

## Internet Of Things

The "Internet of things" (IoT) is becoming an increasingly growing topic of conversation both in the workplace and outside of it. It's a concept that not only has the potential to impact how we live but also how we work. But what exactly is the "Internet of things" and what impact is it going to have on you, if any? There are a lot of complexities around the "Internet of things" but I want to stick to the basics. Lots of technical and policy-related conversations are being had but many people are still just trying to grasp the foundation of what the heck these conversations are about.

Let's start with understanding a few things.

Broadband Internet is becoming more widely available, the cost of connecting is decreasing, more devices are being created with Wi-Fi capabilities and sensors built into them, technology costs are going down, and smartphone penetration is sky-rocketing. All of these things are creating a "perfect storm" for the IoT.

Simply put, this is the concept of basically connecting any device with an on and off switch to the Internet . This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. This also applies to components of machines, for example a jet engine of an airplane or the drill of an oil rig. As I mentioned, if it has an on and off switch then chances are it can be a part of the IoT. The analyst firm Gartner says that by 2020 there will be over 26 billion connected devices... That's a lot of connections some even estimate this number to be much higher, over 100 billion. The IoT is a giant network of connected things which also includes people. The relationship will be between people-people, people-things, and things-things.

The new rule for the future is going to be, "Anything that can be connected, will be connected." But why on earth would you want so many connected devices talking to each other? There are many examples for what this might look like or what the potential value might be. Say for example you are on your way to a meeting; your car could have access to your calendar and already know the best route to take. If the traffic is heavy your car might send a text to the other party notifying them that you will be late. What if your alarm clock wakes you at 6 a.m. and then notifies your coffee maker to start brewing coffee for you? What if your office equipment knew when it was running low on supplies and automatically re-ordered more? What if the wearable device you used in the workplace could tell you when and where you were most active and productive and shared that information with other devices that you used while working?

On a broader scale, the IoT can be applied to things like transportation networks: "smart cities" which can help us reduce waste and improve efficiency for things such as energy use; this helps us understand and improve how we work and live. Take a look at the visual below to see what something like that can look like.

The reality is that the IoT allows for virtually endless opportunities and connections to take place, many of which we can't even think of or fully understand the impact of today. It's not hard to see how and why the IoT is such a hot topic today; it certainly opens the door to a lot of opportunities but also to many challenges. Security is a big issue that is oftentimes brought up. The IoT also opens up companies all over the world to more security threats. Then we have the issue of privacy and data sharing. This is a hot-button topic even today, so one can only imagine how the conversation and concerns will escalate when we are talking about many billions of devices

being connected. Another issue that many companies specifically are going to be faced with is around the massive amounts of data that all of these devices are going to produce. Companies need to figure out a way to store, track, analyze and make sense of the vast amounts of data that will be generated.

Conversations about the IoT are and have been for several years taking place all over the world as we seek to understand how this will impact our lives. We are also trying to understand what the many opportunities and challenges are going to be as more and more devices start to join the IoT. For now the best thing that we can do is educate ourselves about what the IoT is and the potential impacts that can be seen on how we work and live.

The applications of IoT technologies are multiple, because it is adjustable to almost any technology that is capable of providing relevant information about its own operation, about the performance of an activity and even about the environmental conditions that we need to monitor and control at a distance.

Nowadays, many companies from different sectors or sectors are adopting this technology to simplify, improve, automate and control different processes. Next, we show some of the surprising practical applications of the IoT.

1)Wearables-Virtual glasses, fitness bands to monitor for example calorie expenditure and heart beats, or GPS tracking belts, are just some examples of wearable devices that we have been using for some time now. Companies such as Google, Apple, Samsung and others have developed and introduced the Internet of Things and

the application thereof into our daily lives. These are small and energy efficient devices, which are equipped with sensors, with the necessary hardware for measurements and readings, and with software to collect and organize data and information about users.

2)Health-The use of wearables or sensors connected to patients, allows doctors to monitor a patient's condition outside the hospital and in real-time. Through continuously monitoring certain metrics and automatic alerts on their vital signs, the Internet of Things helps to improve the care for patients and the prevention of lethal events in high-risk patients. Another use is the integration of IoT technology into hospital beds, giving way to smart beds, equipped with special sensors to observe vital signs, blood pressure, oximeter and body temperature, among others.

