



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35.

An Autonomous Institution

COURSE NAME : Internet of Things

III YEAR/ V SEMESTER

UNIT – I INTRODUCTION

Topic: *Introduction to IoT*

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■ Definition

(1) The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects.

(2) By embedding short-range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communication between people and things, and between things themselves.



(3)The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects.

(4)“Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts”.



Agriculture automation



Embedded mobile



Everyday things connected for smarter tomorrow



Security and surveillance



Everyday things



Telemedicine and healthcare



M2M wireless sensor network



Smart homes and cities



Building management



Waste management and industrial control



Vehicle, asset, person and pet monitoring, and controlling



Smart retail



Smart transportation

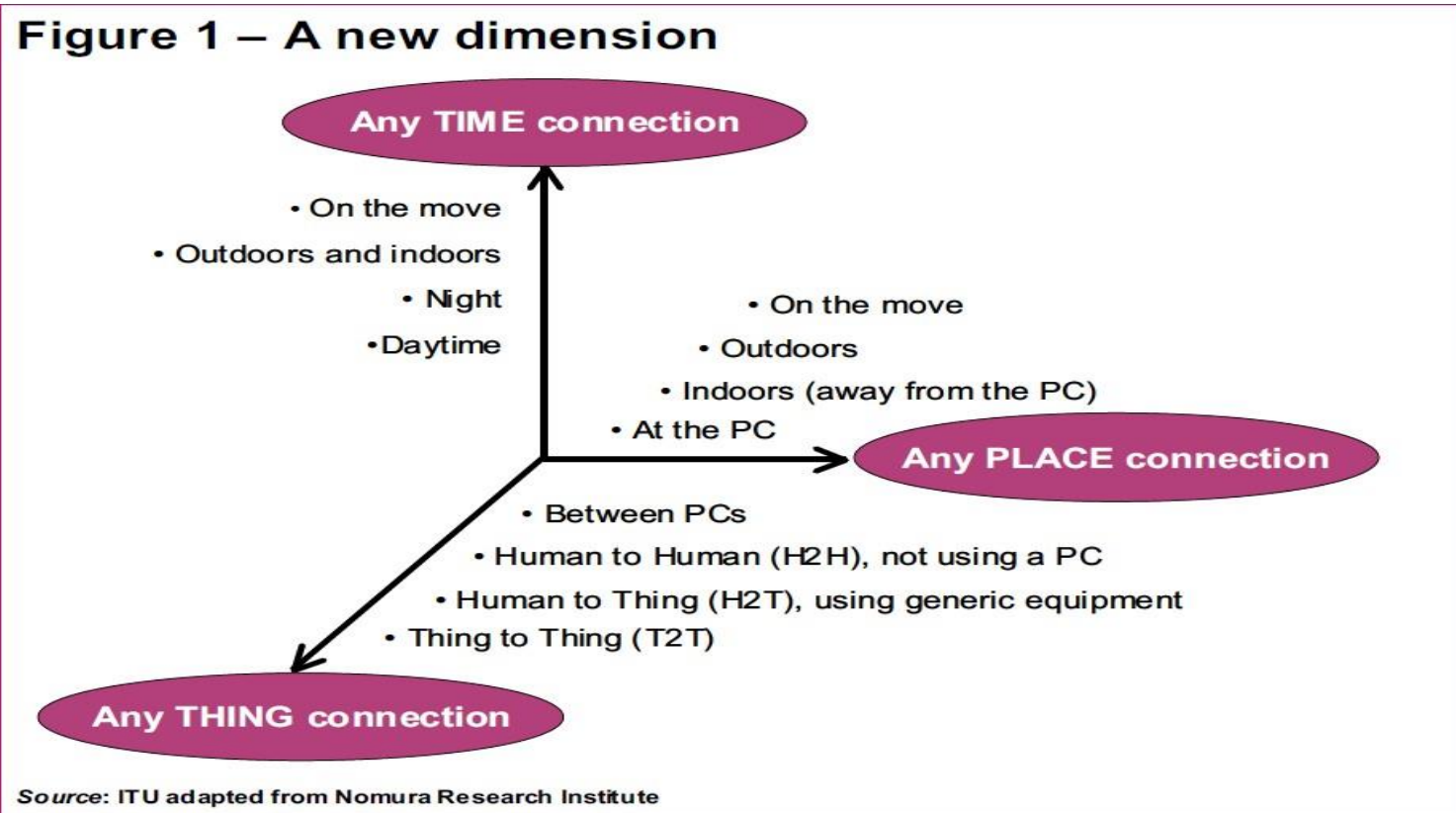


Internet of things



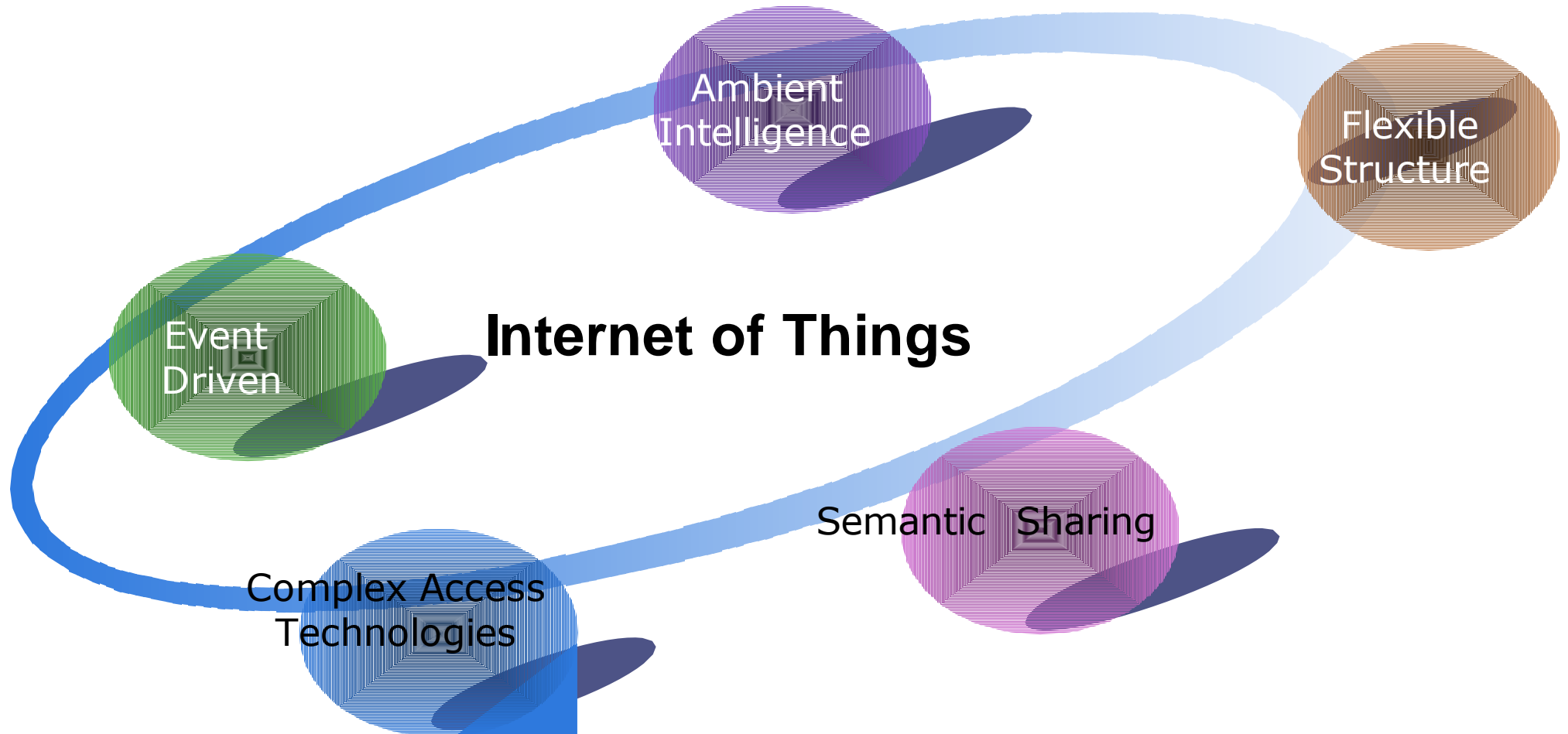
What's the Internet of Things

connectivity for anything!





