

A Literature Survey on The Emerging Trends in The Telecommunications

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Abstract

Improving telecommunications security and decreasing customer churn are two of the most pressing issues facing the telecom industry today, as well as optimising network load as well as infrastructure. These problems are dealt with head-on by the top ten trends in the telecommunications industry, which also serve to improve the overall efficacy of enterprises involved in the telecommunications industry. The global link that has been fostered by the COVID-19 outbreak provides telecommunications companies with a number of alternatives to build new products and grow their consumer base. In order to manage the growing number of people and things that are connected in smart industries, cities, homes, and automobiles, there is a growing need for cloud and 5G technology solutions. These solutions are needed to handle the flow of data generated by these connected environments.

Keywords: Telecommunications, Global Connectivity, 5G Technology, Infrastructure Optimization.

1 Introduction

The contemporary telecommunications sector is confronted with a wide range of difficult business issues. As a result of fierce rivalry from Over-the-Top (OTT) service providers, industry has seen its income streams in fundamental sectors like telephony and text messaging plummet over the last several

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years. A digital revolution of the telecom business is needed to remain competitive in 2022. In order to get better from the COVID-19 disaster and confidently position themselves for future, they are using technologies like "Mobile Edge Computing" (MEC), IoT, as well as 5G. Customer-focused, efficient, and profitable services need to be progressively transitioned away from conventional offerings.

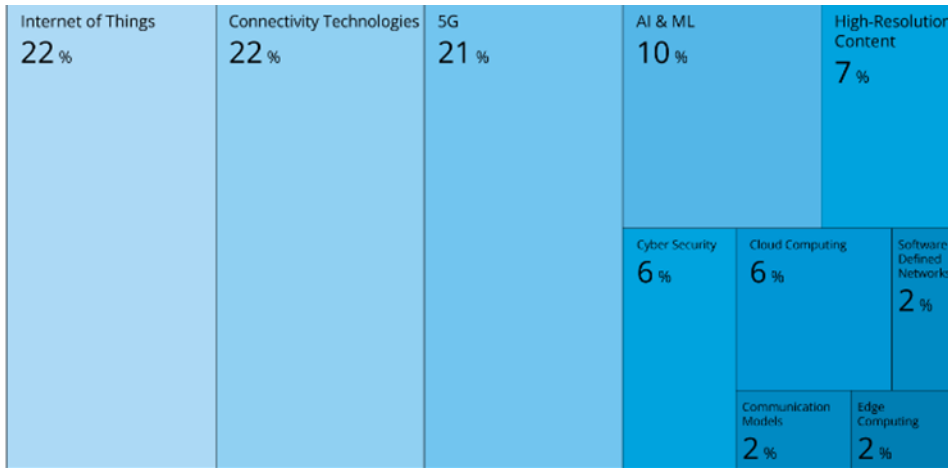


Figure 2 Growth in Telecommunication Technologies

A similar transformation is taking place in the telecom business as cloud computing has in data storage. Thus, cloud-hosted telephony is now widely used by many businesses. The cloud simplifies data as well as voice delivery, allowing an organisation to work with a single vendor for both types of services. We should expect further development, innovation, and opportunity for communication services as the digital revolution continues. The telecommunications industry is undergoing a major structural shift. In doing so, they're creating a new digital ecology of value, a linked market, and a technological change that's all their own. In this digital age, providers are attempting to implement high-performance networks in order to meet the needs and desires of their clients.