3)Traffic Monitoring-The Internet of things can be very useful in the management of vehicular traffic in large cities, contributing to the concept of smart cities. When we use our mobile phones as sensors, which collect and share data from our vehicles through applications such as Waze or Google Maps, we are using the Internet of Things to inform us and at the same time contribute to traffic monitoring, showing the conditions of the different routes, and feeding and improving the information on the different routes to the same destination, distance, estimated time of arrival.

4)Fleet Management-The installation of sensors in fleet vehicles helps to establish an effective interconnectivity between the vehicles and their managers as well as between the vehicles and their drivers. Both driver and manager/ owner can know all kinds of details about

the status, operation and needs of the vehicle, just by accessing the software in charge of collecting, processing and organizing the data. Even, receive alarms in real time of maintenance incidents without having been detected by the driver. The application of the Internet of Things to fleet management assists with geolocation and with it the monitoring of routes and identification of the most efficient routes, performance analysis, telemetry control and fuel savings, the reduction of polluting emissions to the environment and can even provide valuable information to improve the driving of vehicles.

5) Agriculture-Smart farms are a fact. The quality of soil is crucial to produce good crops, and the Internet of Things offers farmers the possibility to access detailed knowledge and valuable information of their soil condition. Through the implementation of IoT sensors, a significant amount of data can be obtained on the state and stages of the soil. Information such as soil moisture, level of acidity, the presence of certain nutrients, temperature and many other chemical characteristics, helps farmers control irrigation, make water use more efficient, specify the best times to start sowing, and even discover the presence of diseases in plants and soil.

6) Hospitality-The application of the IoT to the hotel industry brings with it interesting improvements in the quality of the service. With the implementation of electronic keys, which are sent directly to the mobile devices of each guest, it is possible to automate various interactions. Thus, the location of the guests, the sending of offers or information on activities of interest, the realization of orders to the room or room service, the automatic charge of accounts to the room or the request of personal hygiene supplies, are activities that can be

easily managed through integrated applications using the Internet of Things technology.

With the use of electronic keys, the check-out process is automated, disabling the operation of doors, offering information about the rooms immediately available, and even assigning housekeeping tasks to maintenance personnel.

7)Smart grid and energy saving-The progressive use of intelligent energy meters, or meters equipped with sensors, and the installation of sensors in different strategic points that go from the production plants to the different distribution points, allows better monitoring and control of the electrical network.By establishing a bidirectional communication between the service provider company and the end user, information of enormous value can be obtained for the detection of faults, decision making and repair thereof.

It also allows offering valuable information to the end user about their consumption patterns and about the best ways to reduce or adjust their energy expenditure.

8)Water supply-A sensor, either incorporated or adjusted externally to water meters, connected to the Internet and accompanied by the necessary software , helps to collect, process and analyze data, which allows understanding the behavior of consumers, detecting faults in the supply service, report results and offer courses of action to the company that provides the service.Likewise, it offers final consumers the possibility of tracking their own consumption

information, through a web page and in real time, even receiving automatic alerts in case of detecting consumption out of range to their average consumption record, which could indicate the presence of a leak.

9)Maintenance Management-One of the areas where the application of IoT technology is most extensive is precisely maintenance management. Through the combination of sensors and software specialized in maintenance management, a multifunctional tool is obtained whose use can be applied to a multiplicity of disciplines and practices, with the purpose of extending the useful life of physical assets, while guaranteeing asset reliability and availability. When the characteristics of the software in charge of processing and arranging the data collected by the sensors are designed to specifically address the maintenance management needs of physical assets, their application is almost unlimited.

The real time monitoring of physical assets allows determining when a measurement is out of range and it is necessary to perform condition-based maintenance, or even applying Artificial Intelligence algorithms such as Machine Learning or Deep Learning to predict the failure before it happens.

### Advantages of Internet of things

1)Easy Access-Right now, you can easily access the necessary information in real-time, from whichever location you are at. All it

takes is a smart device and internet connection. We use Google Maps to see where we are, instead of asking a person in the street. Booking is simpler than ever. Factual information is easily accessible, even from the latest scientific research, or business analysis. It is only a click away.

2)Speed-All this data pouring in enables us to complete numerous tasks with envying speed. For example, IoT makes automation easy. Smart offices automate repetitive tasks, thus allowing employees to invest their time and effort into something more challenging.

