APPLICATIONS OF IOT

1: Manufacturing / Industrial

Manufacturing / Industrial has taken over the top spot from “Cities” – the number one IoT application area in the 2018 analysis. Technology giants such as Microsoft and AWS as well as large industrial automation players such as Siemens or Rockwell Automation are among the driving forces of the digital transformation in the manufacturing / industrial industry.“Industrial IoT is transforming the rules of manufacturing, fueling cloud and edge innovation, accelerating the evolution of digital factories, and enhancing operational performance.”

Satya Nadella, CEO of Microsoft, Nov 2019

“Manufacturers and industrial operators are discovering practical ways to apply IoT across their operations, and they’re deriving measurable business value as a result. Combining IoT technology and expertise in specific industrial applications enables better collaboration, faster problem-solving and increased productivity.”

Blake Moret, CEO of Rockwell Automation, May 2019

Typical IoT Platform-enabled applications

The industrial IoT application area covers a wide range of connected “things” projects both inside and outside the factory. For example inside, many IoT-based factory automation and control projects include holistic smart factory solutions with numerous elements such as production floor monitoring, wearables and Augmented Reality on the shop-floor, remote PLC control, or automated quality control systems. Typical outside the factory projects include remote control of connected machinery, equipment monitoring, or management and control of entire remote industrial operations such as oil rigs. Many of the case studies mention “reducing operational downtime and cost saving” as the key drivers for OEMs to introduce industrial IoT solutions.

Selected IoT Platform-enabled projects

Example 1: Howden Mixed Reality solutions. Howden, a Scottish manufacturer of air and gas handling solutions, turned to Microsoft and PTC to develop scalable mixed reality solutions that overlay real-time IoT data from connected products with 3D Augmented Reality experiences to provide step-by-step instructions on how to solve problems with the

equipment. The solutions enable Howden’s customers to reduce the challenges and costs associated with unplanned downtime and better-align overall maintenance strategies—which were previously based only on conjecture and after-the-fact analysis. These innovations ultimately save customers a significant amount of time and associated cost.

Example 2: Severstal Asset Performance. Severstal, a Russian steel manufacturer, turned to GE to reduce unscheduled maintenance delays with Predix Asset Performance Management. The solution enhanced equipment reliability by 20% by means of constantly improving strategies of maintenance, reducing the costs of repair and maintenance scheduling, effectively reallocating resources, and decreasing production risks.

2.Transportation / Mobility

2a. Overview

Transportation / Mobility is the second largest IoT application area in 2020. Tesla set the industry benchmark for connected cars when it launched the Model S in 2012, introducing the first over-the-air software update capabilities. Since then pretty much every car manufacturer has followed suit integrating similar IoT technologies.“Connected solutions bring increased vehicle and construction equipment uptime for our customers, better safety for drivers, operators and other road users – and of course – less emissions of carbon dioxide. The first million connected assets at Volvo is only the start, we are committed to remain a leader in this field.”

Martin Lundstedt, CEO of the Volvo Group, Oct 2019

“At Honda Innovations, we’re witnessing a convergence of technologies that will transform mobility, create new business opportunities, and change the way we manufacture products. Our Honda Xcelerator program is designed for tech innovators who seek to transform the mobility experience and our Honda Developer Studio offers the best resources for developers and partners interested in connected car development.”

Nick Sugimoto, CEO of Honda Innovations, Apr 2019

2b. Typical IoT Platform-enabled applications

Typical applications within Transportation/Mobility include telematics and fleet management solutions that connect with the local operating system within the car for vehicle diagnostic/monitoring such as batterymonitoring, tire pressure monitoring, driver monitoring or simply vehicle tracking.

2c. Selected IoT Platform-enabled projects

Example 1: KWRL real-time fleet monitoring. KWRL Transportation Co-op runs a large-scale school bus fleet in Washington state, USA and uses Samsara’s wireless fleet tracking platform to coordinate routes and keep buses running on schedule. Real-time fleet monitoring supplies visibility into where buses are at any given moment, sensors track stop paddle and emergency light activation, engine fault code alerts are automatically decoded so team instantly determines criticality of faults, and complete route history is used to build smarter routes and plan fleet expansion.

