

(B) → Brownfield IOT ⇒ Brownfield IOT is a model that allows for the deployment of IOT technology on top of existing products, or legacy product. This model can be a good option for Original Equipment Manufacturers (OEMs) because it can help them deliver IOT capabilities more quickly than the greenfield model.

Here are some things to consider when implementing brownfield IOT: →

(i) Challenges → Brownfield IOT projects face unique challenges, such as connecting legacy devices to the cloud, maintaining connectivity, and collecting data.

(ii) Retrofitting → A common solution for brownfield IOT is retrofitting, which involves retrofitting existing infrastructure with IOT capabilities. However, retrofitting can have disadvantages, such as a lack of scalability.

(iii) Cost → legacy systems can become more expensive to maintain over time as their functionality ages.

(iv) Digitalization → Brownfield environment can have unique challenges to digitalization, such as siloed machine data and mismatched machine types and protocols.

(v) Sensors → It's possible to install sensors on existing assets without sensors, or on assets that need more sensors.

(vi) using Converters → Another approach towards full connectivity is to bring IOT to the programmable logic controllers (PLCs) that manage and supervise existing automation systems.

(c) Smart objects → Smart object is an object that enhances interplay with not only humans however also with different smart objects. Also recognized as smart connected products or smart connected things (SCOT), they are products, assets, and different matters embedded with processors, sensors, software program and connectivity that helps in permitting info. to be exchanged b/w the product and its environment, and diff. products and systems.

• Smart objects are an autonomous physical and/or digital object that have sensing, processing and networking capabilities, and carry app. logic.

• Smart object are small computers with a sensor or actuator and a comm. device, embedded in objects such as thermometers, car engines, light switches, and industry machinery.

• Smart object can be battery-operated, but not always and typically have three components: a CPU

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(8, 16- or 32-bit micro-controller), memory and a low-power wireless communication device.

- The size is small and the price is low.

→ classification of smart objects :->

① Mobile or static → The classification is predicated on whether the "thing" should move or always reside in the identical location. A sensor might also be cell due to the fact it is moved from one object to some other or due to the fact it is connected to a transferring object.

② Low or Excessive Reporting Frequency → The classification is primarily based on how regularly the object must report monitored parameters. A rust sensor can also report values as soon as a month. Higher frequencies force greater strength consumption, which can also create constraints on the feasible strength.

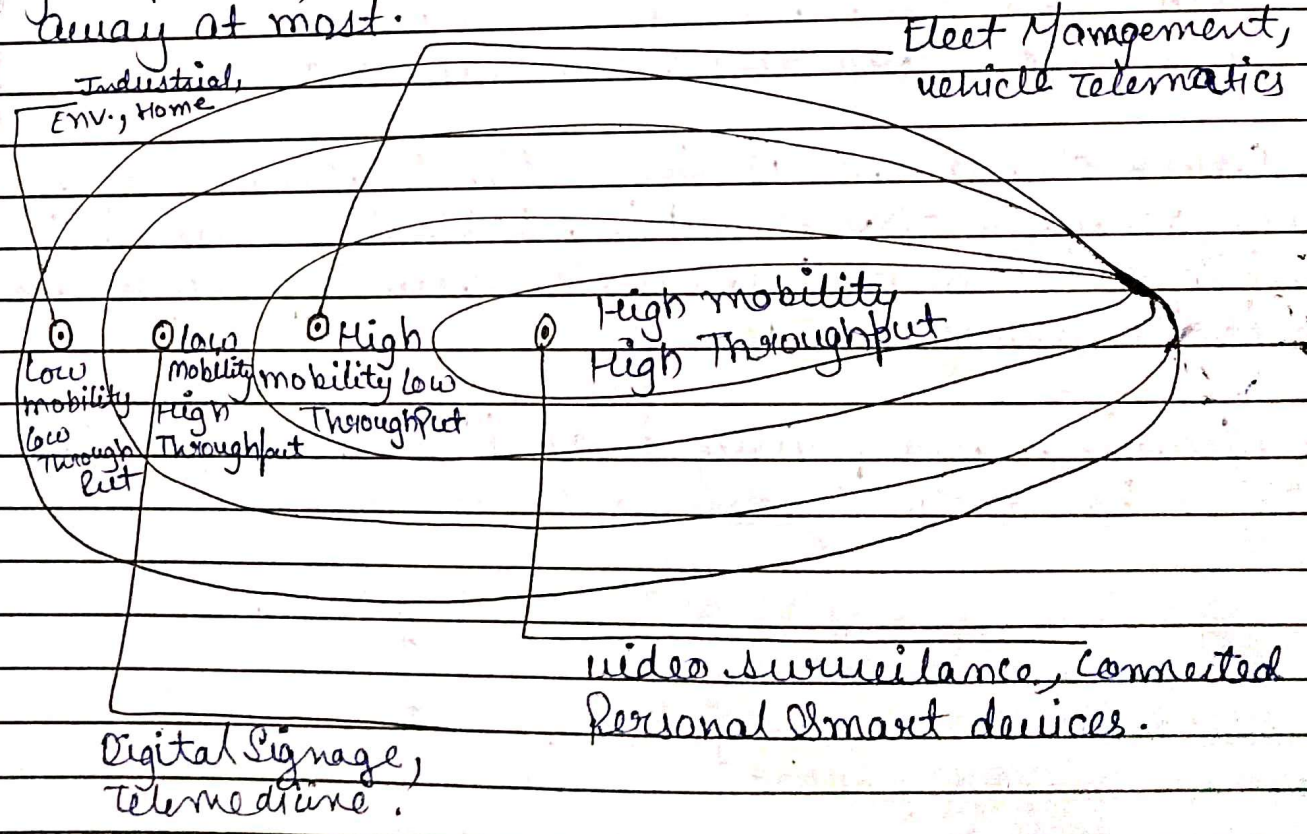
③ Battery-powered or power-connected → This classification is primarily based on whether or not the object incorporates its very own energy supply or receives non-stop power from an external power source.