3)Adapting to new standards-Though IoT is ever-changing, its alterations are minimal compared to the rest of the high tech world. Without IoT, it would be hard for us to keep track of all the latest updates.

4)Better Time Management-Overall, the IoT is an incredible time-saving tool. We can search for the latest news on our phones during our daily commute, or visit a blog about our favorite pastime, purchase an item in an online shop, you name it.

Eventually, we end up with much more time on our hands.



However, nothing is perfect.

## Disadvantages of IOT-

1)Data Breach-Having easy access to data is wonderful.

Unfortunately, our own private data is more exposed than ever too. Statistics show some worrying figures. 12.7 million Americans were victims of identity theft. A credit card number is the type of information that was most compromised, followed by a debit card number.

Data breaches are extremely stressful. Companies also fear them and can lose the trust of their clients for good if the cyber attack comes via their website pages.

The riskiest devices are said to be: smart toys for kids, off-brand IoT gadgets, second-hand smart devices, and the latest, suspicious apps about the newest unusual devices.

2)Dependence-The IoT, obviously, is dependent on the internet connection. When there is none, it can't be used.

On the other hand, we have become increasingly dependent on the IoT's everyday usage. Not only in business, but in our private lives. If we don't download the desired information quickly, we are prone to becoming agitated and upset, even about the most trivial content.

To this end, the IoT does not always bring out the best in us and it has contributed to the great decrease in our attention spans.

3)Complexity-Though IoT seems to be completing tasks with ease, a lot of complex operations are behind it. Consequently, if the software makes a wrong calculation, this will affect the rest of the process. The above-mentioned over-reliance can be very dangerous sometimes. At best, we won't know how to deal with the wrong temperature in our green home. At worst, a glitch in water dam software could cause a disastrous flood. Therefore, oftentimes a mistake in IoT is not always easy to fix.

Standard Devices-

The desktop, tablet, and cellphone remain integral parts of IoT as the command center and remotes. The desktop provides the user with the highest level of control over the system and its settings. The tablet provides access to the key features of the system in a way resembling the desktop, and also acts as a remote. The cell phone

allows some essential settings modification and also provides remote functionality. Other key connected devices include standard network devices like routers and switches.

## Internet of Things Software-

IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network. They exploit integration with critical business systems (e.g., ordering systems, robotics, scheduling, and more) in the execution of related tasks.

**Data Collection** This software manages sensing, measurements, light data filtering, light data security, and aggregation of data. It uses certain protocols to aid sensors in connecting with real-time, machine-to-machine networks. Then it collects data from multiple devices and distributes it in accordance with settings. It also works in reverse by distributing data over devices. The system eventually transmits all collected data to a central server.

**Device Integration** Software supporting integration binds (dependent relationships) all system devices to create the body of the IoT system. It ensures the necessary cooperation and stable networking between devices. These applications are the defining software technology of the IoT network because without them, it is

not an IoT system. They manage the various applications, protocols, and limitations of each device to allow communication.

**Real-Time Analytics** These applications take data or input from various devices and convert it into viable actions or clear patterns for human analysis. They analyze information based on various settings and designs in order to perform automation-related tasks or provide the data required by industry.

**Application and Process Extension** These applications extend the reach of existing systems and software to allow a wider, more effective system. They integrate predefined devices for specific purposes such as allowing certain mobile devices or engineering instruments access. It supports improved productivity and more accurate data collection.

### Common Uses-

IoT has applications across all industries and markets. It spans user groups from those who want to reduce energy use in their home to large organizations who want to streamline their operations. It proves not just useful, but nearly critical in many industries as technology advances and we move towards the advanced automation imagined in the distant future.

**Engineering, Industry, and Infrastructure-Applications of IoT** in these areas include improving production, marketing, service

delivery, and safety. IoT provides a strong means of monitoring various processes; and real transparency creates greater visibility for improvement opportunities. The deep level of control afforded by IoT allows rapid and more action on those opportunities, which include events like obvious customer needs, nonconforming product, malfunctions in equipment, problems in the distribution network, and more. Example Joan runs a manufacturing facility that makes shields for manufacturing equipment. When regulations change for the composition and function of the shields, the new appropriate requirements are automatically programmed in production robotics, and engineers are alerted about their approval of the changes.

