grid infrastructure. And product companies can analyze how customers are actually using devices to inform design improvements.

Even simple conveniences like remotely monitoring and brewing coffee from your smartphone demonstrate IoT's potential to connect businesses to consumers in new ways.

5) <u>Societal Benefits</u> :- IOT will bring broad societal benefits as well, enabling smarter cities with reduced traffic congestion, lower crime rates and more efficient delivery of public services. And applications in healthcare, fitness tracking and food supply chain management have potential to significantly improve health and nutrition globally.

<u>Benefits</u> :-

- Efficient Resource Utilisation
- Save Time
- Human Effortless and minimum errors
- Security
- User-friendly
- Easy to use
- Minimize human effort
- Development of AI through IOT.

<u>IOT ecosystem</u> :- IOT ecosystem is not easy to define. It is also difficult to capture its proper image due to the vastness and
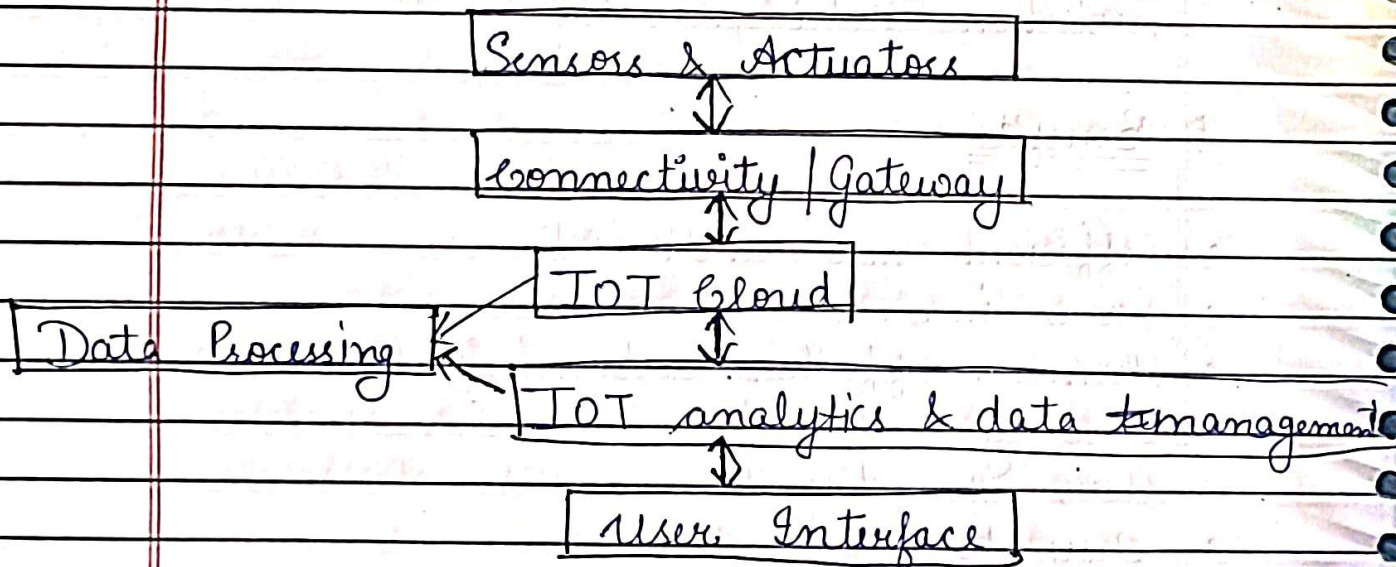
IOT ecosystem is not limited to a particular field but has applications in home automation, vehicle automation, health care etc.

emerging possibility and the rapidity with which it is expanding in the entire sector. However, the IOT ecosystem is a connection of various kind of devices that sense and analyze the data and communicates with each other over the networks.

In the IOT ecosystem, the user uses smart devices such as smartphones, tablet, sensors, etc to send the command or request to devices for information over the networks. The device response and performs the command to send information back to the user through network after analyzed.

