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Wireless Internet Connectivity: 5G & WI-FI 6

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ABSTRACT: Wireless connection in the modern period has introduced 5G and Wi-Fi 6 networking connection. The 5G networking service can play an effective role on mobile phones, in outdoor service and in many organisations. On the other hand, the wireless connectivity through Wi-Fi 6 is impact on the networking services through the direction of "Institute of Electrical and Electronics Engineers (IEEE)". However, the popularity is highlighted within the 5G technology. The main purpose of this study is to showcasing the comparison between: 5G & WI-FI 6 within the connectivity and characteristics, usages and impact on the technological development. Both of these networks connectivity access a huge amount of data within a short time bound and this facilitates all type of tasks. Interpretivism research philosophy, secondary data, and qualitative research design are followed by the researcher to finish the research work within a given timeline. The secondary data collection process has been selected in this study, and the thematic data analysis method is helpful for the researcher to interpret non-numeric data successfully. 5G technology and Wi-Fi 6 are modern networking services in the global market. This is beneficial for the industry to improve performance and position. The profitability and productivity of the industries are enhanced with the usage of Wi-Fi 6 and 5G technology. 5G technology is better than Wi-Fi 6 in the global market for improving industries' performance successfully

KEYWORDS: Wireless connection, network, 5G, Wi-Fi 6, technology

I. INTRODUCTION

A wireless internet connection is meant for connectivity without any wire, where this can be portable in any way. The mobile cellular network, wireless LAN, and Bluetooth are the most common examples of wireless connection. The wireless connection enhancement is recent in a great manner in which the 5G network is popular, which gives more flexible connectivity and compelling networking advantages which meet all the demands of customers (Vaigandla and Venu, 2021). There is the arrival of another new wireless networking connection, which is Wi-Fi 6. This connectivity has yet to be adequately launched, though this connectivity has a better approach as of the innovation. This Wi-Fi type of wireless connection allows many enterprises to access data and helps track any location within a minor.

The 5G technology is the most vital among all the technical implementations in which any connectivity can create easy access within a short time. 3G or 4G is favourable for transforming data or any application, though there are some complications with perfect connection. This modern world has grown with the fastest technology, which creates a facilitated position within the business. On the other hand, the new generation the Wi-Fi connection can give a high capacity of indoor hotspots or relationships that can easily be connected to laptops, computers, and mobile phones simultaneously. Main features of 5G technical users are "enhanced Mobile Broadband (eMBB)", "massive machine type communication (mMTC)" and "Ultra-Reliable and Low Latency Communications (URLLC)" which help in the justification of standardized efforts for the new generation (Gaoet al. 2021). The significant role of technological services is the connectivity of the business enterprises, which used to be involved with technological up gradation.

The Wi-Fi 6 technology ensures the connectivity and suitable spectrum of all locations. This technology is the first amendment of the Wi-Fi family, which can optimize performance and produce certifying promotions, which help to create non-profitable marketing time that this networking connectivity can manage. Various technical features have been introduced within the significant design of Wi-Fi to assist in the wireless connection. OFDMA is one of the important cellular technologies which allow multi-purpose connections simultaneously. This technology can improve spectral efficiency and gives major needs based on the essential connectivity among the new generation.

