Asian Journal of Social Science and Management Technology
ISSN: 2313-7410
Volume 7, Issue 3, May-June, 2025
Available at www.ajssmt.com

A Comprehensive Analysis of IoT: Trends, Applications, and Future Prospects

Gayatri Bhuibhar[1], Shivani Wadatkar[2], Snehal Patil[3], Prof. Nikesh Gadre[4]

[1,2,3,] *Sipna College of Engineering and Technology, Amravati*

Abstract:
The Internet of Things (IoT) is emerging as one of the fastest-evolving technologies in today's research landscape, often considered more impactful than even AI and robotics. Representing a new era in computing, IoT can be viewed as a cloud-based, global neural network that interconnects various physical objects. It is essentially a network of smart devices and systems that communicate and interact with other machines, environments, objects, and infrastructure. Technologies such as radio frequency identification (RFID) and sensor networks are stepping up to support this transformation. As a result, enormous amounts of data are generated, stored, and analyzed to drive intelligent actions that help control and optimize these devices—enhancing safety, quality of life, and environmental sustainability. Access to real-time personal data is increasingly vital for both businesses and public agencies. Traditionally, organizations have relied on notice boards, emails, and websites to disseminate information. However, with widespread internet access on mobile and desktop platforms across most countries, sharing information via the internet has become significantly more efficient and cost-effective.

Keywords: - Internet of things, IOT application, smart application

---

1. Introduction

The Internet of Things (IoT) stands out as the most rapidly developing technology among all the advancements being explored by researchers; it has been prioritized over AI and robotics. The term "internet of things" (iot) refers to the broad idea of a collection of devices with internet connectivity that can gather data from their surroundings through sensors or actuators and then transmit that data to the internet for processing and possible applications. The internet has emerged as the most significant means of human connection in the modern era, allowing individuals to communicate with one another from all over the world. The fundamental concept of the Internet of Things (IoT) has been existing for almost 20 years, and because to its high potential influence on enhancing society and our daily lives, it has drawn the attention of numerous industries and researchers. These days, we are all surrounded by a variety of Internet of Things (IOT) gadgets that enhance our quality of life by utilizing smart dwellings, cars, healthcare, agriculture, and education. By 2020, there will be 24 billion linked devices worldwide, up from the current 9 billion.

These days, information desks are required everywhere, including train stations, malls, and colleges. They provide immediate access to information on train schedules, promotional deals, and vital notices. From the standpoint of educational organizations, the issue is that it calls for a certain number of employees who are committed to that work and who need to be informed about the institute's most current events. The second issue is that obtaining information from them requires going to the institute and visiting the information desk. The answer to this is to employ technology and assign it the task of responding to all of the questions that people have. The ideal instrument is a cell phone, which is accessible to practically everyone and can be used to

download the most recent information from the internet. If the information is not updated online, we must contact the customer service centre for assistance in those situations when the information is not updated online. A device that some writers created has all the information saved in a database; anyone in need of information just needs to utilize the device to access the relevant data. The device must be accessible to the user in order for this to function.

In 1999, Kevin Ashton, the executive director of the Auto-ID Centre, first introduced the phrase "internet of things" (IOT) to refer to a system that employed sensors to link the real world and the internet. As more and more connected devices entered the market over the course of the following ten years, public interest in IoT technology started to surge. The first smart refrigerator was introduced by LG in 2000, the first iPhone was released in 2007, and by 2008, there were more linked devices than humans on the earth. Google began developing autonomous vehicles in 2009, and the company released its Nest smart thermostat, which enabled remote management of the central heating system, in 2011.

IoT technology is currently ranked among the top 5 globally, per a Gartner chart. This indicates that it is widely utilized in a variety of sectors and roles, including as smart homes, car tracking, monitoring children and the elderly, and daily tasks. But in reality, these markets currently employ a number of IoT-enabling gadgets, and the new revolution is beginning to break up in the future.

The next major global revolution in the digitalization and commercialization of different modules and goods is the Internet of Things. Everything is connected to the internet; certain tasks need managing the parameters while others require remote parameter monitoring. Alongside wearables and robots, the most popular technology of the present day is the Internet of Things. Currently, a wide variety of devices are connected through mobile networks, which can facilitate the creation of new services and apps. Beyond tablets and laptops, this new wave of connection includes smart meters, traffic control, connected automobiles and buildings, and the potential to intelligently connect nearly anything and everybody.