2 LITERATURE REVIEW

(Khan et al., 2022) Electronics and biology have come together to create bioelectronics, which has opened up promising new avenues for the development of medicinal therapies. New nanoelectronics plus soft, biocompatible materials have been proved to be useful in healthcare activities such as physiological sensing as well as medicine distribution as well as monitoring the heart and brain. Wired connections are required for electrical control on the majority of bioelectronic devices now in use. Bioelectronics that provide non-invasive control, biotelemetry, as well as wireless power transmission (WPT) are being developed as an alternative as wireless technology grows in popularity. In this review article, wireless bioelectronics and their applications for organ-specific therapies, such as diseases and dysfunctions, are discussed in detail. Key antenna properties, including materials, radiation characteristics, integration with other devices, and experimental setup are the focus of this paper. Wirelessly mediated

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bioelectronics, despite recent success, still faces significant problems that must be overcome for commercialization, and also for the ever-expanding and developing therapeutic targets of the future.

(Menaka et al., 2021) Nearly three-quarters of the planet's surface is covered by water. The oceans are still a mystery because of all the amazing things that go on under the surface of the water. Water pollution, oil and gas extraction and exploration, natural disaster mitigation, marine safety, naval military operations and the detection of improvements to the aquatic environment all benefit from "Underwater Wireless Communication" (UWC). A new age known as the "Internet of Underwater Things" (IoUT) has been established to help with these applications. Research, commercialization, and undersea military applications may all benefit from IoUT's scientific advancements. It's also a key aspect of the next 5G & 6G telecommunications networks. As we move forward to the next generation of mobile networks, we can expect a significant leap in performance over the current 4th generation systems, especially in the areas of 5G and high-capability networking. These improvements will be made possible by advances in 5G and 6G connectivity networks, which are expected to provide even greater coverage with lower latency, better security and lower power consumption. In order to overcome the challenges of 5G networks, new technologies including optical wireless communication (OWC) are being used. In order to overcome difficulties of 5G networks, new technologies such as OWC are being used. Compared to other wireless technologies, OWC is a better fit for 5G network operations. Using the OWC technique to develop 5G, 6G, & IoUT networks would be the best as well as most effective option, according to this article.

(Fahad A. Rida, 2021) Since bandwidth restrictions made it impossible to communicate with the medical team or patients while providing care to patients in distant locations, these technologies have been used to treat and monitor remote health care patients. Power consumption and sending large amounts of data between medical professionals and patients are strictly prohibited. "Direct-spread spectrum" (DSP) is used by wireless sensors, notably 3G mobile wireless, to communicate massive data, like multimedia, between patients as well as physicians at any time and anyplace. The "wireless sensor network" uses binary transmission as well as multipath to reduce the power consumption of the transmitter as well as receiver sensors. The precision of the measurement is dependent on the bandwidth of the unit used to determine the time of arrival (TOA). Because of the MPC's delay and the decrease in the number of copies of the original signal, the TOA predictions are constantly changing as they are sent to the receiver. The TOA is skewed in favour of positive values because of the delay introduced by transporting signals over obstacles.

(Jijo et al., 2021) Research into physical layer protection, that uses information-theoretic approaches to safeguard data secrecy, has lately gained a lot of interest. Physical layer security relies on the inherent randomness of transmission channel in order to safeguard physical layer. Physical layer security has become a new issue in 5G wireless communication. An overview of current 5G technologies, such as millimetre wave, multi-input multiple-output (MIMO), microcells with beamforming and full-duplex technology, is presented in this document. Technology like attenuation, millimeter-wave penetration and antenna array design have all been employed to overcome this problem. Aside from that, the author

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included explanations of the methods/algorithms employed, as well as aims, issues, and findings that mattered.