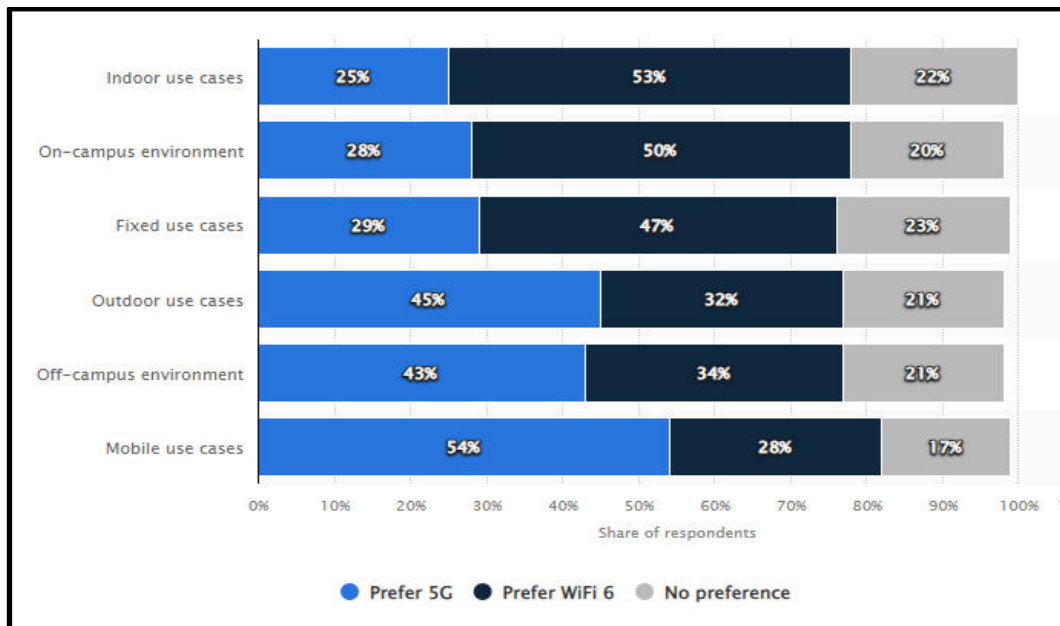


Figure 1: Case performance of the usages of 5G and Wi-Fi 6 throughout the world as on 2021 (Source: Influenced by Taylor, 2023)

The global networking execution can be indicated by the 5G technology and better connectivity through the perfection of the connectivity by the arrival of Wi-Fi 6. A recent report has shown embodiment in the connection through both of the technological innovations in which 5G and Wi-Fi 6 are used simultaneously. There is enormous availability of both networking connections, which helps the people in the new generation. In the case of mobile use cases, 54% of people prefer to use the 5G technology rather than Wi-Fi 6 (Taylor, 2023). On the other hand, in indoor cases, 53% of people mainly use Wi-Fi 6, which can give a better connection at home. Wi-Fi 6 is the most advantageous for connectivity, personal work, and big data transformation within the home. In most cases, both types of connectivity are used simultaneously to get some facilities.

1.1 Objectives

The study's main aim is to evaluate the comparison and contrast of 5G and WI-FI 6 as wireless internet connectivity. The main objectives of the study are:

- To investigate the impact of 5G Technology and Wi-Fi 6 on the real world.
- To examine the uses of 5G Technology and Wi-Fi 6
- To evaluate the comparison between 5G Technology and Wi-Fi

II. METHODS

Research philosophy provides a unique guideline to conduct research work in a successive manner. This is beneficial for the researcher to maintain a smooth approach successfully. Research work is completed based on ideas about the nature of knowledge and reality. Different types of research philosophies are "Interpretivism" and "positivism". In this study, the "Interpretivism research philosophy" was selected to gather ideas and thoughts about the social world. As mentioned by Ikram and Kenayathulla (2022), Interpretivism research philosophy helps the researcher follow a suitable work process and strategies consistently for a specific study.



Figure 2: Used research methods
(Source: Self-developed)

Research design is a valuable segment of the methodology chapter that is beneficial to maintain a proper research design successfully. A scientific study blueprint is a research design which plays a significant role in identifying adequate tools and techniques for the research work. Qualitative, quantitative, and mixed methods are three types of research design in the study. In this study, a *“qualitative research design”* has been chosen to interpret non-numerical data in a successive manner. From the viewpoint of Muzari (2022), a qualitative research design is helpful for the researcher to achieve research aims and objectives. The researcher gets an opportunity to successfully solve problems related to research work with the help of qualitative design.

The data collection process is an indispensable segment for the methodology chapter to gather various data related to the subject matter. A secondary data collection process has been chosen for the study to gather non-numeric data in a successive manner. The researcher gets an opportunity to collect data from peer-reviewed journals, online websites, books, and journals published before 2019. As Ruggiano and Perry (2019) mentioned, the secondary data collection process is helpful for the researcher to save money and time for a specific study. A researcher has a responsibility to interpret all data significantly. In this study, a thematic data analysis process has been chosen to finish the research work within a given deadline.