The primary goal of current Internet of Things (IoT) research is to enable common things to see, hear, and smell the real world for themselves and to interact with one another so that they can share their discoveries. It is possible to shift monitoring and decision-making from the human to the machine side in this way.

2. Literature Review

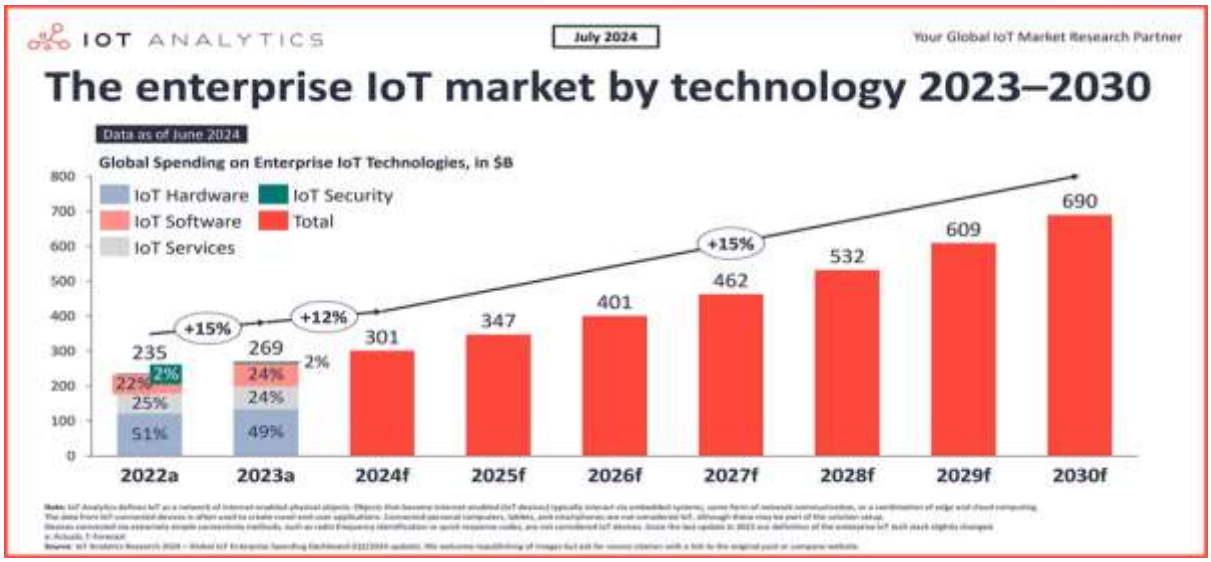

figure 1. The Enterprises IOT Market by Technology 2023-2030 and the source is https://iot-analytics.com/iot-market-size/

Sr. no	Author name	Year of publication	methodology	finding	Gap
1	ANAM SAJID	2016	Industries use IoT-cloud integration for smart systems, improving efficiency and security.	IoT-cloud integration improves industrial systems but requires research for security.	IoT-cloud integration improves industrial systems but requires research for security.
2	Vandana Sharma	2016	IoT connects devices, automates tasks, improves safety, efficiency, and accessibility.	IoT connects devices using Bluetooth, RFID, Wi-Fi for global automation.	IoT enhances life, productivity, revolutionizes advertising in various settings.
3	Pradnya.A. Hukeri	2017	IoT enables remote automation, ensuring precise PCB etching in manufacturing.	IoT enables low-cost remote control of industrial devices efficiently	System enables remote industrial monitoring, improving efficiency and preventing errors.
4	SONIYA VAZIRANI	2018	IoT connects devices, automates tasks, and improves life through smart systems	IoT's 9 billion devices enhance innovation, data exchange, and safety.	IoT revolutionizes life, boosts services, and proposes e advertising systems.
5	Liang Xiao	2018	Article explores IoT security challenges, highlighting machine learning and backup solutions.	Article reviews IoT security, focusing on machine learning for protection.	Article examines IoT attack models, machine learning, and security challenges.
6	IKRAM UD DIN	2018	IoT connects billions, enhances sectors, and challenges resource management.	IoT connects billions, impacting healthcare and computing with key technologies.	IoT impacts healthcare, computing; survey reviews technologies and research challenges.
7	MUHAMMAD FAHIM	2019	Anomaly detection in IoT is challenging; review covers methods and techniques.	Anomaly detection faces challenges; study reviews methods and analysis flowchart.	Paper reviews methods for IoT anomaly detection, emphasizing performance and challenges.
8	Mohamad Kassab	2019	IoT, coined by Ashton, connects objects;	IoT connects objects online; 20.4 billion	This paper reviews IoT's educational