(Storck & Duarte-Figueiredo, 2020) Designed to boost the speed and responsiveness of wireless networks, the "Fifth-Generation Network" (5G) is capable of transmitting a large amount of data. End-user and corporate services are supported through wireless broadband connections. Designed primarily for use in the Internet of Vehicles, it ensures lightning-fast connectivity while still providing a high level of security. " Vehicle-to-everything" (V2X) communications as well as applications may be supported by the 5G network technology. People, cars, and infrastructure may communicate data with this technology. An improved and safer environment, as well as precise traffic information, may be provided. Pollution as well as accident rates may be reduced by improving traffic flow. It is possible to use the cellular network as a communication basis for V2X in order to improve road safety and self-driving car technology and to provide IoV connections. An in-depth look at IoV's V2X ecosystem's 5G growth, standards, as well as infrastructure is presented in this study. For example, it shows how 5G V2X communications may be used to support the Internet of Things (IoT) by examining its architecture, applications, as well as V2X capabilities and protocols. This research makes a significant contribution by conducting a systematic investigation of the interactions between IoV, 5G, & V2X. Eighty-four pieces were chosen to illustrate ideas, norms, and strategies for overcoming obstacles. New 5G-V2X services as well as technology specialised to the vehicle communications are expected to be developed as a result of this study, which is also expected to provide a roadmap for future developments.

(Salazar-Cabrera et al., 2020) "The "transit vehicle service" in the intermediate cities of Latin American is afflicted by a significant number of passengers being involved in the traffic accidents; the congestion caused by transit vehicles; as well as the pollution generated by these automobiles, which increases in high congestion circumstances. Studying "transit vehicle tracking service," which is critical to the implementation of transportation options to address these issues, as well as the key aspects of this service for the Latin American intermediate cities, were the focus of this research effort. As a direct consequence of this study, a solution for implementation was suggested. The following are the four stages of the study, as described in this document: (a) examination of services or systems linked to vehicle monitoring, including the "wireless communications technologies" and sustainability techniques, the use of specific algorithms for the efficiency improvement, as well as "intelligent transportation system" (ITS) architecture utilised as a foundation; b) procedure for determining which aspects of the service are appropriate in a particular situation; (c) a proposal for this service in an intermediary city, together with its specifications and potential technology solutions will be made; (d) the creation of trials to test the use of the essential technologies. With regard to recommended "wireless communication technology" (long range, LoRa), vehicle positioning technologies, energy consumption considerations as well as the use of artificial intelligence (AI) to determine user waiting times at bus stops, the review was able to identify the most important service characteristics. It is also suggested that the above features be taken into consideration while designing an ITS architecture for the Popayán (a Colombian city), and specific experiments involving the usage of such technologies are detailed.

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(Abdulkarem et al., 2020) Due to rising urban concerns about security and safety, the wireless sensor networks are becoming more important for the "structural health monitoring". Since the fast emergence of wireless technology and the widespread usage of wireless sensor networks, structural monitoring systems have made great strides in their effectiveness. An innovative wireless sensor network-based "structure health monitoring" system offers significant benefits over traditional cable systems, such as lower installation and maintenance costs. It is a revolutionary new technology. In addition, the "wireless sensor networks" are facing new design issues due to the need to monitor structure health. For the purpose of monitoring structural health, researchers have been using "wireless sensor networks" for some time now, and this article summarises their findings. The design, functioning, connectivity, and popular operating systems of wireless sensor nodes, as well as their wired as well as "wireless sensor system" technologies, are all being studied. After that, a comprehensive review of the wireless platform technologies that were used in laboratory testbeds as well as field test deployments for the "structure health monitoring" applications will be provided and summarised in the following sections: A classification taxonomy of the key challenges associated with wireless sensor networks for "structural health monitoring" is thoroughly discussed, along with research efforts that are currently available to overcome these challenges, in order to assist researchers understand better the hurdles as well as the suitability of "wireless sensor networks" for the applications of "structural health monitoring."