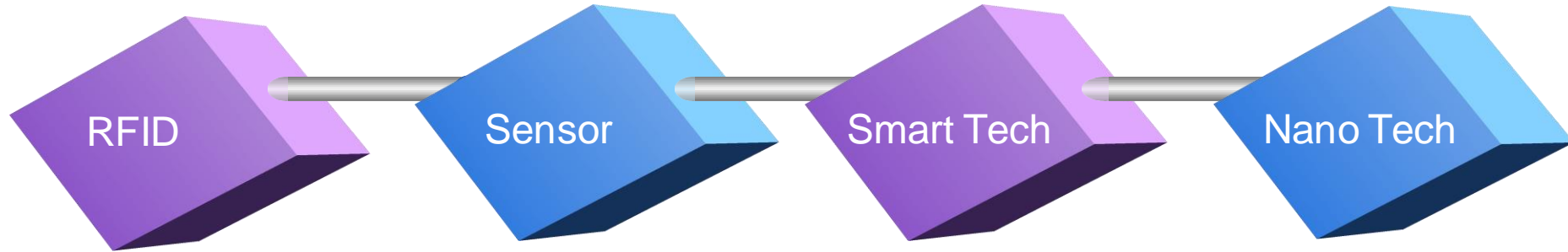
What's the Internet of Things







Enabling Technologies



To identify and track the data of things

To collect and process the data to detect the changes in the physical status of things

To enhance the power of the network by evolving processing capabilities to different part of the network.

To make the smaller and smaller things have the ability to connect and interact.