Example 2: OmniBus fleet operations optimization. OnniBus.com is a leading long-distance bus service in Finland, building a more streamlined and sustainable transport operation with Telia’s connected vehicle solution designed to optimize the operations of heavy equipment and reduce fuel consumption using real-time operating data.

Example 3: Caledonian driver behavior tracking. Caledonian Logistics, based in Aberdeen, Scotland, specializes in the movement of palletized goods and uses MyGeotab for fleet monitoring and tracking driver behavior. A fleet dashboard shows a lead table of drivers diagnostics making them fully accountable for their actions and raises alerts if any abnormal activity occurs.

3: Energy

As worldwide energy consumption is expected to grow by 40% over the next 25 years, the need for smarter energy solutions has reached an all-time high. IoT is revolutionizing nearly every part of the energy industry from generation to transmission to distribution and changing how energy companies and customers interact. Both solution providers and energy companies themselves understand the need for and value of connected IoT solutions in the sector.“Through IoT we’re looking to significantly enhance the productivity and scope of our advanced analytics capabilities to create greater economic value across Shell’s operations. IoT allows us to optimize our existing investments in data and cloud infrastructure while accelerating time to value of AI-based applications, so we can better serve our customers with even more agility and efficiency.”

Jay Crotts, CIO Shell Group, Sept 2019

“IoT exists, there’s nothing futuristic about it. Already today advanced sensors make it possible to monitor and communicate grid data. The information gathered by the sensors is transmitted to gateways and elaborated by data centers using machine learning algorithms with increasingly sophisticated models of data reading. This process brings enormous benefits in terms of grid efficiency.”

Fabio Veronese, Head of Infrastructure & Networks Digital Hub at Enel, Nov 2018

3b. Typical IoT Platform-enabled applications

Energy accounts for 11% of the identified projects, up from 10% in 2018. The majority of projects focus on energy distribution, grid optimization, remote asset monitoring and management, predictive maintenance and creating more transparency for better informed customers.

3c. Selected IoT Platform-enabled projects

Example 1: Exelon’s wind power forecast model. Amrican utility company, Exelon, optimizes wind forecasting accuracy with GE’s Predix Platform to achieve a 70% performance increase for their wind farms. GE’s data science team created a physical and statistical wind power forecast model based on historical data provided by Exelon. They incorporated diverse data sources and took into account seasonal or time-of-day effects, ran the analytics in Predix Cloud, and wrote back the results in seconds.

Example 2: Enel’s enhanced grid reliability solutions. To improve grid reliability and reduce the occurrence of faults, Enel, an Italian multinational energy company, deployed the C3.ai Predictive Maintenance application for 5 control centers. The application uses AI to analyze real-time network sensor data, smart meter data, asset maintenance records, and weather data to predict feeder failure.

4.: Retail

More and more retailers recognize that they can improve their cost-efficiency and in-store customer-experience through innovative IoT use cases. There is a rising interest for retailers to digitize stores and create smarter processes – retail now accounts for 9% of the identified projects, up from 5% in the 2018 analysis.“The potential to gather data and put it to use more effectively is exciting. We’re learning how IoT can help us to work differently. We’re improving many of our processes, and we’re empowering our associates with better tools and technology.”

Doug McMillon, CEO Walmart, Oct 2018

“We are seeing the integration of Internet of Things (IoT) technologies in the shape of voice-activated digital assistants with a high degree of automation, taking care of purchases through interfaces with retailers’ ordering systems.”

Tesco Bengaluru, CEO Sumit Mitra, Dec 2017

Typical IoT Platform-enabled applications

Typical IoT in retail solutions include in-store digital signage, customer tracking and engagement, goods monitoring and inventory management and smart vending machines among others.