(Olayode et al., 2020) In recent years, there has been an increase in the amount of rural as well as urban road traffic flow, which has led to an increase in the incidence of traffic congestion, accidents, as well as pollution. If there are worries about the flow of traffic in the here and now, it is vital to make use of alternative methods of traffic management at road junctions when traditional methods of traffic control fail. This study investigates the stability and efficacy of AI techniques, such as artificial neural networks (ANNs), for reducing the amount of non-autonomous vehicle traffic in a mixed-flow traffic environment in South Africa. The goal of the study is to ultimately eliminate traffic completely. The "Mikros Traffic Monitoring" (MTM) organisation, which is a member of the Syntell Group of Companies in South Africa, gathered electronic data on the traffic patterns of 126 vehicles. The MTM traffic technology, which comprises of sensors implanted in road surfaces to monitor and regulate vehicles that regularly pass the traffic counter, was used to gather data on the flow of traffic. We used the vehicle class descriptions and accompanying speeds as input variables to train and evaluate the artificial neural network model on the MTM dataset under signalised road intersections under diverse conditions. In the end, it seems that the ANN model outperformed all other approaches in terms of predicting the likelihood of traffic congestion in a variety of traffic situations.

(Boukerche et al., 2020) In recent years, there has been a rise in the volume of rural as well as urban road traffic, which has led to an increase in the number of transportation disasters. These disasters include congestion, accidents, and a high rate of pollution in the transportation sector. When conventional methods of traffic control are ineffective or when there are issues with the flow of traffic in real time at a road intersection, alternative traffic management techniques must be used. An "artificial neural network" (ANN) is being tested in a mixed-flow South African traffic environment to determine whether

it can reduce or eliminate traffic volume caused by non-autonomous cars while still maintaining its stability and efficiency. Electronic traffic data from "Mikros Traffic Monitoring" (MTM) business, a part of the Syntell Group of South Africa, was monitored. A sensor implanted in the road surface monitors and controls the cars that pass the traffic counter every day, and the traffic data was gathered using this method. To train, test, and verify the artificial neural network model, we used the vehicle class descriptions and related speeds as input variables to the dataset collected from MTM. According to the findings after many iterations of training, using an ANN model yielded best results for the traffic congestion in a diversely congested environment.

(Lian et al., 2020) A new era has dawned: the age of Big Data. Big Data has recently been used in the transportation sector, particularly traffic safety, within the context of ITS and CAV (connected/automated vehicles). Using Big Data to investigate traffic safety in the context of ITS and CAV has been examined in this work. Predicting crashes, identifying contributing variables to accidents and identifying potential crash hotspots are some of the specific subjects covered in this course. Using sophisticated analytics for Big Data offers a lot of promise for improving road safety, according to the research analysed. Integrating and processing enormous amounts of multi-source information, Big Data in traffic safety breaks through the restrictions imposed by conventional statistical analysis. It then finds solutions to issues that cannot be addressed by conventional statistical methods. Finally, recommendations are made for future Big Data safety analytics in an ITS and CAV context.

3 EMERGING TRENDS IN TELECOMMUNICATION

a. 5G network – The network of Today and Tomorrow

There are now over 3 billion internet users in the world. Smartphones are the major means of internet access for many of these people. Because smartphones can increasingly assist customers in the management of crucial aspects of their life, customers are searching for high-capacity networks that provide quicker access to apps and richer services. With 5G and wireless broadband, data transmission speeds of up to 100 times faster than 4G, as well as high speed and low latency, may be made possible.

According to a survey by CCS Insight, the number of people connected to 5G networks globally is expected to reach 1.34 billion by 2022. Telecoms are already targeting certain industries with 5G apps and IoT devices. Telemedicine is being used by the healthcare industry as a method that is both cost-effective and timely for the delivery of diagnosis and treatments to both the medical personnel and the patients. The treatment of both the means of transportation and the traffic infrastructure is being improved thanks to connected automobiles. As the globe adjusts to the new normal in light of the Covid-19 scenario, the education industry is turning to electronic learning. By automating online clients, telecoms are spreading into a wide range of industries. It may be used in a variety of sectors, including transportation, agriculture, medical, and public services. Every technology that will be included in the next 5G network will work together to enhance current communications.

