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Internet of Things in Marketing

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ABSTRACT

The Internet of things (IoT) basically describes the billions of physical devices all around the globe that are connected to the Internet, which gather and share data. IoT devices could be smartphones, laptops, tablets, computers, smart TVs, vehicles, smart home appliances, door locks, wearable devices like smartwatches, heart and blood pressure monitors. These devices use sensors and actuators to collect and exchange data from their environments with each other devices through the Internet. IoT provides an opportunity to improve a product or marketing strategy, while simultaneously enhancing customer experience and providing a unique approach. It enables marketers to create totally different experiences in bridging the digital and physical world. This paper helps you to understand the concept of Internet of things (IoT) and its role in marketing.

KEYWORDS: *Internet of things, IoT, industrial Internet of things, IIoT, marketing, automation.*

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INTRODUCTION

Internet of things (IoT) refers to the billions of physical devices that are now connected to the Internet, all collecting and sharing data. It is a network of devices that collect data from physical objects and transmit it to the Internet. The Internet of things affects all industries, irrespective of their size and popularity. Companies across sectors are integrating IoT devices within their network infrastructure and developing new ways to manage and maneuver the data obtained through IoT. As the cost of connectivity has fallen, the number of connected devices has increased.

IoT devices, like smart watches or smart home devices, are things that people use every day to help make their lives easier by always being connected to the Internet. They also offer marketers an opportunity to gain valuable insight into their ideal customers. One way IoT can revolutionize marketing is by creating real-time and personalized messages for customers. Any device can be used to create these messages. The main thing that connected devices do is generate data and they do so continuously. Marketers can use this data to understand the preferences of their customers. They can use it to not only know what your customers do but also anticipate what your customers will want and need in the future. The IoT also allows integration across a number of devices, which means no matter where your customers are, you can reach them [1].

OVERVIEW OF INTERNET OF THINGS

The concept of the Internet of things (IoT) has been around since the late 1990s, but it gained momentum in the 2000s with the rise of Internet-connected devices. The Internet began with some military computers in the Pentagon called Arpanet in 1969. It expanded throughout the 1980s as a set of four parallel military networks, each at a different security level. The core technology which gives the Internet its particular characteristics is called Transmission Control Protocol/Internet Protocol (TCP/IP), which is essentially a set of rules for communication [2].

Internet of things (IoT) is a worldwide network that connects devices to the Internet and to each other using wireless technology. These devices contain hardware such as sensors and electronics which give them the ability to interact with other objects and to be monitored and controlled from afar. The idea is that the physical devices with sensors or the ability to

capture data, shares that data with websites. The information is then used or analyzed in real time or at a later time, to create efficiencies. IoT is expanding rapidly and it has been estimated that 50 billion devices will be connected to the Internet by 2020. These include smart phones, tablets, desktop computers, autonomous vehicles, refrigerators, toasters, thermostats, cameras, alarm systems, home appliances, insulin pumps, industrial machines, intelligent wheelchairs, wireless sensors, mobile robots, etc. Figure 1 illustrates the Internet of things [3], while Figure 2 shows its various applications [4].

There are four main technologies that enable IoT [5]: (1) Radio-frequency identification (RFID) and near-field communication, (2) Optical tags and quick response codes: This is used for low cost tagging, (3) Bluetooth low energy (BLE), (4) Wireless sensor network: They are usually connected as wireless sensor networks to monitor physical properties in specific environments. Communications technologies in Internet of things are portrayed in Figure 3 [6]

IoT technology enables people and objects to interact with each other. It is employed in many areas such as smart transportation, smart cities, smart energy, emergency services, healthcare, data security, industrial control, logistics, retails, structural health, traffic congestion, manufacturing, and waste management. The Internet of things is extensively developed world-wide with a focus on civilian applications such as electric power distribution, intelligent transportation, healthcare, industrial control, precision agriculture, environmental monitoring, etc.

The growth of the internet of things (IoT) is drastically making impact on home and industry. While the IoT affects among others transportation, healthcare, or smart homes, the Industrial Internet of Things (IIoT) refers in particular to industrial environments. IIoT is a new industrial ecosystem that combines intelligent and autonomous machines, advanced predictive analytics, and machine-human collaboration to improve productivity, efficiency and reliability. It is bringing about a world where smart, connected embedded systems and products operate as part of larger systems [7].