			reviews education benefits, challenges .	devices projected by 2020.	impact, highlighting benefits, challenges, and solutions.
9	Sarika A. Korade	2019	IoT connects devices, evolved, gaining significance with company investments.	Internet evolved from Web to IoT, enabling broad machine communication.	IoT connects devices, transforming life, creating a smart, efficient future.
10	KINZA SHAFIQUE	2020	IoT advancements support e-health, smart homes; review highlights 5G integration.	IoT advancements support e-health, smart homes; review highlights 5G integration.	Paper reviews 5G advancements for IoT, impacting smart applications and challenges.
11	Fatemeh Molaei	2020	Mining benefits from AI, robotics, IoT, improving efficiency and safety.	This study reviews IoT in mining: automation, control, data challenges.	IoT aids mining tasks but faces data management and network challenges.

3. Application

The purpose of this system is to show information and notifications in a retail complex mall, but it can also be used in other places, such as educational notice boards, train stations, bus stops, and airports. Temperature sensors are also utilized in malls to regulate the mall's humidity and temperature through central air conditioning. It can also be utilized in industrial organizations. In hospitals, emergency messages may be displayed via an e-display system. Some contexts in which IoT is widely utilized.

1. Smart Cities:

In order to interact with the data exhaust generated from your city and neighborhood, you must transform your city into a smart city.

- Keeping an eye on the city's parking lot availability.
- Vibration and material condition monitoring in structures, bridges, and landmarks from history.
- Identify iPhones, Android smartphones, and generally any gadget that supports Wi-Fi and Bluetooth interfaces.
- Energy emitted by cell towers is measured, and as well as Wi-Fi routers.
- Vehicle and pedestrian level monitoring for optimal routes for walking and driving.
- Measuring the amount of trash in containers to maximize the routes for collecting trash.
- Intelligent freeways equipped with alerts and deviations based on the weather and unforeseen things like traffic bottlenecks and accidents.

2. *Domestic & Home Automation:*

Reduce your monthly expenses and resource usage by remotely monitoring and controlling your home appliances with an IoT system.

- Energy and Water Use: Monitoring water and energy supply usage to get recommendations on resource and cost savings.
- Appliances with remote controls: Turning appliances on and off from a distance helps prevent acciden ts and save energy.
- Intrusion Detection Systems: These systems identify openings in windows and doors and take action to stop

intruders.
• Art and Goods Preservation: keeping an eye on the state of art warehouses and museums.

3. *Security & Emergencies:*
• Perimeter Access Control: Recognizing and managing unauthorized and restricted individuals.
• Liquid Presence: To stop corrosion and breakdowns, liquid detection is used in data centres, sensitive building sites, and warehouses.
• Radiation Levels: To produce leakage alerts, radiation levels in the vicinity of nuclear power plants are measured widely.
• Explosive and Hazardous Gases: Finding gas leaks and concentrations in mines, industrial settings, and the vicinity of chemical industries**.**

4. *Medical Field:*
• All Detection: Support for self-sufficient elderly or disabled individuals.
• Medical Fridges: Keeping an eye on and managing the conditions within freezers that hold medications, shots, and organic materials.
• Sportsmen's Care: Vital sign monitoring on fields and at high-performance centres.
• Patient Surveillance: Keeping an eye on the health of patients in nursing homes and hospitals.
• Ultraviolet Radiation: UV sun ray measurements are used to alert people to avoid exposure during specific hours.