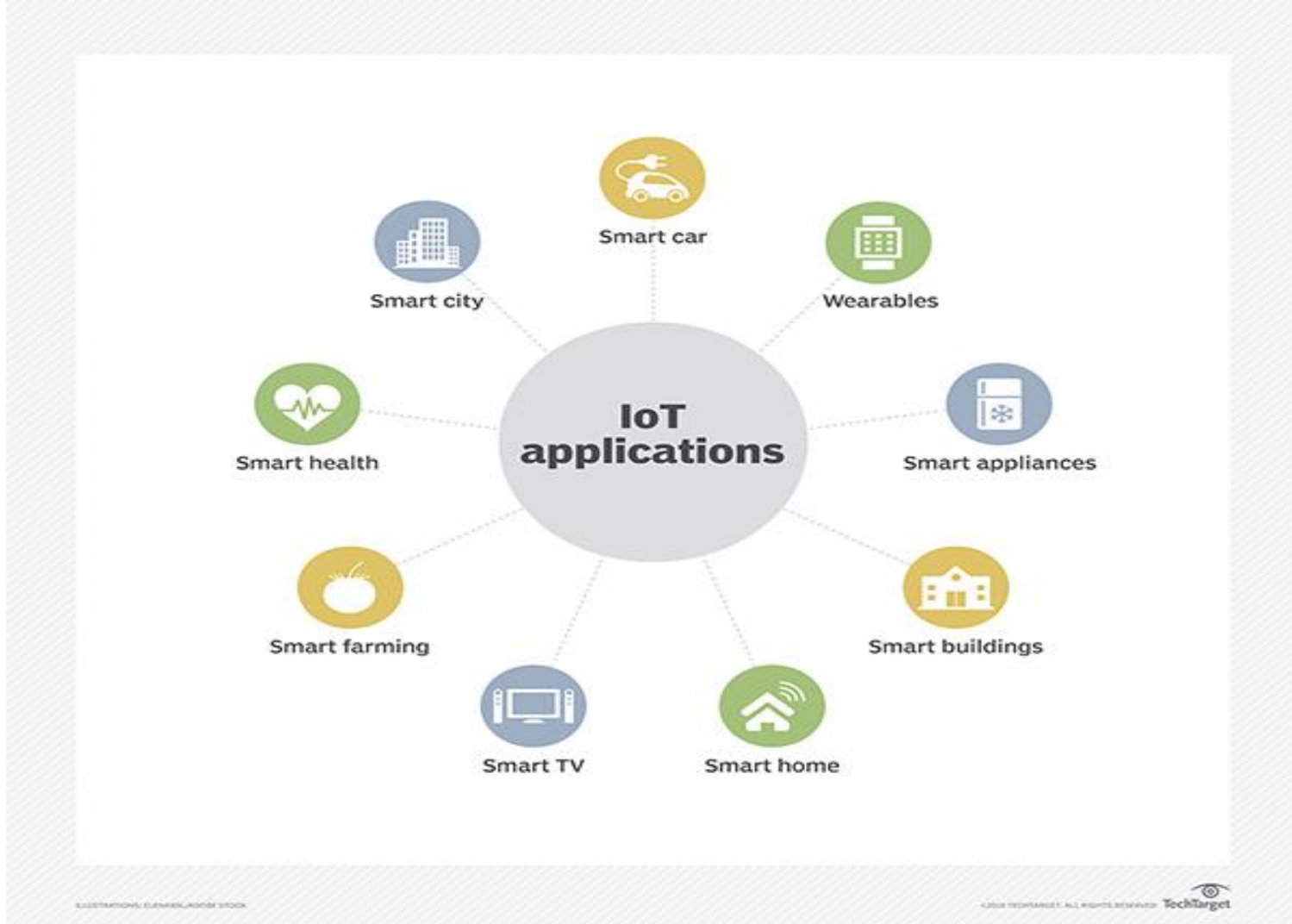
Benefits of IoT

IoT offers a number of benefits to organizations, enabling them to:

1. Monitor their overall business processes;
2. Improve the customer experience;
3. Save time and money;
4. Enhance employee productivity;
5. Integrate and adapt business models;
6. Make better business decisions; and
7. Generate more revenue.



Consumer and enterprise IoT applications



Source:
<https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>



The smart world of the future – using IoT

Libelium Smart World

Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

Water Leakages

Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

Waste Management

Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking

Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Source:
<https://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#ef2433f1d091>



Sample: consumer IoT products & Services

1. Helmet Concussion Sensor
2. Medical Alert Watch
3. Smart Fitness Clothing and Smart Running Shoes
4. **One-Button Product Purchases:** “Order at the click of a button!” Amazon has taken that phrase literally and produced physical branded buttons called *Amazon Dash* that link to products in your home. Say you run out of laundry powder. You can press your Dash button for Tide and Amazon will reorder your Tide Powder product for you. No need to sign onto the Web, fumble with payment methods, or retype credit card numbers.
5. Garden Sensors
6. Smart Televisions



Helmet concussion sensor

Shockbox®



Shockbox MultiSport Helmet Sensor

by Shockbox

★★★★☆ 7 customer reviews

Currently unavailable.

We don't know when or if this item will be back in stock.

- Wireless head impact sensors sends alerts direct to your smartphone when a hit is too hard
- Long range Bluetooth connects to smartphone over 100m away inside arenas
- 100 hour rechargeable battery life with supplied micro USB cable
- Fits on all sizes of hockey helmet with high bonding adhesive tape
- Free downloaded Shockbox smartphone App displays history of impacts over set threshold

<https://www.amazon.com/Shockbox-LM2004-EXT-MultiSport-Helmet-Sensor/dp/B00DVHA1LM?imprToken=NXcTrCpNfgrAo2MA1K7ig&slotNum=2&SubscriptionId=AKIAIO22DD3AFUSKXUKQ&tag=makeusw-20&linkCode=xm2&camp=2025&creative=165953&creativeASIN=B00DVHA1LM>



Amazon DASH

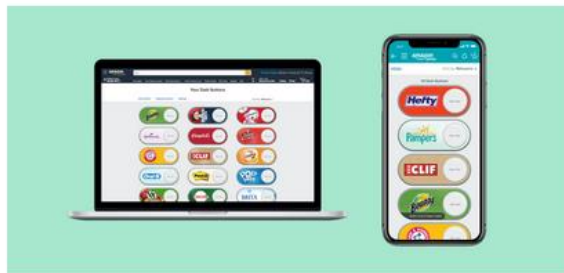
amazon dash

Instantly reorder your favorite products

Dash Buttons are available for millions of products that ship with Prime.

<https://www.amazon.com/b?ie=UTF8&node=17729534011>

Getting Started



Always Accessible

Find Dash Buttons on the Amazon home page, or at [Your Dash Buttons](#), where you can sort, label, or delete your buttons.

