collect highly personalised data. Marketers must ensure that they follow strict data privacy regulations and implement strong security practices to protect consumer information. In addition, with so much data available, marketers must be careful not to engage in 'over-personalisation' that could make consumers feel uncomfortable. The balance between personalisation and privacy is key in leveraging IoT for marketing (Njathi et al., 2024). Despite these challenges, IoT continues to open up innovative opportunities in marketing, allowing brands to connect with consumers in more meaningful and relevant ways than ever before.

Impact of 5G Technology on E-Commerce

5G technology represents a significant milestone in mobile network progress, providing considerably improved data rates, minimum possible delays, and wider network coverage than earlier versions. The appropriateness of this technology in e-commerce is anticipated to be great, altering the patterns of consumer online shopping and the operating strategies of businesses in the electronic medium. With V G speeds

of up to 20 Gbps, it will become possible for potential buyers to quickly access e-commerce sites, preview detailed product images, and watch video clips without waiting for them to load, even on portable devices. This, in good measure, will accentuate the penetration of mobile shopping, which is already a critical window for many online shoppers.

One of the main advantages of 5G technology pertaining to e-commerce is the most probable integration of the emerging technologies of augmented reality (AR) and virtual reality (VR) in e- commerce. Using advanced augmented reality applications in low-latency and high-bandwidth environments, consumers can virtually 'fit' products such as designs of sofas in their suitability at home and even fitem, clothes on themselves (Senthilkumar, 2024). With time, immersive virtual stores, where customers are taken into hyper-realistic 3D environments will be developed, where they will be able to move around, touch products and even talk to virtual assistants. This interaction can be highly beneficial to both customers and sellers as it can help improve customer satisfaction and thus reduce product return rates and help increase sales conversions (Denga & Rakshit, 2022).

E-commerce will also make more efficient use of warehousing and delivery services across supply chains. Because of the 5G enabled Internet of Things (IoT), management of companies will improve as it will be possible to monitor the movements of their stocks as well as the shipping of goods as they happen and with greater information accuracy. This allows higher efficiency of stock control, speeding of deliveries, and even makes it possible to deliver goods using drones or self-driving vehicles. Furthermore, higher network bandwidth and speed would improve the ability of e- commerce firms to perform in-depth customer analysis and in real time making it possible to make accurate and quick decisions to help increase and retain the customer base (Zhang & Yu, 2023).

5G opportunities are plentiful. At the same time, its deployment in the e-commerce industry has drawbacks. There will be a need to deploy new infrastructure and technologies that will make full use of 5G technology (Sibarani, 2021). Data security and data privacy however remain issues since more data will be transferred on 5G networks. Moreover, notwithstanding these advantagesof 5G, fast speeds on the broadband are on offer yet not all regions will have 5G networks in the near future posing a threat of a further digital divide. All in all, however, 5G is anticipated to be the panacea to all difficulties faced by the e-commerce industry by improving the shopping experience for the global consumer into a much faster, interactive, and personalized one.

Conclusion

The introduction of 5G technology has completely changed the dynamics of the digital marketing and e-commerce business thus changing the way businesses and consumers will interact as well as how business marketing strategies will be applied. Supporting extremely high data speeds over long distances with little delay and with the ability to connect to a larger number of devices, 5G facilitates AR and VR shopping experience which tends to get the customers more involved and thus improving the effectiveness of the marketing campaigns. Other technologies offering better real time analysis improve the speed to which decisions can be made and enhance the level of individualisation, whereas IoT powered by 5G enhances management and logistic processes of the supply. All these in combination add needless to say more threats to the normalization of e-commerce where the boundaries between the online and offline purchasing patterns are blurred.

On the other hand, the introduction of 5G mobile networks requires the new responsibilities on the part of industry players. Companies will have to fund new infrastructure and expertise in order to wring out all possibilities that 5G has to offer, as well as enhance the protection of data and consumers' privacy. Despite the numerous possibilities for innovation and expansion of the scope of digital marketing and e-commerce that 5G adoption provides, its patchy implementation threatens to create another digital gap. So it is critical that all players, including tech and e-commerce companies as well as policy makers, do their best to support safe and embrace all the possibilities of 5G towards everyone. Provided the correct conditions are created, 5G technology can not just shift the paradigm in terms of how we procure and market our goods, it will, in turn, fuel even greater progress across many other facets of the global economy.

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