III. FINDINGS AND DISCUSSION

3.1 Overview of 5G Technology and Wi-Fi 6

The new global wireless standard 5th generation mobile network is 5G technology. The technology helps to include devices, machines, and objects in the worldwide market. A higher multi-Gbps peak data speed is delivered with the help of 5G technology. Massive network capacity, reliability, ultra-low latency, and increased availability are improved through 5G technology in the market. 5G technology helps to empower new development models and deliver new services. As a result, the user gets an opportunity to experience high-speed networks on a daily basis. According to the perspectives of Gohar and Nencioni (2021), 5G technology plays a significant role in improving the global economy significantly. Global growth is developed through using 5G technology in the market. This is beneficial for different industries to establish their profitability and productivity.

Global economic output is enhanced with the help of 5G technology. As mentioned by (Qualcomm.com, 2023), approximately \$13.1 Trillion dollars of global economic output is collected through the usage of 5G technology on a daily basis. More than 20 Million new job opportunities are created by 5G technology in the global market. As a result, the global economic condition has improved successfully. About \$265B global 5G CAPEX is developed after using 5G

technology significantly daily. This is beneficial for the users to maintain more incredible transmission speed in the global market.

Wi-Fi 6 provides better speed, scalability, and flexibility in the global market. As a result, the updated network system helps to use cloud and digital transformation initiatives successfully. Wi-Fi 6, also known as 802.11ax, expands on the 802.11ac standard globally. This is beneficial for the user to develop their lifestyle on a daily basis. As mentioned by Oughton *et al.* (2021), Wi-Fi 6 is helpful to improve security, and the updated technology provides secure wireless networking in the market. The industry can easily develop its profitability and productivity using Wi-Fi 6 in the workplace. The capabilities of the industry are enhanced through the impact of Wi-Fi 6.

There are six features of the Wi-Fi 6 in the global market such as: Target Wake Time (TWT), 1024-QAM (Quadrature Amplitude Modulation mode), Basic Service Set (BSS) Colouring, Orthogonal Frequency Division Multiple Access (OFDMA), Multiple-User, Multiple-In, Multiple-Out (MU-MIMO) and Transmit Beam forming, and Wi-Fi Protected Access 3 (WPA3). The features help maintain the working processes of Wi-Fi 6 in different marketplaces and industries. Different types of industries are benefited from the usage of Wi-Fi 6. This Wi-Fi 6 can provide a better network speed on a daily basis. In the viewpoint of (Intel.in, 2023), the frequency of the Wi-Fi 6 is 2.4/5 GHz, and the maximum link rate is 600–9608 Mbit/s within the year 2019. Wi-Fi 6 can achieve 9.6 Gbps throughout multiple channels in the global market. This is beneficial to experience the faster speed of the network.

3.2 Impact of 5G Technology and Wi-Fi 6 on real-world

5G technology is helpful for industries to improve their profitability and productivity in the global market. The industries are manufacturing industries, automobile industry, and healthcare industry in the global market. This is beneficial for the global economic condition to enhance its positions successfully. As mentioned by Wirc-icai.org (2023), approximately 91% expect new products and services to be invented with the help of 5G technology in the global market. Different types of industries are merged in a consistent manner; the percentage is about 87% after the usage of 5G technology in the market. 5G technology can add up to \$1.5 trillion to US GDP and up to €1 trillion to European GDP in the next five years in the global market (Accenture.com, 2023). The share of 5G services will grow from 15% in 2020 to 74% in 2023 in a consistent manner.

5G technology is valuable for different industries to improve their positions in the global market. The fourth industrial revolution is successfully enhanced with the help of 5G technology. The wide-scale deployment of 5G communication networks is improved with the impact of 5G technology. As mentioned by Pwc.com (2023), approximately \$13.2 trillion in global economic value is improved after the usage of 5G technology. More than 20 million jobs are created through the 5G technology in the global market.