If you've purchased a product on Amazon that is typically reordered, we will automatically create a Dash Button for you. You can [add new Dash Buttons](#) from the product details page of any product available



Dash with Your Echo Show

You can also say, "Alexa, show my Dash Buttons" on the Echo Show to see all of your Dash Buttons.

Learn more about [Dash Buttons on Echo Show](#).



Samsung Family Hub

Access your Dash Buttons on the Samsung Family Hub smart refrigerator. Together, Amazon and Samsung make it easy to reorder the everyday essentials that keep your household running.

To get started, find Amazon Dash in your Family Hubs Apps.



Kinsa thermometer

Well Informed

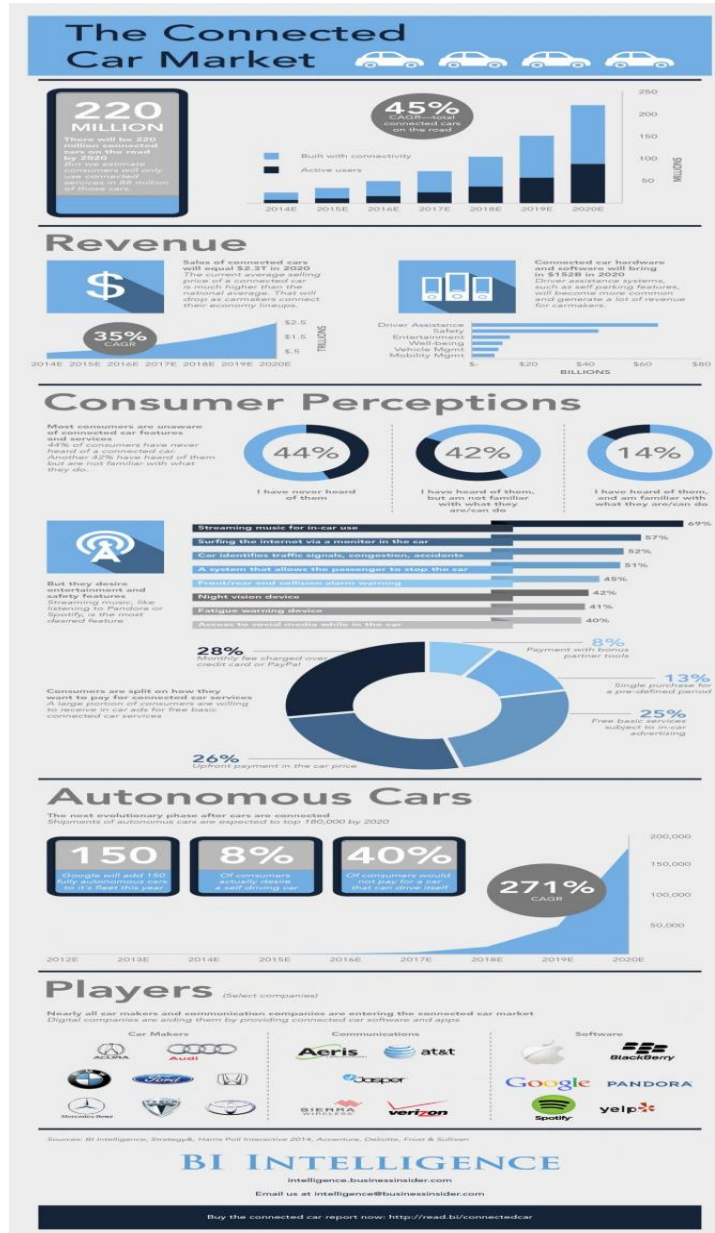
Kinsa uses your age, fever and symptoms to help you understand when and how to soothe symptoms, take meds or call the doctor.



Monitoring your temperature and can call your doctor as necessary



Connected car story



The connected car is equipped with internet connections and software that allow people to stream music, look up movie times, be alerted of traffic and weather conditions, and even power driving-assistance services such as self-parking.