The industrial Internet of things (IIoT) refers to the application of the Internet of things (IoT) across several industries such as manufacturing, logistics, oil and gas, transportation, energy/utilities, chemical, aviation and other industrial sectors. A typical industrial Internet of things is shown in Figure 4 [8].

IOT IN MARKETING

The Internet of things (IoT) describes physical objects that are embedded with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communication networks. The devices do not need to be connected to the public Internet; they only need to be connected to a network and be individually addressable. The explosion of interest surrounding the Internet of things presents a truly remarkable opportunity for marketing. The Internet of things has not only made our lives easier but has also opened up a whole world of marketing opportunities and new ways to reach consumers. The use of the Internet of things in marketing is really about thinking outside of the box and offering relevant services in the most valuable ways for the "real" customer in real life.

With the new age technology and the integration of the Internet to everyday life, it comes as no surprise that corporations have turned to the Internet to market their products. Experts are now becoming more aware of the applications of the IoT as a means of improving digital marketing strategies. The IoT is a disruptive technology that is already affecting every aspect of running a business, from production and distribution to marketing and customer service. IoT devices have the potential to change our lives for the better and they bring a lot of business opportunities with them too [9]. Figure 5 shows how marketers use IoT [10].

APPLICATIONS OF IOT IN MARKETING

Main areas where IoT can be used for marketing include ecommerce, advertising, customer channeling, and big data. Common applications include the following [11,12]:

- *Advertising:* The main place where IoT can work is advertisement placements. The main purpose of an advertisement is to inform, educate, and entice a prospective customer to purchase a particular service or a product. IoT can be used as a good advertising tool as it generates a lot of high quality, specific data pertaining to individual customers. While there is a limitation of sorts on how individuals might respond to an advertisement, nevertheless, it is something that has a deep impact as it can track customer purchase behaviors online and offline. We have only touched the surface of what the Internet of things will make possible in advertising.

- *Big Data:* One of the key drivers of the IoT is data. We are living in a world of big data. IoT devices generate a huge, continuous stream of real-time data. Smart devices allow marketers to gather lots of data about consumers which will be used for effective marketing campaigns. This not only provides a deep

understanding of customer needs and wants, it also allows companies to adapt in real-time and capitalize on opportunities with agility. Big data means that it is possible to create more targeted content and personalize content for different audiences. When used together with big data coming from real-time transactions, IoT has the potential to change the customer experience. Data analysis involves interpreting raw data to determine which is actually valuable and finally it provides useful information to the end-user. This data is valuable for a predictive analytics model. Big data provides more accurate insights that will help marketers reduce risk and increase opportunities.

- *Location-based Marketing:* IoT enables precise location-based marketing strategies. Using GPS and RFID technologies, businesses can send targeted advertisements and offers to consumers based on their real-time location. There is also beacon technology, where small wireless devices use Bluetooth Low Energy (BLE) to transmit signals to nearby smart devices, typically phones or tablets. It is commonly used in retail, museums, airports, and event spaces to provide location-based information, navigation assistance, targeted advertising, and interaction opportunities. Smart billboards are another form of location-based advertising using IoT technology. These billboards collect mobile data from passing devices.

- *Home Automation:* Home automation is becoming increasingly ubiquitous. Home automation integrates technology to control and automate home features like lighting, climate, entertainment, and security through a central system, offering convenience, energy efficiency, and enhanced security via smart devices and apps. A growing array of devices connected to the Internet has massive implications for automation. A smart home, also known as an automated home, could be based on a platform or hubs that control smart devices and appliances. Apple, Google, Samsung, Amazon and many other companies already provide apps that allow you to monitor, control and automate appliances, lights, and security systems. This trend is accelerating as more devices and appliances are replaced with new "smart devices." Figure 6 shows how IoT is used in a smart home [13].

BENEFITS

With the rise of the Internet of things (IoT), marketing and customer engagement guesswork will become a thing of the past. Real-time, actionable insights are introducing unprecedented opportunities for businesses to know *what* to promote *where* and *when*, and *to whom.* Other benefits include [1,4]:

- *Automation:* Today, most IoT projects are about the optimization and automation of processes. IoT will make marketing more exact and increasingly automated. IoT devices are part of the broader concept of home automation, which generally includes lighting, heating, and air conditioning, media and security systems, and camera systems. IoT devices can be used to monitor and control the mechanical, electrical, and electronic systems used in in home automation and building automation systems. By integrating social media with IoT, marketers are using automation.