Selected IoT Platform-enabled projects

Example 1: nuMedia’s mixed reality solution. US-basednuMedia Innovations digital host solution, PRSONAS powered by Digi, is using mixed-reality technology that mimics human experiences to enhance customer experiences e.g., smart digital kiosks have interactive self-service holograms that act as virtual sales reps and product specialists on the store’s front lines. These holograms together with digital signage project a company’s brand personality to attract, automate, and analyze customer engagements.

Example 2: Art of Shaving enhanced shopper insights. The Art of Shaving, a US retail business of high-end men’s shaving and skin care accessories, turned to RetailNext to compare store performance across its retail locations based on an accurate entrance traffic solution.

5: Cities

Smart cities are growing and blossoming in all parts of the world. The IMD Smart City Index 2019, which focuses on how citizens perceive the scope and impact of efforts to make their cities smart – balancing “economic and technological aspects” with “humane dimensions”, put Singapore, Zurich and Oslo as the top 3 smartest cities in 2019, followed by Geneva, Copenhagen, Auckland, Taipei, Helsinki, Bilbao and Dusseldorf completing the top 10. More and more cities continue to embrace the smart city concept from a citizen’s perspective:“My brief is to rethink the smart city from the ground up, meaning to rethink technology, IoT, data, and focusing on what it can do to serve the people”

Francesca Bria, CTO of Barcelona Smart City, Oct 2019

“Open IoT data is a central point for any city that is smart in its character. We are trying to make data available to the public — not only to ensure transparency — but also to make our citizens better informed.”

Winn Nielsen, Head of City Data, City of Copenhagen, Denmark, Nov 2019

The percentage of smart city projects is down from the 2018 analysis for a number of reasons such as long tender timelines, long lead time to get smart city projects started, and the need to navigate city politics. The CEO of an IoT Platform start-up, for example, recently shared with IoT Analytics that “Sometimes, smart city tender timelines are so long that start-ups can’t survive long enough to wait for the process to finish, so the process tends to be biased towards the largest vendors”.

Typical IoT Platform-enabled applications

Typical IoT projects in Smart Cities include connected traffic (smart parking, traffic management), utilities (smart waste, lighting), public safety (video surveillance) and environmental monitoring (air pollution).

Selected IoT Platform-enabled projects

Example 1: Amsterdam smart LED lighting project. Amsterdam’s Smart Lighting scheme includes a deployment of 144 LED smart streetlights along with cameras and public WIFI network in Hoekenrodeplein square. The LED Lights can be controlled remotely and automatically adapt to different lighting conditions.

Example 2: Singapore’s sensor data sharing platform. Singapore uses an integrated sensor platform, Smart Nation Sensor Platform, to collect, analyze, and share data from connected sensors and devices to improve urban planning, transportation and public safety in the island. Examples of data sources include residential meters, traffic counters, cameras and lampposts.

6.: Healthcare

IoT has only slowly proliferated itself in healthcare. However, things look to be changing in light of the center of COVID-19 pandemic. Early data suggests that digital health solutions that relate to COVID-19 are surging. Demand for specific IoT health applications such as telehealth consultations, digital diagnostics, remote monitoring, and robot assistance is increasing. The pandemic has thrust the healthcare industry into the limelight and many C-suites are taking note:“There is a huge applicability of technology, data, and communication methodologies to tackle the current pandemic and help improve healthcare solutions through telehealth and telemedicine. Demand is emerging across the globe, there is a growing number of patients being remotely treated globally, for example the number of online consults globally has gone up 50 to hundred times in many health systems already. These solutions are here to stay even after the current crisis”

Amit Phadnis, Chief Digital Officer GE Healthcare, May 2020

“The pandemic has told us how much patients benefit from technology and apps. It is a kind of turbo-boost to advance our efforts around digitization. My main learnings from the coronavirus crisis so far have been of a technical nature: we need more open and transparent communication to address structures and processes that are no longer working.”

Dr. Peter Gocke, Chief Digital Officer Charite Universitätsmedizin Berlin

Typical IoT Platform-enabled applications

Typical healthcare IoT projects within hospitals/clinics include medical device monitoring, health team coordination, optimizing workflow operations while out-patient focused solutions include patient monitoring, assisted living, elderly care, and pain medication management among others.