Wi-Fi 6 helps different industries to enhance their profitability and productivity in the global market, and this is beneficial for the industries to improve their performance and position in a consistent manner. Innovative and creative work processes and strategies are improved with the impact of Wi-Fi 6 across the global market. Overall connectivity of the industry is improved by the usage of Wi-Fi 6. As mentioned by Experts (2022), a 2.4 GHz and 5 GHz wireless network framework is developed with the help of Wi-Fi 6. The upgraded technology is helpful for the industry to enhance brand equity and brand value of the industries in the global market.

3.3 Uses of 5G Technology and Wi-Fi 6

The 5G technology builds with perfect success factors as this is mostly available from any wireless technology. There are few surahs in the case of this type of technology. This type of technology can help in the application of many areas 24/7 hours without any obstacles. This performance is mandatory in which a larger environment creates support more than major cases of 5G technology; the significant issues can be accelerated in the case of extensive data transformation. The usage areas of this technology are hospitals and clinics, k-12 education, colleges and universities, hotels, many venues, enterprise office spaces, airports, airlines, and even in the mines.

The 5G technologies are used across three main types, which can connect some services in communication and critically handle any mission. As mentioned by Lin (2019), the 5G technology is designed with forward compatibility and thus able to support effective services in the future, which is only exciting now. The 5G technology is mainly used for analytical and video surveillance and some augmentation among vertical reality. This technology is vital. Cloud computational execution can efficiently be conducted through such technological usage. The automation in many IT sectors is mainly achieved through the perfect uses of 5G technology which can give a vast range of connectivity with

better frequency and multiple works, and this networking connection can transfer big files or data within less time-bound.

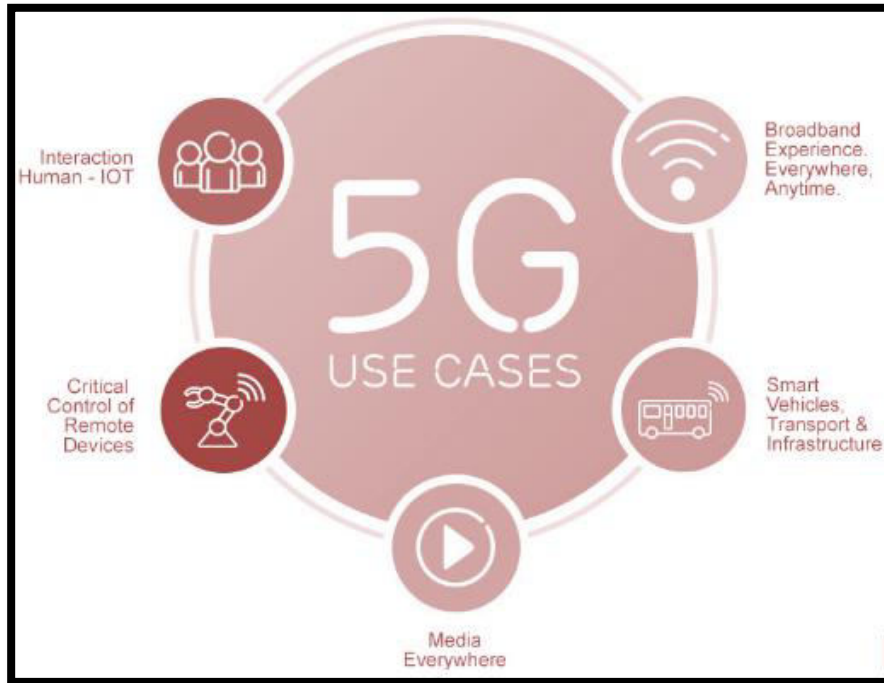


Figure 3: Uses of 5G technology
(Source: Influenced by Lin, 2019)

The Wi-Fi 6 is mainly grown up with successful reviews on the connectivity, which can cover many areas. From the viewpoint of George (2020), Wi-Fi 6 is specifically used in the home, in work from home, and used in small and medium-sized businesses, consumers IoT which helps in the perfection of connectivity. However, this connection has some limitations in the criteria for making coverage's. Apart from this, Wi-Fi 6 networking connectivity has a 2.4/5 GHz frequency in which maximum speed is covered by this networking service rather than other Wi-Fi connections (Wang *et al.* 2021). This is mainly used for the highest range of transfer modes. This technique is started more efficiently with the usages of the wires spectrum; this is encoded with the most powerful processors.