5. *Industrial Control:*
• Applications using machines to machines: automatic issue diagnosis and control.
• Indoor Air Quality: Keeping an eye on poisonous gas concentrations and oxygen levels within chemical factories to protect both personnel and property.
• Temperature Monitoring: Keep an eye on the industry's internal temperature.
• Ozone Presence: During the meat-drying process, ozone levels are monitored in food manufacturers.
• Vehicle auto-diagnosis: gathering data from Can Bus to alert drivers to emergencies in real time or offer guidance to drivers.

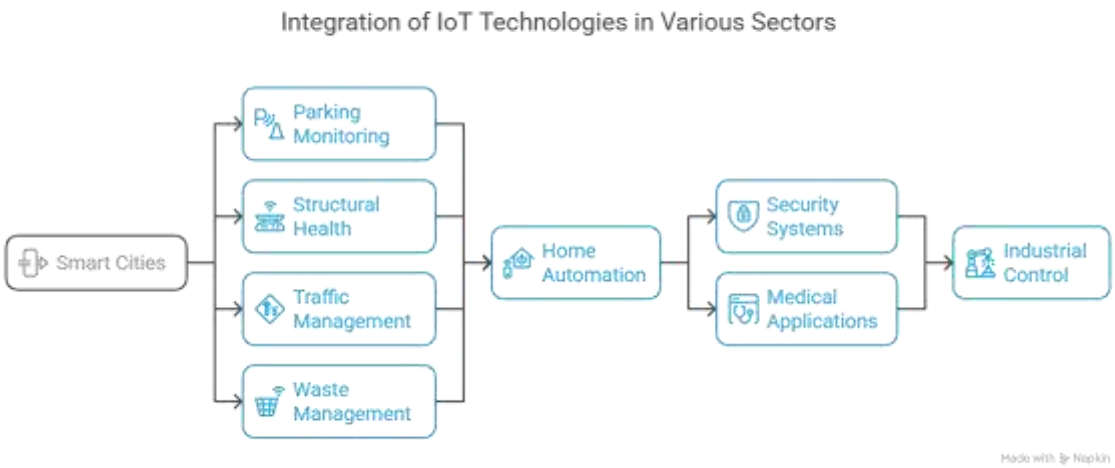

Figure 2. Integration of IoT Technologies

4. Result and Discussion

IoT is making education better with smart tools, online learning platforms, and virtual classrooms. It helps students and teachers connect and work together more effectively. In the mining industry, IoT links people, machines, and processes in real-time, improving safety and maintenance through remote monitoring and

sensors. This allows for quicker problem detection and better overall efficiency.

In transportation, IoT employs PCA and machine learning models like SVMs and Gaussian Mixture Models to detect unusual patterns and predict potential issues. Smart objects use thresholding and unsupervised learning to identify problems. In healthcare and industrial systems, clustering and statistical models are used to detect and resolve issues, reducing downtime and preventing failures. An IoT-based medical device uses an XBEE S2 module and Intel Galileo board for connectivity. Statistical methods spot unusual patterns by checking how data differs from what's normal. Challenges include selecting proper devices, integrating them into education, and ensuring security. The IEEE backs nearly 100 IoT standards and stresses consistent IoT education.
IOTPOT was tested in two phases from November 2014 to May 2015. It monitored 165 IP addresses, recording 70,230 visits, 49,141 successful logins, and 16,934 malware download attempts, collecting 43 malware files. The ZORRO malware group led attacks in three stages: intrusion, infection, and monetization. IOTBOX analysis revealed DoS attacks, TCP scans, fake websites, and hidden access points. Despite progress, there are still research gaps because technology keeps changing and different fields have their own issues. While IoT helps with automation, there are challenges in using IoT throughout mining stages, storing data, and keeping systems safe.
Sensors are used in various fields to detect anomalies. In smart environments, wearables and transport systems use sensors for monitoring. Healthcare and industrial systems rely on embedded sensors. Key challenges include handling complex data and improving sensor integration. Anomaly detection methods include statistical models, machine learning, and deep learning techniques, each evaluated using accuracy, precision, recall, F1 scores, and AUC, especially on uneven datasets. Challenges include managing diverse data in smart environments, high-dimensional data in transport systems, uncertainties in smart objects, and reliable data analysis in healthcare.