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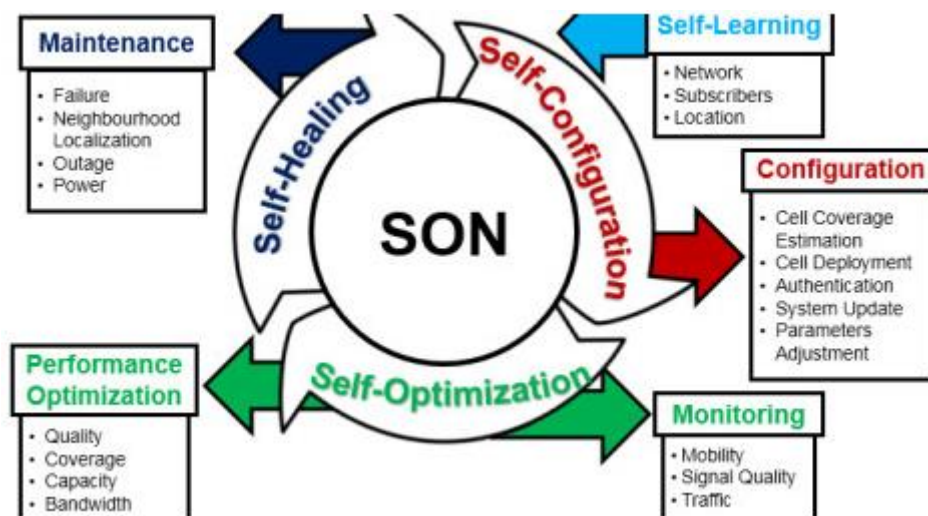
b. WiFi 6

WiFi 6 may be characterised as a wireless local area network (WLAN) that has an increased range, offers improved network performance, connects more devices, and speeds up communications. It's possible to expand network capacity, decrease latency, and provide many options to save money and earn more money with the inclusion of new technologies. WiFi 6 may be used by telecom operators to create new methods of optimising traffic across access networks. The industries of entertainment, telemedicine, education, and remote jobs will all benefit from this technology, and it will also be helpful in areas where the cost of reaching fibre is too exorbitant. In addition, the Internet of Things will be able to be deployed and always-on devices will be supported if WiFi 6 is combined with 5G technology, which will give greater signal strength. It reduces resource congestion in high-capacity networks so that data may be sent between IoT devices without interruptions.

c. Artificial Intelligence

Artificial intelligence has the potential to transform the telecommunications industry. They already employ AI tools like virtual assistants, chatbots, and other AI technologies to cater to the needs of their customers and enhance their level of happiness. It can handle and analyse massive amounts of data without compromising its security in any way. It is anticipated that by the year 2025, 70 percent of operators would have invested in AI systems as part of their efforts to upgrade their infrastructure. The use of artificial intelligence enables the development of novel approaches that reduce the costs of network maintenance, predictive maintenance, and customer support. It enables operators to tailor their B2C and B2B client offerings to their specific needs.

In addition to this, AI is able to identify issues within the network, facilitates the process of self-healing, and guards networks against any fraudulent activity. A key benefit of this technology is that it allows operators to keep tabs on the start of their equipment and predict when it will fail. In a nutshell, AI will allow for more efficient root cause investigation of new hardware faults.



d. Internet of Things

Telecom service providers' responsibilities in allowing communication between people and things have been revolutionised as a result of the Internet of Things. It is easier for telecom companies to monitor base stations and data centres thanks to the Internet of Things (IoT). As a result, the network is more stable, business processes are improved, and more income is generated. IoT solutions are being monetized in new ways by the telecom industry, which is creating new techniques and applications. To become IoT leaders and provide services that go beyond network connection, they may take use of these new technologies. Additionally, CSPs have the ability to explore new prospects and provide a wide range of services for a wide variety of sectors, from manufacturing to healthcare.