- *Improved Customer Engagement:* Companies will have a deeper understanding of their customers, and this understanding will be more actionable than ever before. There is no better way to engage with your customers than through personalized content. IoT devices will allow you to do just that. The IoT also allows integration across a number of devices, which means no matter where your customers are, you can reach them.

- *Enhanced Customer Experience*: IoT devices can be used to improve the customer experience by providing personalized recommendations and offers based on individual preferences and behavior. IoT helps your customers to understand better your products, services, and operations. IoT not only improves the overall customer experience, it can create memorable experiences that differentiate brands. Then there are smart fitting rooms for retail, which bring many benefits for customers and businesses alike. Sensors can identify the items a customer brings into the fitting room, then connected screens and mirrors display information on complementary items, color variations and sizes that are in stock in that specific store, in other stores or online.

- *Predictive Marketing:* As IoT continues to grow and expand, predictive marketing will become increasingly important. Predictive marketing could also give retailers the ability to anticipate demand, which means they can optimize their inventory and have a better understanding of what they need.

- *Fast Transactions:* As customers are extremely busy these days, they want a quick, smooth, and flawless checkout experience. It is expected that customer experience (CX) may leave behind price and product as key marketing determinants. To keep up with the demand for better CX, your business should look into deploying an IoT-activated mobile app to deliver the desired output at the right moment. IoT makes it possible to do all of these in real-time!

- *Better Personalization:* Personalization is an effective way to reach, and engage your audience. Targeting the customers through personalized content or messages via offline and online mode has been possible due to IoT. IoT helps marketers to connect with their customers on a real-time basis. It helps to target the audience more accurately, and it improves the effectiveness of the marketing campaign.

- *Improved Customer Loyalty:* As the IoT continues to advance, reward programs could be totally customized based on each individual customer's shopping habits. Offering this level of personalization could give your customers the feeling that they are valued and that you care about their experience.

CHALLENGES

There are potential challenges associated with using IoT in marketing. Several concerns exist regarding the risks associated with the growth and diffusion of IoT technologies and products, particularly in the areas of privacy and security. The real challenge will be in keeping up with consumer demands and expectations as they rapidly evolve along with their connected environment. Other challenges include the following [14,15]:

- *Security and Privacy*: A lack of consumer trust in IoT security and privacy is often cited as the biggest blocker to widespread adoption. IoT devices collect and transmit large amounts of data, including personal information. This data must be protected to ensure that it is not compromised or misused. The only way for the Internet of things to reach its full potential for innovation is with the trust of consumers. Technically, the IoT can respect consumers' privacy and protect their data, but consumers may decide that the exchange of personal information is justified by the value of personalized services they get from their products in return. Concerns about privacy have led many to consider the possibility that big data infrastructures such as the Internet of things and data mining are inherently incompatible with privacy.

- *Safety:* IoT systems are typically controlled by event-driven smart apps that take as input either sensed data, user inputs, or other external triggers (from the Internet) and command one or more actuators towards providing different forms of automation. Examples of sensors include smoke detectors, motion sensors, and contact sensors. Examples of actuators include smart locks, smart power outlets, and door controls.

- *Complexity:* Another challenge is the complexity of implementing IoT systems. The exact scale of the Internet of things is unknown. Globally there are currently around 9 billion smart devices. IoT is multifaceted and complicated. One of the main factors that hindering people from adopting and using Internet of things (IoT) based products and services is its complexity. The IoT will often be considered and studied as a complex system due to the huge number of different links, interactions between autonomous actors, and its capacity to integrate new actors. As a practical approach, not all elements on the Internet of things run in a global, public space. Subsystems are often implemented to mitigate the risks of privacy, control, and reliability. Managing and controlling a high dynamic ad hoc IoT things/devices network is a tough task with the traditional networks architecture.