5. Conclusion

This study explores the integration of IoT and cloud computing with industrial SCADA systems, emphasizing their advantages such as enhanced flexibility and scalability. However, it also draws attention to critical security concerns, particularly data privacy risks associated with third-party cloud service management. The paper highlights the urgent need for robust security measures to protect vulnerable IoT devices and reduce potential attack surfaces. Additionally, it examines anomaly detection models, the role of 5G in advancing IoT capabilities, and practical applications across industries such as mining. The transformative potential of IoT is further analyzed in sectors like healthcare, transportation, and smart homes. Lastly, the research underscores the importance of region-specific strategies—especially for countries like Ghana and the USA—to effectively harness the full potential of IoT technologies.

6. References

[1] Ms.Pradnya. A. Hukeri,Mr.P.B.Ghewari,"REVIEW PAPER ON IOT BASED TECHNOLOGY."

[2] ANAM SAJID, HAIDER ABBAS, AND KASHIF SALEEM,"Cloud-Assisted IoT Based SCADA Systems Security: A Review of the State of the Art and Future Challenges."

[3] SONIYA VAZIRANI, "A Review Paper on "IOT" & It's Smart Applications."

[4] IKRAM UD DIN , MOHSEN GUIZANI ,et al,"The Internet of Things: A Review of Enabled Technologies and Future Challenge".

[5] MUHAMMAD FAHIM AND ALBERTO SILLITTI,"Anomaly Detection, Analysis and Prediction Techniques in IoT Environment: A Systematic Literature Review."

[6] KINZA SHAFIQUE , BILAL A. KHAWAJA ,et al,"Internet of Things (IoT) for Next-Generation Smart Systems: A Review of Current Challenges, Future Trends and Prospects for Emerging 5G-IoT Scenarios.

[7] Mrs. Sarika A. Korade, Dr. Vinit Kotak, Mrs. Asha Durafe,"A Review Paper on Internet of Things(IoT) and its Applications."

[8] Mohamad Kassab,Joanna DeFranco , Phillip Laplante ,"A systematic literature review on Internet of things

in education: Benefits and challenges."
[9] Fatemeh Molaei, Elham Rahimi, Hossein Siavoshi, Setareh Ghaychi Afrouz and Victor Tenorio,"A Comprehensive Review on Internet of Things (IoT) and its Implications in the Mining Industry."
[10] Liang Xiao, Xiaoyue Wan, Xiaozhen Lu,Yanyong Zhang, Di Wu,"IoT Security Techniques Based on Machine Learning."
[11] Er. Pooja Yadav, Er. Ankur Mittal, et al, "IoT: Challenges and Issues in Indian Perspective."
[12] Jayavardhana Gubbi,Rajkumar Buyya,Slaven Marusic,Marimuthu Palaniswami "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions."
[13] Yin Minn Pa Pa, Shogo Suzuki,et al,"IoTPOT: Analysing the Rise of IoT Compromises."
[14] Ravi Kishore Kodali, Govinda Swamy and Boppana Lakshmi ,"An Implementation of IoT for Healthcare."
[15] Vandana Sharma, Ravi Tiwari,"A review paper on "IOT" & It's Smart Applications".
[16] Asif Ali Laghari1 · Hang Li1 · Abdullah Ayub Khan2 · Yin Shoulin1 · Shahid Karim3 · Muhammad Adnan Kaim Khani4, "Internet of Things (IoT) applications security trends and challenges".
[17] Rupinderpal Kaur, "Internet of Things: An Overview".
[18] Idoko Peter Idoko 1, *, Onuh Matthew Ijiga 2, Daniel Obekpa Agbo 3, Ehi Peace Abutu 4, Chijioke Ifakandu Ezebuka 5 and Esther Ene Umama 6, "Comparative analysis of Internet of Things (IOT) implementation: A case study of Ghana and the USA - vision, architectural elements, and future directions".

INFO

Corresponding Author: Shivani Wadatkar, Sipna College of Engineering and Technology, Amravati.

How to cite/reference this article: Gayatri Bhuibhar, Shivani Wadatkar, Snehal Patil, Prof. Nikesh Gadre, A Comprehensive Analysis of IoT: Trends, Applications, and Future Prospects, *Asian. Jour. Social. Scie. Mgmt. Tech*. 2025; 7(3): 358-364.