According to Berg Insight, an IoT analytics firm, there will be 4.15 billion IoT devices linked to cellular networks worldwide by 2024, presenting enormous prospects for telecommunications service providers throughout the globe. Smart home mobile applications and real-time monitoring systems benefit from superior mobile and network services provided by IoT in Home automation.

e. Big Data

With the aid of IoT sensors included in mobile devices and applications, telecommunications firms are able to collect vast amounts of data thanks to the Internet of Things (IoT). This helps these organisations create information pools. Hence, it is essential that their network be capable of moving large volumes of data and supporting new technologies indefinitely. Customers' use habits and business insights may be gleaned from the acquired data in the telecom industry. The data may be used to enhance customer service, assess new goods, and monitor and optimise the network in the long run. The utilisation of big data enables firms to establish better enterprises and gives them an edge over their competitors.

f. RPA

One of the industries that has one of the greatest acceptance rates for RPA technology is the telecommunications sector. It is able to take over jobs or processes that are repetitive and rule-based, such as replying to client inquiries, report production, pricing monitoring, and so on, and then finish them extremely precisely, which enables it to give great levels of scalability and agility. It offers the organisation with the appropriate power and capabilities to effortlessly handle back-office operations such as preserving data integrity and security, staff wages, marketing and advertising expenditures, and hardware and software costs. As a result, personnel have more time to focus on high-priority activities, build stronger connections with customers, improve operational efficiency, and fix delays in providing service to customers.

g. Cloud Computing

According to the Mordor Intelligence analysis, the telecom cloud market was valued at \$25.33 billion in 2020 and is expected to reach \$74.36 billion by 2026. There will be a huge change in communication service providers (CSPs) to cloud computing in the next several years. To offer a wide range of services, handle data, and charge customers, most telecommunications companies depend on a massive

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computational infrastructure. Internal computer resource requirements and costs are reduced, while income sources are increased, by moving to the cloud.

It is easier for telecommunications to launch new services, lower costs, and operate more efficiently as the market requires thanks to the pay-per-use model. Telecom companies may reap the benefits of cloud technology by moving essential business processes to the cloud and reaping the benefits of its efficiency. A single-product telecom like Lebara, which began expanding internationally in 2014, may also use the cloud to extend its service offerings and reach new markets more quickly.

h. Cyber Security

When it comes to cybersecurity, the telecommunications industry is one of the most susceptible. As a result of the vast number of customers that telecom firms serve, there is a plethora of opportunity for hostile attacks to get unauthorised access to the data that these organisations store. When a major telecom service provider's infrastructure is attacked, the repercussions have the ability to damage a whole nation, as well as companies, customers, and government agencies. It also has a significant impact on the brand's reputation and credibility in the communications industry. The telecom providers may better identify attacks, take preventive steps, and enhance resilience when attacked by using a comprehensive strategy such as cyber security mesh. Instead of guarding a single IT perimeter, the mesh adopts a more modular approach. This is necessary since networks do not have physical boundaries.

Zero-trust networks, such as the cybersecurity mesh, are on their way to becoming commonplace. In other words, unless the security protocol checks every connection used to extract data, it will be regarded untrustworthy. In addition, the mesh promises to handle all data systems and equipment equally and securely, regardless of whether they are located inside or outside of the mesh network.

4 CONCLUSION

What we observed throughout our investigation is merely scratched the surface by the innovative areas that are discussed in our study on the top 10 trends in the telecom industry. There are a number of areas that are certain to have a large influence on telecom firms, including the development and deployment of 5G networks and technologies, flexible networks that can accommodate high- and low-latency needs, and speedier means of communication. Competitive advantage and leadership in the market may be gained by early identification of new prospects and developing technology that can be included into a company's operations.

During our extensive investigation, we discovered a slew of trends in the telecommunications industry that we've included in this report. In addition to AI, 5G, and connectivity advancements, the industry as we know it now will be transformed. A significant step in gaining a competitive edge is making an early discovery of new business prospects and developing technological trends that may be incorporated into existing operations.

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