Selected IoT Platform-enabled projects

Example 1: Medisanté remote patient monitoring. Medisanté are simplifying remote patient monitoring with continuous monitoring of assets connected to healthcare applications, including battery life and general health of devices, which allows personalized patient care anytime, anywhere and equips care teams with a near real-time view of the patient’s health and activities.

Example 2: Medtronic connected pacemakers. Medtronic offers connected pacemakers which are small devices implanted in the chest or abdomeno treat patients whose hearts are beating too slowly or irregularly. The device gathers data such as transmission history, battery information, updates on physical activity and vitals tracking, and can stimulate the heart muscle with electricity pulses that restore the heart’s rhythm to a normal rate.

7: Supply chain

As supply chains extend more and more to the end customers, resulting in more intricate flows of goods that are more complex to deliver, logistics providers are increasingly integrating connected digital solutions to tackle the complexity. A recent survey by Kenco, a US logistics provider, found that 56% of supply chain professionals are currently or planning to invest in sensors/IoT; up from 42% in 2017, to look for more operational efficiencies in how their supply chains operate.“The transformation of A.P. Moller – Maersk from a diversified conglomerate to becoming a focused, integrated and digitized global logistics company continues. In particular, usage of our digital services has increased significantly over the last year, with more and more customers beginning to explore options for remote management of their supply chains.”

Søren Skou, CEO of A.P. Moller – Maersk, May 2020

“DHL are integrating IoT innovations to build the digital supply chain of tomorrow today. This is changing the way we collect, analyze and use data and, ultimately, our ways of working at these sites. By monitoring operational activities in real time rather than retrospectively, we can interpret data more meaningfully, and immediately re-engineer processes or warehouse layouts to boost operational efficiency and address potential safety blind spots in a warehouse.”

Markus Voss, Chief Operating Officer of DHL Supply Chain. May 2019

Typical IoT Platform-enabled applications

Typical supply chain IoT projects include asset tracking, condition monitoring (e.g., cold chain, medical goods), inventory and storage management, automated guided vehicles, connected workers, among others. The Covid-19 pandemic has highlighted the value of IoT tracking across the supply chain. Recent months have unfortunately shown the stark reality that even vital medical equipment and PPE can go out of stock as global supply chains are disrupted. This realization is expected to be a big driver for IoT tracking solutions in the supply chain to help companies stay in control, keep an overview, and react quickly.

Selected IoT Platform-enabled projects

Example 1: Rotterdam’s connected port. Rotterdam Port is using sensors throughout their expansive dock facility to continuously gather real-time data about air temperature, wind speed, relative humidity, turbidity and salinity of the water plus water flow and levels, tides and currents. The port even has “Digital Dolphins,” smart quay walls and sensor-equipped buoys, and is exploring connected container solutions to gather data and use artificial intelligence to predict more accurately what the best time is to moor and depart cargo ships at ports – to reduce waiting times and costs.

Example 2: DHL smart pallet solutions. DHL is trialing smart pallets for real time ehipment monitoring (e.g., embedded sensors to detect geo location, movement, delay, shock, temperature, etc).

8. Agriculture

In 2050, it is estimated that a population of almost 10 billion people will need up to 70 percent more food than we do today. One way to address this challenge is through smart agriculture. IoT sensors can help farmers make more informed decisions to achieve higher crop yield, better quality produce, and save costs by reducing the use of fertilizers and pesticides. Some CEOs see IoT as the main source of disruption for the agriculture industry: “Agriculture needs something to drive growth in productivity and sustainable intensification of food production. We believe the internet of things is the basis of the future of agriculture.”

Ros Harvey, Managing Director of The Yield, Australian start-up working with Bosch to develop smart agricultural solutions. June 2019

“John Deere sees the adoption of information technologies and IoT services in agriculture as no less transformative than the introduction of self-propelled machines to farming a century ago. We believe that precision agricultural practices in use today are laying the foundation for the future of farming: a continually smart, evolving and more efficient farm.”