- *Space Considerations:* In the Internet of things, the precise geographic location of a thing—and also the precise geographic dimensions of a thing—can be critical. Therefore, facts about a thing, such as its location in time and space, have been less critical to track because the person processing the information can decide whether or not that information was important to the action being taken, and if so, add the missing information (or decide to not take the action).

- *Data Storage:* A challenge for producers of IoT applications is to clean, process and interpret the vast amount of data which is gathered by the sensors. There is a solution proposed for the analytics of the information referred to as *wireless sensor networks*. These networks share data among sensor nodes that are sent to a distributed system for the analytics of the sensory data. Another challenge is the storage of this bulk data.

FUTURE OF IOT IN MARKETING

The Internet of things sits at the intersection of a convergence between the worlds of enterprise technology systems and marketing. The integration of IoT into marketing has revolutionized the way customer data is collected. IoT is bound to get even more advanced in the future. As the IoT market continues to grow, it will enhance customer engagement, streamline marketing strategy, and give a way to create more effective campaigns for customers.

IoT's major significant trend in recent years is the growth of devices connected and controlled via the Internet. The IoT has yet to reach its full potential. With the high probability of digital devices and platforms to be launched in the future, there stand more opportunities and ways to capture more data about the customers. Everything in your house that is electrical could become a part of the IoT, allowing

them to communicate with each other and your smart devices. It is not too far into the future that most of the appliances we use every day will be connected to be part of the Internet of things. Businesses will be able to use printed electronics and sensors to turn almost any product into an IoT device. The Internet of things will drastically change how brands should interact with their customers and how they should run their marketing department.

The future of marketing is bright in the hands of IoT [16,17].

CONCLUSION

Internet of things (IoT) is a network of physical devices connected with each other through the Internet, allowing them to collect and exchange data. It has changed everyone's lives and is constantly evolving with time. It has the potential to transform the way that businesses operate, including the field of marketing. IoT is already making a significant impact on marketing. It allows marketers to gather data about consumer behavior in real-time. This data can be used to analyze the effectiveness of marketing campaigns and identify trends that can be used to optimize future campaigns.

IoT creates opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. Companies positioning themselves well for IoT will be at the forefront for increased demand for innovative, smart, and connected products and environments. Success will depend on the ability to connect with an interdependent network of devices, apps, and services, which means that data is no longer to be collected and coveted, but shared. More information about Internet of things in marketing can be found in the books in [18-21] and the following related journal: *IEEE Internet of Things Journal.*

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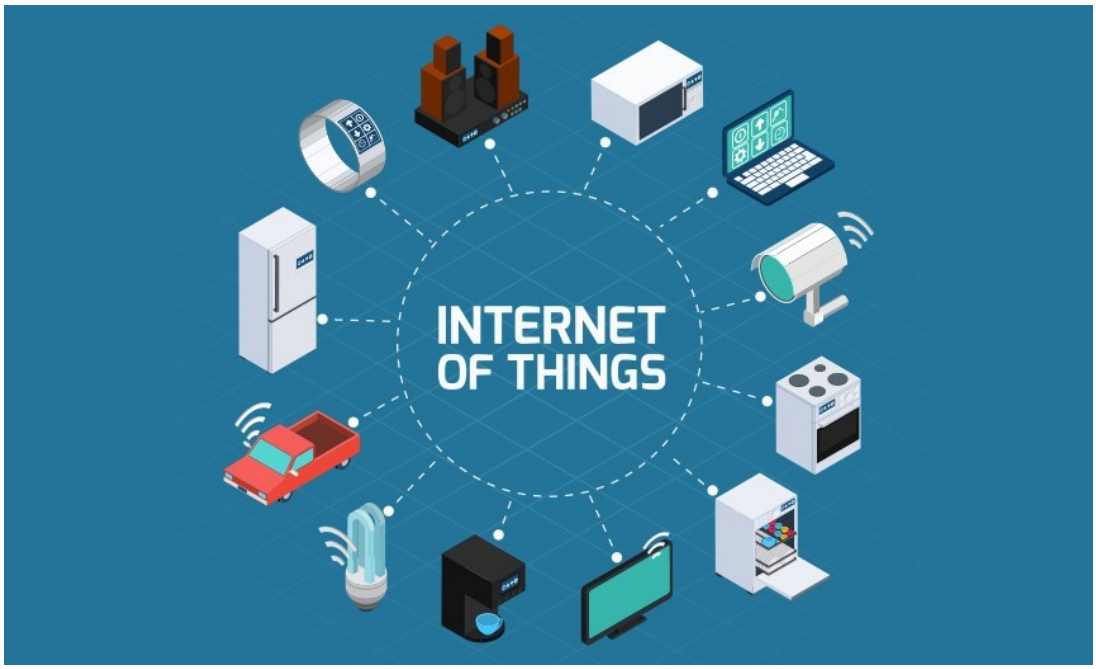

Figure 1 The Internet of things [3].