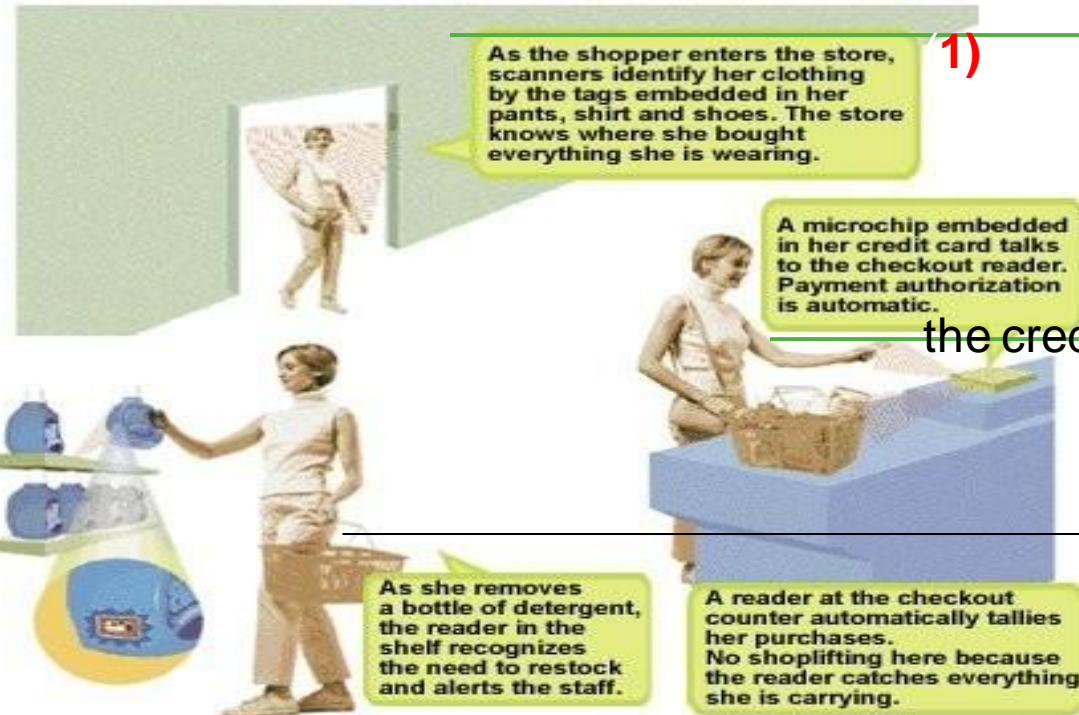
Source:
<https://www.businessinsider.com/connected-car-statistics-manufacturers-2015-2?IR=T>



Shopping Experience



(2) When shopping in the market, the goods



1)

When entering the doors, scanners will identify the tags on her clothing.

(4) When paying for the goods, the microchip of the credit card will communicate with checkout reader.

(3) When moving the goods, the reader will tell the staff to put a new one.



Smart farming: Use of IoT to improve agriculture

In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. This is highly efficient compared to the traditional/conventional approach.

In terms of environmental issues, IoT-based smart farming provides great benefits including: better and efficient water usage, and optimization of inputs and treatments.

Therefore, smart farming based on IoT technologies enables growers and farmers to reduce waste and enhance productivity.

Some of the IoT applications in this area are:

- i. Precision farming
- ii. Agricultural drones
- iii. Livestock monitoring
- iv. Smart greenhouses



Industrial lot (IIoT)

Industrial IoT (IIoT) focusses on the use of cyber-physical systems to monitor the physical factory processes and make data-based automated decisions.

While the physical systems are made the intelligent using IoT, the real-time communication, and cooperation both with each other and with humans is established via the wireless web IIoT brings in the concept of '*a connected factory leads to a smart factory*'.



IIoT in Manufacturing

1. **Digital/connected factory:** IoT enabled machinery can transmit operational information to the partners like original equipment manufacturers and to field engineers.
2. **Facility management:** The use of IoT sensors in manufacturing equipment enables condition-based maintenance alerts.
3. **Production flow monitoring:** IoT in manufacturing can enable the monitoring of production lines starting from the refining process down to the packaging of final products.
4. **Inventory management:** IoT applications permit the monitoring of events across a supply chain.



IloT in Manufacturing



5. **Plant Safety and Security:** IoT combined big data analysis can improve the overall workers' safety and security in the plant. .
6. **Quality control:** IoT sensors collect aggregate product data and other third-party syndicated data from various stages of a product cycle.
7. **Packaging Optimization:** By using IoT sensors in products and/or packaging, manufacturers can gain insights into the usage patterns and handling of product from multiple customers.
8. **Logistics and Supply Chain Optimization:** The Industrial IoT (IIoT) can provide access to real-time supply chain information by tracking materials, equipment, and products as they move through the supply chain.