④ Simple or Rich data → This classification is based totally on the extent of records exchanged at every reporting cycle. A humidity sensor in an area can also report an easy daily

index value. This classification is regularly mixed with the preceding to decide the object information throughput.

⑤ Object Density per Cell → This classification is based totally on the number of smart objects over a given area, linked to the identical gateway. An oil pipeline can also make use of a single sensor at key places every few miles.

⑥ Report Range → This classification is primarily based on the distance at which the gateway is located. For Example → for your fitness band to speak with your phone, it desires to be positioned a few meters away at most.



Advantages of Smart object →

- ① Energy saving is one of them. Smart objects are usually powered by battery.
- ② The second advantage is automation. IOT smart objects are autonomous and self-governed.
- ③ They operate independently and can collaborate with other objects globally.

Challenges of Smart objects →

- ① Smart objects are often constrained devices and are usually powered by battery.
- ② Frequently they are working in real-time mode. These are the main causes of the challenges.
- ③ Other challenges is connectivity. Current a large number of networking technologies are being employed in connecting physical devices together and to the internet.
- ④ Security and privacy is of big concern for smart object based IOT systems.

① Smart application → The most important characteristics of humans is that we can work with each other as a team and gain knowledge from each other. IOT has made our life easier with its app. you won't believe all the cool stuff IOT can do! Imagine having a home where the lights turn on by themselves, the TV knows your favourite shows.

All these top application of IOT in different facets and industries of the world.

① Smart agriculture → Food is an integral part of life without which we cannot survive. However, it is an unfortunate fact that a lot of food is wasted in developed countries like America while people starve in poorer countries like Chad, Sudan, etc.

② Smart vehicles → Smart vehicles or self-driving cars are lot app. as they can be called are pretty dependent on IOT. These cars have a lot of features that are integrated with each other and need to communicate such as the sensors that handle navigation, various antennas, controls for speeding or slowing down, etc.

③ Smart Home → Maybe one of the most famous app. of IOT is in smart homes. After all, who hasn't heard about connecting all the home app. like lighting, air conditioners, locks, thermostat, etc. These app. of IOT are getting famous nowadays.

④ Smart Pollution Control → Pollution is one of the biggest problems in most of the cities in the world. Some times it's not clear if we are inhaling oxygen or smog! IOT app. can be a big help in controlling pollution levels to make breathable standards. This can be done by collecting data related to city pollution like emissions from vehicles, airflow direction, weather, traffic levels etc.

⑤ Smart Healthcare → There are many app. of IOT in the Healthcare industry where doctors can monitor patients remotely through a web of interconnected devices and machines without need to be in direct contact with them.

⑥ Smart Cities → Cities can be made more efficient so that they require fewer resources and are more energy-efficient. This can be done with a combination of sensors in different capacity all over the city that can be used for various tasks ranging from managing the traffic, waste mang., creating smart buildings, etc.

⑦ Smart Retail → There is a way to make shopping even more exciting for customers and that's to use the latest tech like IOT of course!

Retail store can make use of IOT app. in a wide range of operation to make shopping a much smoother experience of customers and also easier for employees.