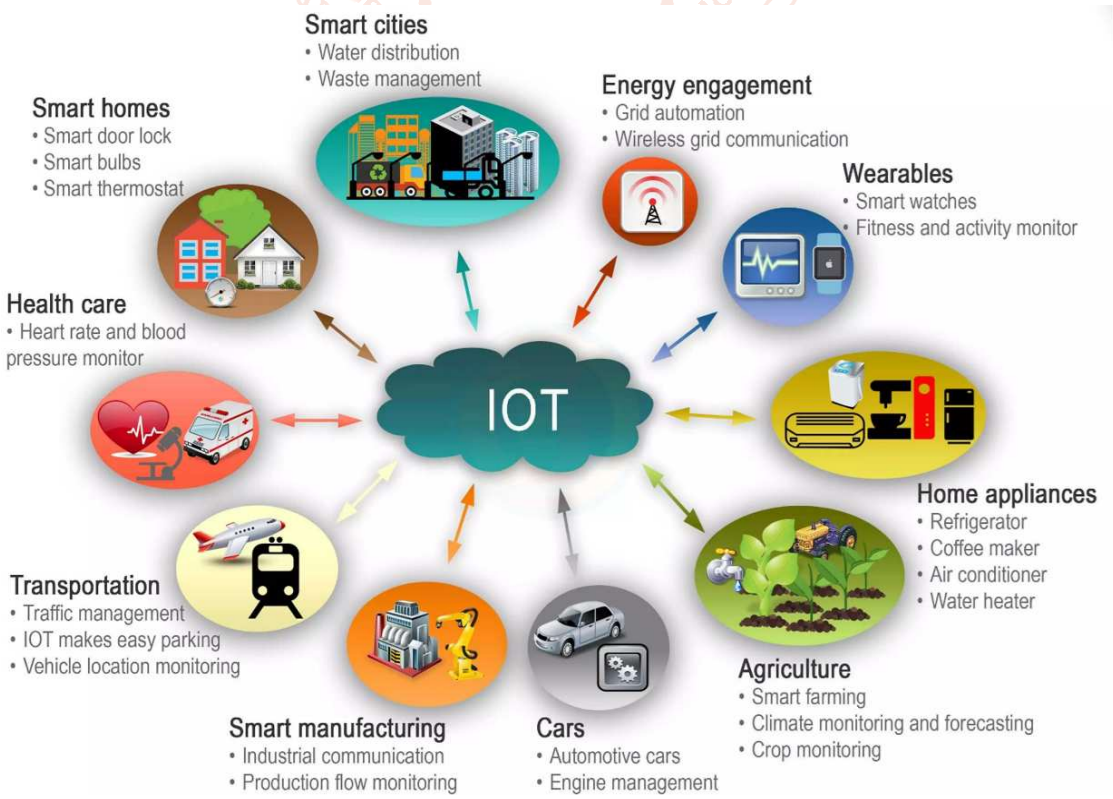

Figure 2 Applications of IoT [4].