John May, CEO of John Deere, Mar 2017

. Typical IoT Platform-enabled applications

Typical smart agriculture projects include precision farming, livestock monitoring, irrigation management, and automated drones for surveying farms, mapping fields, spraying crops, etc. Analysis of the case studies suggests that innovative technologies such as LPWAN are paving the way for Smart Agriculture’s growth in the Internet of Things landscape. LPWAN supplies a range of features in terms of energy consumption and long-range transmission i.e., the main network requirements for key applications in the sector. LPWANs are ideal for gathering data about local agricultural conditions including weather, soil moisture, chemical compositions of the soil and other environmental conditions at a much lower total cost of ownership. Furthermore, LPWANs make it possible to expand per-acre coverage and monitor more assets due to the simplicity of deployment and cost of ownership reductions.

Selected IoT Platform-enabled projects

Example 1: Kwekerij connected greenhouses.“We get so much insight into the temperature of our peppers during the growth phase, and can adjust the greenhouse climate accordingly. Based on this information, we can continually improve the quality of our produce, while cutting energy costs”- Sander Berkers, Supervisor at Kwekerij Moors Pepper Farm, Netherlands, Jan 2019

Example 2 Hake connected dairy farm solutions. “When I get up in the morning and put on my boots, I don’t go to the stables first, I check my PC for alerts and I’m in the know right away. That’s what makes IoT technology so helpful. When a cow is in heat or eats less than anticipated because she starts coming down sick, there is a warning indicator for me. And that’s a great thing.” Steffen Hake, Dairy farmer in Wagenfeld-Ströhen, Germany, Aug 2015

9: Buildings

As part of the 2019 Energy Efficiency Indicator study Johnson Controls surveyed 400 energy and facility management executives in the United States and found that 71 percent of organizations invested in smart building control system improvements and over half have implemented an enterprise-wide smart building management system. Most new innovative connected solutions aim to increase productivity and efficiency while reducing operational costs through complete building life cycle management.

“Buildings have been there for thousands of years, but unaware if someone were to enter or leave them. With digitalization and IoT, a building can now get to know about its occupants. It can provide feedback, not only to the residents, but also to the facility managers and the owners. So to me, a smart building is one that doesn’t just stand there, but one that understands its environment, interacts, learns and adapts.”

Cedrik Neike, CEO of Siemens Smart Infrastructure, Oct 2019

“Real estate owners and managers are always seeking ways to reduce costs and increase tenant satisfaction. We believe that putting intelligence into the building that improves facilities management and analyzes how occupants and visitors use the building is the best way to fulfill their needs. We’re employing digitalization, AI, and Internet of Things technologies to optimize usage at every level and make the building a pleasant place to work, visit, and live.”

Michael Cesarz, CEO for MULTI at thyssenkrupp Elevator, Sept 2018.

Typical IoT Platform-enabled applications

Typical connected building projects involve facility-automation and monitoring for building systems (HVAC, lighting, elevators, smoke alarms, fire extinguishers), building utilization and security (room use, access, surveillance).

Selected IoT Platform-enabled projects

Example 1: thyssenkrupp connected elevator solutions. At its Innovation Test Tower in Rottweil, Germany, thyssenkrupp Elevator is using Willow Twin, a digitalized virtual model of the physical building, to revolutionize the way buildings are maintained and to enhance the experience of tenants and visitors.

Example 2 Connected shopping centre in Finland. A shopping centre in the Leppävaara district of Espoo, Finland is using Navigator software, from Siemens and eggsunimedia, to monitor and analyze the ventilation systems, room sensors and lighting systems in the multitude of premises and shops. The shopping centre was able to save 680 MWh of electricity and 800 MWh in centre heating, which is about half of the previous year’s consumption and cut energy costs by around €110,000.

10. Other

There are only a few (3%) projects that have been identified that are not part of the other 9 categories.