Government and Safety-IoT applied to government and safety allows improved law enforcement, defense, city planning, and economic management. The technology fills in the current gaps, corrects many current flaws, and expands the reach of these efforts. For example, IoT can help city planners have a clearer view of the impact of their design, and governments have a better idea of the local economy. Example Joan lives in a small city. She's heard about a recent spike in crime in her area, and worries about coming home late at night. Local law enforcement has been alerted about the new "hot" zone through system flags, and they've increases their presence. Area monitoring devices have detected suspicious behavior, and law enforcement has investigated these leads to prevent crimes.

Home and Office-In our daily lives, IoT provides a personalized experience from the home to the office to the organizations we frequently do business with. This improves our overall satisfaction,

enhances productivity, and improves our health and safety. For example, IoT can help us customize our office space to optimize our work.

Example Joan works in advertising. She enters her office, and it recognizes her face. It adjusts the lighting and temperature to her preference. It turns on her devices and opens applications to her last working points. Her office door detected and recognized a colleague visiting her office multiple times before she arrived. Joan's system opens this visitor's messages automatically.

Health and Medicine-IoT pushes us towards our imagined future of medicine which exploits a highly integrated network of sophisticated medical devices. Today, IoT can dramatically enhance medical research, devices, care, and emergency care. The integration of all elements provides more accuracy, more attention to detail, faster reactions to events, and constant improvement while reducing the typical overhead of medical research and organizations.

Example Joan is a nurse in an emergency room. A call has come in for a man wounded in an altercation. The system recognizes the patient and pulls his records. On the scene, paramedic equipment captures critical information automatically sent to the receiving parties at the hospital. The system analyzes the new data and current records to deliver a guiding solution. The status of the patient is updated every second in the system during his transport. The system prompts Joan to approve system actions for medicine distribution and medical equipment preparation.

## Environmental Monitoring-

The applications of IoT in environmental monitoring are broad: environmental protection, extreme weather monitoring, water safety, endangered species protection, commercial farming, and more. In these applications, sensors detect and measure every type of environmental change.

**Air and Water Pollution-**Current monitoring technology for air and water safety primarily uses manual labor along with advanced instruments, and lab processing. IoT improves on this technology by reducing the need for human labor, allowing frequent sampling, increasing the range of sampling and monitoring, allowing sophisticated testing on-site, and binding response efforts to detection systems. This allows us to prevent substantial contamination and related disasters.

**Extreme Weather-**Though powerful, advanced systems currently in use allow deep monitoring, they suffer from using broad instruments, such as radar and satellites, rather than more granular solutions. Their instruments for smaller details lack the same accurate targeting of stronger technology. New IoT advances promise more fine-grained data, better accuracy, and flexibility. Effective forecasting requires high detail and flexibility in range, instrument type, and deployment. This allows early detection and early responses to prevent loss of life and property.

Commercial Farming -Today's sophisticated commercial farms have exploited advanced technology and biotechnology for quite some time, however, IoT introduces more access to deeper automation and analysis. Much of commercial farming, like weather monitoring, suffers from a lack of precision and requires human labor in the area of monitoring. Its automation also remains limited. IoT allows operations to remove much of the human intervention in system function, farming analysis, and monitoring. Systems detect changes to crops, soil, environment, and more. They optimize standard processes through analysis of large, rich data collections. They also prevent health hazards from happening and allow better control.

## Manufacturing Applications

Manufacturing technology currently in use exploits standard technology along with modern distribution and analytics. IoT introduces deeper integration and more powerful analytics. This opens the world of manufacturing in a way never seen before, as organizations become fully developed for product delivery rather than a global network of suppliers, makers, and distributors loosely tied together.

## Intelligent Product Enhancements

Much like IoT in content delivery, IoT in manufacturing allows richer insight in real-time. This dramatically reduces the time and resources devoted to this one area, which traditionally requires heavy market research before, during, and well after the products



hit the market. IoT also reduces the risks associated with launching new or modified products because it provides more reliable and detailed information. The information comes directly from market use and buyers rather than assorted sources of varied credibility.

**Dynamic Response to Market Demands-**Supplying the market requires maintaining a certain balance impacted by a number of factors such as economy state, sales performance, season, supplier status, manufacturing facility status, distribution status, and more. The expenses associated with supply present unique challenges given today's global partners. The associated potential or real losses can dramatically impact business and future decisions.