Figure 4: Uses of Wi-Fi 6
(Source: Influenced by Wang *et al.* 2021)

In the printers and video cameras, this Wi-Fi 6 connectivity can make an impact as it can cover much frequency. The “Institute of Electrical and Electronics Engineers (IEEE)” is mainly capable of delivering a higher capacity of transformation through introducing the Wi-Fi 6 and 75 % lower latency (Intel, 2023). The Wi-Fi6 can connect many devices as the standard Wi-Fi router, and Beam formation can proceed through perfect collaboration within OFDMA and OBSS. These technologies help in the high-tech communication settlement of remote-based working processes. The beam formation efficiently increased in recent times due to the demand for many jobs. This technology helps in developing proper networking connection at home and this can able to control all the devices at home more fatly.

3.4 Comparison of 5G Technology and Wi-Fi 6

It has been identified in this study that 5G technology and Wi-Fi 6 are crucial parts of life in recent times that significantly impact the lifestyle of people. A brief discussion of the comparison between these two technologies is presented in this portion of the study. Wireless technology is the major priority in the next generation, in which cellular technology takes a perfect position in the market with the arrival of the fifth generation (Intel, 2023). Besides that, cellular connectivity is not only wireless connectivity, though Wi-Fi has also created an impact on the market of technology. The new implementation has created an impact on the arrival of Wi-Fi 6. The 5G and Wi-Fi 6 are both developed with the underlying technology which accelerates network connectivity. From the viewpoint of Oughton *et al.* (2021), “orthogonal frequency-division multiplexing” is the most vital method of technology which assists 5G to exert better access. Apart from that, a comparison between speed, reliability, uses, and cost of the network technologies has been identified.

It is theoretically proven that 5G technologies and Wi-Fi 6 both provide internet at gigabit speeds which are more than enough for people. Thus, Wi-Fi 6 is capable of providing internet at 9.6 Gbps speed, whereas 5G technologies are capable of providing internet at 20 Gbps speed (Mourtziset *al.* 2021). 5G technology is faster than Wi-Fi 6 most of the time; the main difference between these two network technologies is in terms of range. Cost is another factor that differs between the two network technologies. 5G technology is more expensive than Wi-Fi 6, and because of that, the use of Wi-Fi 6 is rare. Pricing is one of the biggest factors that influence the sale of a product, and that has been influencing the huge use of 5G technology in businesses nowadays. Apart from that, differences have been identified in the uses of these two network technologies. Wi-Fi 6 is mainly used in consumer IoT, home offices, SMEs, dormitories, classrooms, and high-performance hotspots (Sandoval, 2021). On the other hand, 5G technologies are used in several cases, such as theme parks, clinics, hospitals, airports, Hostels & Event Venues, stadiums, warehousing and distribution, agriculture, and many more cases. Furthermore, a big difference between the two network technologies is reliability. It has been identified that 5G technology is capable of providing a more reliable connection by using the CBRS spectrum than Wi-Fi 6. The overall comparison suggests that 5G technologies are better than Wi-Fi 6 in terms of speed, use and reliability

IV. CONCLUSION

Wi-Fi 6 and 5G technology are two modern types of technology in the global market, and this is beneficial for industries to improve their position and performance in a consistent manner. The 5th generation of mobile networks is 5G technology in the market, and this provides high-speed networks to every individual. As a result, the user gets an opportunity to improve their lifestyle on a daily basis. Global economic condition is improved with the help of 5G technology and Wi-Fi 6 in the market. Different job opportunities are improved through the usage of 5G technology on a daily basis.

Different types of industries are improved with the impact of 5G technology and Wi-Fi 6 globally. This is beneficial for the industry to gather more profitability and productivity in the global market. In recent times, everyone uses 5G technology and Wi-Fi 6 on a daily basis to maintain buffer-free search work successfully. These two network framework is helpful for the global economy to improve its position and performance successfully. Wi-Fi 6 can achieve up to 9.6 Gbps, and 5G technologies can achieve up to 20 Gbps in the global market. As a result, 5G technology is better than Wi-Fi 6 in the global market to use on a daily basis

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