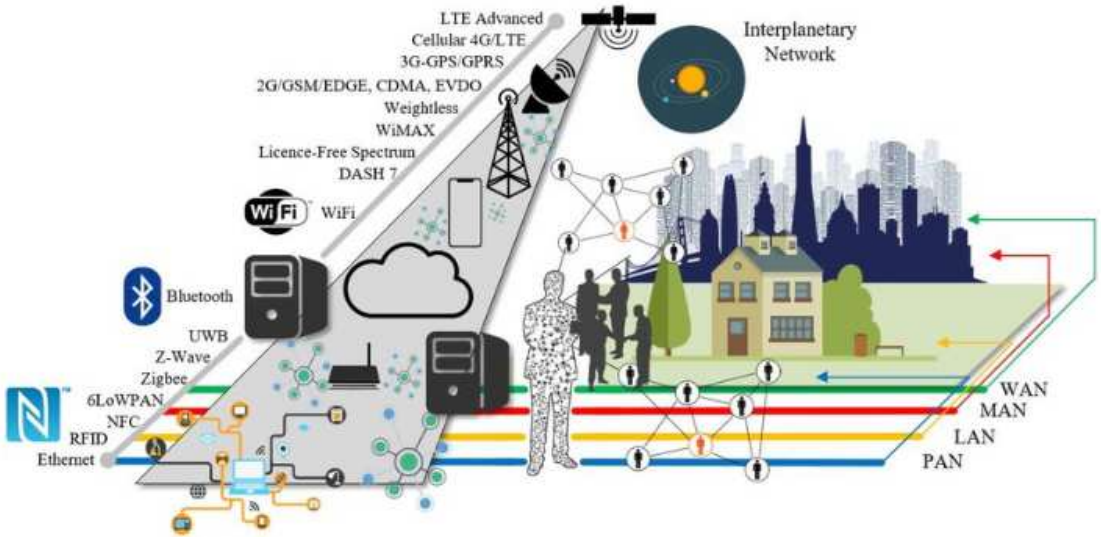

Figure 3 Communications technologies in Internet of things [6].

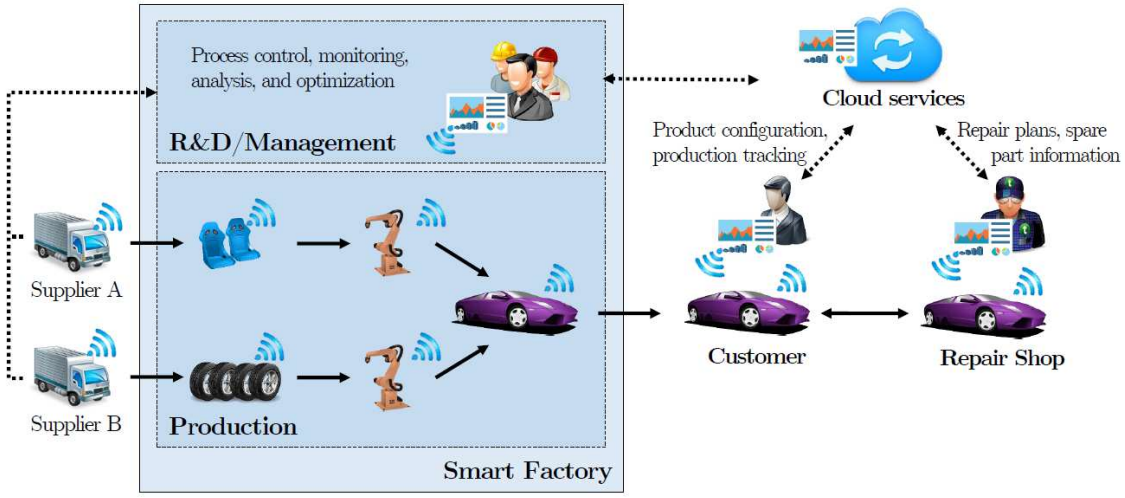

Figure 4 A typical industrial Internet of things [8].