IoT manages these areas through ensuring fine details are managed more at the system level rather than through human evaluations and decisions. An IoT system can better assess and control the supply chain with most products, whether demands are high or low.

### Lower Costs, Optimized Resource Use, and Waste Reduction

IoT offers a replacement for traditional labor and tools in a production facility and in the overall chain which cuts many previously unavoidable costs; for example, maintenance checks or tests traditionally requiring human labor can be performed remotely with instruments and sensors of an IoT system. IoT also enhances operation analytics to optimize resource use and labor, and eliminate various types of waste, e.g., energy and materials. It analyzes the entire process from the source point to its end, not just

the process at one point in a particular facility, which allows improvement to have a more substantial impact. It essentially reduces waste throughout the network, and returns those savings throughout.

**Improved Facility Safety-**A typical facility suffers from a number of health and safety hazards due to risks posed by processes, equipment, and product handling. IoT aids in better control and visibility. Its monitoring extends throughout the network of devices for not only performance, but for dangerous malfunctions and usage. It aids (or performs) analysis and repair, or correction, of critical flaws.

**Product Safety-**Even the most sophisticated system cannot avoid malfunctions, nonconforming product, and other hazards finding their way to market. Sometimes these incidents have nothing to do with the manufacturing process, and result from unknown conflicts. In manufacturing, IoT helps in avoiding recalls and controlling nonconforming or dangerous product distribution. Its high level of visibility, control, and integration can better contain any issues that appear.

### Energy Applications-

The optimization qualities of IoT in manufacturing also apply to energy consumption. IoT allows a wide variety of energy control and monitoring functions, with applications in devices, commercial and residential energy use, and the energy source. Optimization results

from the detailed analysis previously unavailable to most organizations and individuals.

**Residential Energy-**The rise of technology has driven energy costs up. Consumers search for ways to reduce or control consumption. IoT offers a sophisticated way to analyze and optimize use not only at device level, but throughout the entire system of the home. This can mean simple switching off or dimming of lights, or changing device settings and modifying multiple home settings to optimize energy use. IoT can also discover problematic consumption from issues like older appliances, damaged appliances, or faulty system components. Traditionally, finding such problems required the use of often multiple professionals.

**Commercial Energy-**Energy waste can easily and quietly impact business in a major way, given the tremendous energy needs of even small organizations. Smaller organizations wrestle with balancing costs of business while delivering a product with typically smaller margins, and working with limited funding and technology. Larger organizations must monitor a massive, complex ecosystem of energy use that offers few simple, effective solutions for energy use management. IoT simplifies the process of energy monitoring and management while maintaining a low cost and high level of precision. It addresses all points of an organization's consumption across devices. Its depth of analysis and control provides organizations with a strong means of managing their consumption for cost shaving and output optimization. IoT systems discover energy issues in the same way as functional issues in a complex business network, and provide solutions.

**Reliability**-The analytics and action delivered by IoT also help to ensure system reliability. Beyond consumption, IoT prevents system overloads or throttling. It also detects threats to system performance and stability, which protects against losses such as downtime, damaged equipment, and injuries.

## Building housing Applications

IoT applied to buildings and various structures allows us to automate routine residential and commercial tasks and needs in a way that dramatically improves living and working environments. This, as seen with manufacturing and energy applications, reduces costs, enhances safety, improves individual productivity, and enhances quality of life.

**Environment and Conditioning**-One of the greatest challenges in the engineering of buildings remains management of environment and conditions due to many factors at work. These factors include building materials, climate, building use, and more. Managing energy costs receives the most attention, but conditioning also impacts the durability and state of the structure. IoT aids in improving structure design and managing existing structures through more accurate and complete data on buildings. It provides important engineering information such as how well a material performs as insulation in a particular design and environment.

**Health and Safety**-Buildings, even when constructed with care, can suffer from certain health and safety issues. These issues include

poor performing materials, flaws that leave the building vulnerable to extreme weather, poor foundations, and more.

To sum up-

The IoT has brought us many amazing things and it continues to surprise us in lots of sectors: business, healthcare, and our private lives. As for the downsides, now that you are more aware of them, try to keep those under control. Protect your data and be aware of how automation and easy access can affect you or your business.