Typical IoT Platform-enabled applications

Example IoT Platform-enabled projects in the Other area include those in hospitality, enterprise, finance, and sports.

. Selected IoT Platform-enabled project

Example 1: Cybex connected exercise equipment. “Our customers invest in our catalog of products for our reputation for developing innovative and reliable equipment that enhances human performance. We are furthering that reputation, and our customer’s success, by offering an Internet-based monitoring system that helps owners maximize the benefit of our products.” Lisa Juris, Chief Marketing Officer Cybex International. Cybex International offers premium exercise equipment used in fitness facilities worldwide. Gym owners regularly service their treadmills to ensure they stay up and running so Cybex developed a web-based asset management system to provide gym owners with real-time data on the status of each treadmill.

Methodology

The data presented in this article is partially based on IoT Analytics research on IoT platforms, performed in Q4/2019. As part of a wider research project on IoT platforms, IoT Analytics mined the websites of 620 IoT platform vendors in regards to documented IoT case studies and aggregated the data for each segment to come up with the top 10 applications areas based on real IoT projects.

Number of IoT Platforms 2015 - 2019Scope.

11. Connected Car

Sometimes we see a scene in a science fiction movie where an actor is driving a car by voice command. That fiction is becoming true nowadays with the blessing of IoT. The idea of a connected car is when a car or any other vehicle can be controlled by a smartphone or any other device that is connected with the internet.

Insight of this application

This type of application contains a lot of sensors to monitor regularly the current status of the car.Analyzes if any impediment is currently at the front of the car and take immediate steps to avoid any accident.It is a self-learning car with the use of artificial intelligence. With time, a car becomes more advanced and smart.Predicts any machinery failure before it occurs, which makes it more different than a regular car.Users can star.t the engine by on voice command from a smartphone before driving.The report of NHTSA says that it is safer to use an automated car rather than self-driven.Possible to control home devices from a car.

12. Smart Home

Smart home refers to a system where appliance, fridge, air conditions, microwave oven, door home and security system, washing-machine, lightening, etc. are connected via the internet. Smart devices can control all those stuff from any part of the world. The main difference between the common home and smart homes is that different types of sensors can improve the security levels.

Insight of this application

The usage of smart home appliances would make it safer and comfortable to live.Home appliances will be able to make decisions with the use of artificial intelligence.Conserves energy to home appliances during natural calamity.The smart home will generate an enormous amount of data that will help big data industries to predict more customer choice.A lot of companies will provide data security for home appliances.Voice command technology in smart home appliances will save a lot of time.Saves money on the electricity bills.

13. Smart City+

The smart city is a great innovative example of the internet of things applications. This application consists of so many use cases like water management, traffic, and electricity management, waste management, etc. The smart city is the most popular application according to a recent study as it comes up with the solution of regular city life problems. Very soon the internet of things applications will keep a significant impact in our city life.

Insight of this application

The opportunity of the IT job sector in a city increases with the use of smart city applications.Increases the condition of air and water pollution because of regular monitoring.Decreases crime ratio comparing with other cities.Reduces traffic and accident with self-driving sensor connected automated car.Ensures appropriate use of water and electricity supply.Urban people can rely on secured automated public transport systems.Sensors connected with the building can detect seismic activity, wind pressure.

14. Precision Farming

Application of IoT in agriculture can make farming practice more effective and precise. Day by day, IoT applications are becoming popular in the farming sector because of good output. The idea of precision farming includes collecting data by field observation, vehicle monitoring, temperature and humidity measure, and so more. A core application analyzes all those data and provides a decision.

Insight of this application

Analyzes soil conditions and provide the current PH of the soil and what types of farming should be appropriate.Detects water and nutrition level of soil and instructs IoT connected water irrigation system.Precise farming is a connected automated system with the collaboration of multiple mobile and desktop applications. As the population is increasing the demand for food increases as well. So the internet of things applications may provide a solution here.Ensures the use of each resource to grow more crops.