Working / Components of IOT ecosystem :-

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┌─────────────────────────┐
│   Sensors & Actuators    │
└─────────────────────────┘
              ↕
┌─────────────────────────┐
│  Connectivity / Gateway  │
└─────────────────────────┘
              ↕
        ┌──────────────┐
        │  IOT Cloud   │
        └──────────────┘
              ↕
┌──────────────┐   ┌──────────────────────────────────┐
│Data Processing│◄─│IOT analytics & data tㅑmanagement│
└──────────────┘   └──────────────────────────────────┘
                              ↕
                   ┌──────────────────┐
                   │  User Interface  │
                   └──────────────────┘
```

The IOT ecosystem consists of multiple components that allow business, governments, and consumers to connect to their IOT devices. These components include:

1) <u>Sensor and Actuators</u> :- Sensors and actuators are at the centre of the entire IOT network. Sensors are connected to assets in the form of a physical micro appliance, embedded into an IOT device. These sensors are connected to assets in the form of a physical micro appliances, embedded into an IOT device. These sensors are responsible for collecting and gathering data in order to send signals or commands to the actuator. The actuator then responds to the signal or command and "acts" or makes something happen based on this signal. As an eg. your office may make use of a smart air conditioni system that is set to a specific temperature. Sensors are used to monitor any changes in temperature in the office environment. If a change is detected, they send a signal to the actuators, which will then automatically adjust the airflow.

• <u>Sensor</u> :- It is a hardware device that take input from real-time environment and gives to the system by converting it.
     eg → Thermometer.
• <u>Actuator</u> :- It is a device that converts the electrical signals into physical event or characteristi It takes the input from the system and gives output to environment.

2) <u>Connectivity</u> :- This is largely refered to as the network layer and talks about how data is transferred and processed to ensure

seamless communication b/w connected devices, sensors, the cloud, and actuators. For this to work efficiently, these elements need to be interconnected in order to understand the data and respond with the appropriate action. This is where IOT protocols and IOT gateways come in. IOT protocols provide a medium of transport for data collected from sensors. Data then goes through an IOT gateway that collects and translates the data being received via the protocols.

Gateways can be configured to perform preprocessing of the collected data from thousands of sensors before transmitting it to the next layer.

It acts as a middle layer b/w devices and cloud to protect the system from malicious attacks or unauthorized access.

3) IOT Cloud :- Once the data has travelled through the IOT protocols and gateway. It moves to the cloud. The cloud is a high performance compute and storage ecosystem that is used for processing and data storage and brings all the different components of IOT together. In the cloud, data is filtered, managed, and stored. The data is then used to provide real-time analytics for fast decision making about what action should be taken

in response to the data collected and signals received

IOT cloud is the brain of IOT ecosystem.
- Data needs to be processed.
- To make a break or deal.
- Latency cannot be compromised.
- Cloud is optional.
- Used for local processing.

4) IOT analytics and data management :- This is used to make sense of the large amounts of data being processed. IOT technology can compute all raw data, being collected and transported into data analytics which provides actionable insights and real-time solutions that can be used for effective decision making.

- Converting raw data into useful insights (extraction
- Data extraction, Data Aggregation, Data classification are majored task of IOT analytics & data management
- Deep learning.
- Storage power & intelligent computation are E-parameter of IOT analytics & data management.

5) Devices and Interface / User Interface :- This is the visible component that an IOT user can use to control the system and set their preferences. This interaction is usually conducted

on the device itself or remotely via smartphone, tablets and laptops.

Task is to monitor and control the field devices.

- It might provide the users with an actual or show trends.

What are the benefits of an IOT ecosystem for a business?

- From the above, it is clear that the IOT ecosystem is a complex system that relies on the interconnectivity of multiple systems. What might not be clear from the above is how an IOT ecosystem can benefits business and add value. These benefits include :-

- Provides opportunities for new revenue streams: as IOT technology continues to gain traction with consumers and with a push towards smart buildings, vehicles telemat--ics and industrial automation, there will be an opportunity to provide new offerings that weren't needed before. These IOT offerings will provide an entirely new revenue stream for many businesses, including Telcos.

- Drives Efficiency :- an IOT ecosystem allows companies to simplifies and automate

processes, making them more efficient which in turn makes the workforce more produc- -tive. with more streamlined and autom- -ated processes, you can get more done faster with fewer resources and less chance of human error.

- New business models :- IOT is being used to create new business models through autom- -ation and new services offerings. The way businesses are being operated is changing for the better with the inclusion of the IOT ecosystem.

- Improved business insights and customer exp- -erience :- the speed at which the IOT ecosys tem functions allows you to get real-time data, analytics and insights that can be used to improve operations, product and service offerings and this, in turn, impacts the customer experience.

Technology Drivers :- A group of technologies doing similar things brought under an umbrella coining word internet of things

IOT enabling technologies are :-
1. Wireless Sensor Network,
2. Cloud Computing
3. Big Data Analytics
4. Communication Protocols
5. Embedded System