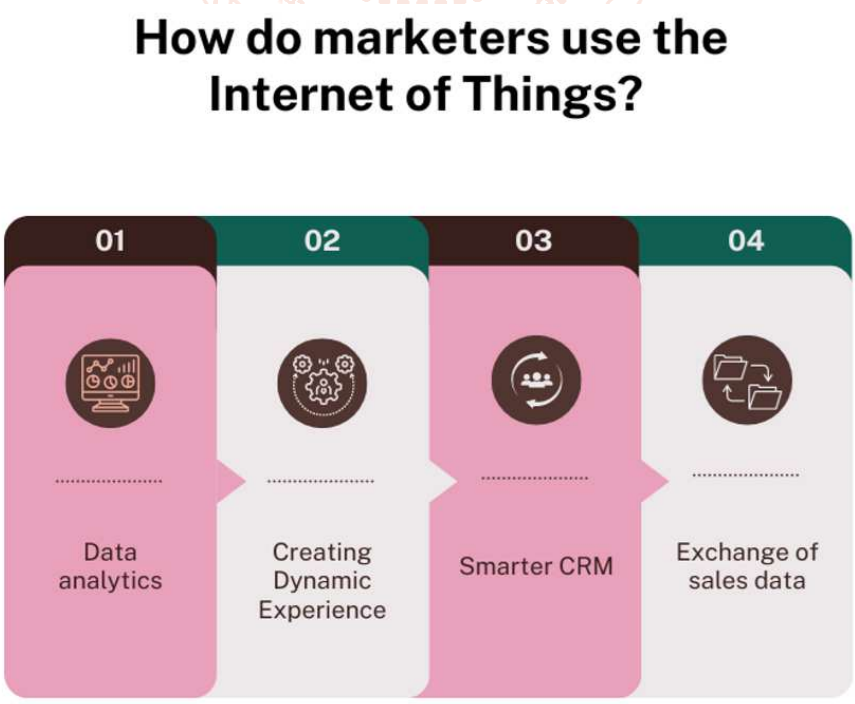

Figure 5 How marketers use IoT [10].

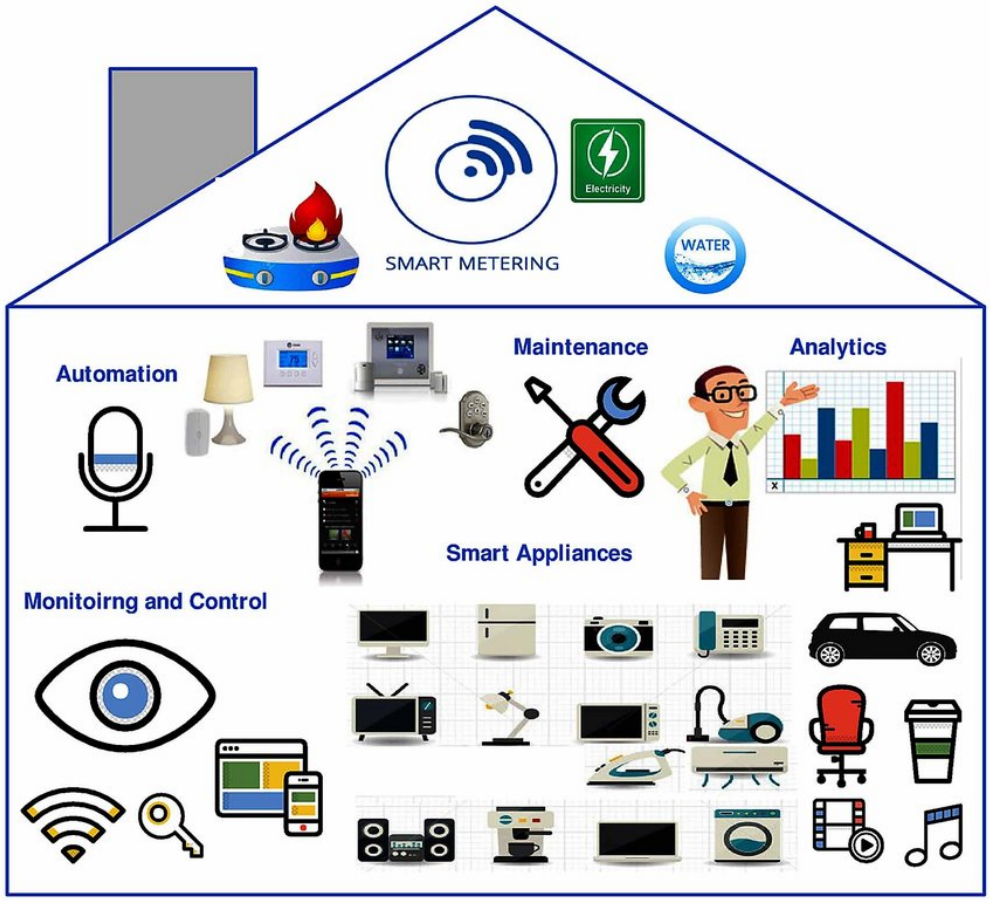

Figure 6 How IoT is used in a smart home [13].