IOT CHALLENGES

Security, privacy and data sharing issues

Because IoT devices are closely connected, all a hacker has to do is exploit one vulnerability to manipulate all the data, rendering it unusable. And manufacturers that don't update their devices regularly -- or at all -- leave them vulnerable to cybercriminals.

However, hackers aren't the only threat to the internet of things; privacy is another major concern for IoT users. For instance, companies that make and distribute consumer IoT devices could use those devices to obtain and sell users' personal data.

Challenges with IIoT:

- i. Security of data – same as above
- ii. Reliability and stability – of IIoT sensors
- iii. Connectivity of all the systems in IIoT setup – no maintenance envisioned?
- iv. Blending legacy systems – IIoT is new in the market























What NEEDS TO be done?

1. Consumer education
2. Product reviews and comparisons
3. Vulnerability disclosure and vulnerability markets
4. Self-certification and voluntary codes of practice
5. Trust marks and labels like Internet Society's Online Trust Alliance (OTA) IoT Trust Framework
6. Government initiatives
7. Mandated security requirements
8. Mandated certification
9. Liability reform
10. Etc.
11. **No intervention!?**



Top 10 IoT Startups 2019 (alphabetic order)



Company Name	IoT Focus	Country	Highlights
 ARUNDO	Data Analytics		+ Strong partnerships + Outstanding team
 Bright Machines.	Microfactories		+ Impressive employee growth + Outstanding team
 DRAGOS	Cybersecurity		+ Impressive employee growth + Strong partnerships
 ELEMENT	Data Analytics		+ Impressive list of investors + Strong partnerships
 FOGHORN	Edge Intelligence		+ Strong customer portfolio + Positive customer sentiment
 iguazio	Data Science platform		+ Strong customer portfolio + Strong disruption potential
 IoTium	Secure Network Infrastructure		+ Impressive list of investors + Strong disruption potential
 Preferred Networks	Real-time machine learning		+ Strong customer portfolio + Strong disruption potential
 READY ROBOTICS	Robotics		+ Impressive employee growth + Strong disruption potential
 sparkcognition™	Analytics / AI		+ Strong customer portfolio + Strong partnerships

Methodology: In order to classify as “IoT Startups”, companies have to focus on building enterprise solutions for the Internet of Things (at least 1 element of the tech stack), must be founded in 2013 or later, must provide enough public information. Out of the 1,018 companies that qualify according to those criteria, the top 10 were awarded based on Size of existing investment (>\$10M or more), Employee growth (>~50% in last 2 years), Quality of partnerships/investors (Reputed companies / organizations), Quality of team (Experience of board members), Quality of customers (Reputed companies), Analyst opinion (Known customer sentiment, market disruption potential, others) **Source: IoT Analytics Research – IoT Startups Report & Database 2019**



The future of IoT



Bain & Company expects annual IoT revenue of hardware and software to exceed \$450 billion by 2020.

McKinsey & Company estimates IoT will have an \$11.1 trillion impact by 2025.

IHS Markit believes the number of connected IoT devices will increase 12% annually to reach 125 billion in 2030.

Gartner assesses that 20.8 billion connected things will be in use by 2020, with total spend on IoT devices and services to reach \$3.7 trillion in 2021.

By 2023, the average CIO will be responsible for more than three times as many endpoints as this year
– Gartner

Gartner forecasts that worldwide IoT Security Spending will be 3.11 billion by 2021 largely driven by regulatory compliance.

Great improvements in the security of IoT devices driven by manufacturers' own initiatives as well users' demand for better secure devices.

Global manufacturers will use analytics data recorded from connected devices to analyze processes and identify optimization possibilities, according to IDC and SAP.

Business Insider forecasts that by 2020, 75 percent of new cars will come with built-in IoT connectivity.



References :

1. Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Wiley Publications, First Edition, 2013. (UNIT I-IV)
2. Arsheep Bahga , Vijay Madisetti , Internet of Things: A Hands-On Approach, Universities Press, First Edition , 2014.(UNIT I & V)