15. Agricultural Drone

Monitoring a massive crop field is not so easy. The agricultural drone is an aerial vehicle that can survey the massive field and reveal problems. Birds-eye view from the sky with sensors provides a clear and effective image. It can keep a great impact on agricultural business by saving time and accurate land management decisions.

Insight of this application

Evaluate field analysis, crop health, crop growth, and pest attack.Research is going on overseed planting by drone technology.It can spray fertilizer and pesticides, which is much effective than regular spraying systems.With proper image processing algorithms, a drone can detect the fungal attacks.Excessive water flow on the crop fields can ruin the fields. To prevent that moisture sensor from a drone can detect extra moisture in an area.New job opportunity as agricultural drone pilot is coming.

16. Smart Grid

The previous grid system sends electricity from power plants to homes and industries. But the smart grid consists of electrical equipment, computer network, automation, and power supply. In another way, the smart grid is two-way communication between consumer need and utility. The smart grid makes responses according to the need of the customer. It brings the opportunity to increase the efficiency and output of a country.

Insight of this application

Sensing the transmission line smart grid ensures proper electric supply.Self-repairing characteristics of the smart grid mean it can automatically reroute electricity during a power failure.The transmission level of electricity is more effective than a common grid system.Reduces electricity costs of the consumer by suggesting them low-priority electronic devices.During heavy load, this IoT application suggests users reduce power consumption.Fault detection by the smart grid makes power supply management more reliable.

17. Connected Factories

IoT applications are changing our world, providing smart solutions. The idea of connected factories comprises of tools, machinery, and internet-connected sensors. It’s a connected network with different tasks like schedule maintenance, the shipment of products, the flow of operation control and stop or pause a specific process. Generally, a supervisor monitors the entire task held in the factory, but IoT technology proposes remote monitoring by surveillance applications.

Insight of this application

Real-time scheduling reduces extra energy consumption.Fault detection on system ensures quality of products.Smart factories run their operation the whole day long and reduce labor costs.This system uses a smart vehicle for product transportation.Working labor can focus on safer tasks.The flexibility of operation increases productivity.

18. Smart Retail

Who doesn’t love to shop? IoT applications can make our shopping experience more effective and time-saving. It is a combination of “things” like RFID chip, foot traffic counter, and Wi-Fi monitoring and mobile application of the customer. The idea is when a customer is leaving a checkout system will scan all the products and reduce the total price from the mobile apps of that customer.

Insight of this application

A customer does not need to maintain a long queue for checkout. The automated system saves time and makes the customer happier.The use of IoT deducts extra technology and implementation cost.Data management of this application is a challenge.Effective transportation of products.The sensor located in each self sends notifications if any products are out of stock.

19. Supply Chain Management by IoT

Logistics and transportation management is an old challenge. From manufacture to a retailer, maintaining inventory properly is always a problem. It is possible that a product can be lost during transportation. IoT applications provide a solution by GPS monitoring and RFID tag in a product. IoT technology can solve all the problems of supply chain management.

Insight of this application

Ensures product transportation to the retailer, which increases the efficiency of the supply chain.The automated system ensures the perfect temperature for production, which increases productivity.It provides safety from theft and differentiates right products from damaged productsSupervisor gets notifications if any damage occurred to machinery.Shipment tracking is a challenge. Especially when the shipment is in between two countries. But using the special tag on products can reduce uncertainty.

20. Traffic Monitoring System by IoT

In third world countries, the existing traffic monitoring system is old fashioned. Traffic light somewhere controlled by manually. Traffic rules violator remains out of reach for proper surveillance. The solution of IoT applications could be appropriate here. Traffic control by using the internet of things gives us an intelligent solution with the use of image processing.

Insight of this application

This application can count several vehicles on each side of the road and apply the KNN algorithm to measure the waiting time of each side.Surveillance cameras can detect and capture an image of traffic rules violator, and monitoring authority can take proper steps.It provides an extra facility to the ambulance.Less human effort to manage traffic system.Useful for any city in the world.Research is going on to find out the stolen vehicle by this application.