CHAPTER

15

OVERVIEW OF FUTURE TECHNOLOGY

'Future Technology' is a term generally used to describe a new technology, but it may also refer to the continuing development of an existing technology. It can have slightly different meaning when used in different areas, such as media, business, science or education.

This term commonly refers to technologies that are currently developing or that are expected to be available within the next 4 to 5 years. It is usually reserved for technologies that are creating, or expected to create, significant social or economic effects.

Introduction to Internet of Things (IoT)

IoT is a network in which all physical objects are connected to the Internet through network devices and exchange data. IoT allows objects to be controlled remotely across existing network infrastructure.

The goal of IoT is to extend to Internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster.

Components of IoT

1. **Sensors** Sensors or devices are key components that help you to collect real time data from the surrounding environment.

   All this data may have various levels of complexities. It could be a simple temperature monitoring sensor or it may be in the form of the video feed.

2. **Connectivity** All the collected data is sent to a cloud infrastructure. The sensors should be connected to the cloud using various media of communication. These communication media include Mobile or Satellite networks, Bluetooth, Wi-Fi, WAN, etc.

3. **Data Processing** Once the data is collected and it gets to the cloud, the software performs processing on the gathered data.

   This process can be just checking the temperature, reading on devices like AC or heaters. However, it can sometimes also be very complex like identifying objects using computer vision on video.

4. **User Interface** The information made available to the end user in some ways, that can achieve by triggering alarms on their phones or notifying through text or E-mails. Also, a user sometimes might also have an interface through which he/she can actively check in on their IoT system.

Advantages of IoT

1. **Technical Optimisation** IoT technology helps a lot in improving technologies and making them better.
2. **Reduce Waste** IoT offers real time information leading to effective decision-making and management of resources.
3. **Improved Customer Engagement** IoT allows you to improve customer experience by detecting problems and improving the process.
4. **Improved Data Collection** Traditional data collection has its limitations and it's designed for passive use. With the help of IoT, limitation of data collection has reduced.

Disadvantages of IoT

1. **Security** As the IoT systems are inter-connected and communicate over networks, the system offer little control despite any security measures. It can reduce the various kinds of network attacks.
2. **Privacy** Even without the active participation of user, IoT system provides substantial personal data in maximum detail.
3. **Complexity** The designing, developing, maintaining and enabling the large technology to IoT system is quite complicated.

Big Data Analytics

It is the process of collecting, organising and analysing large sets of data to discover patterns and other useful information. Big data analytics can help organisations to better understand the information contained within the data and well also help to identify the data that is most important to the business and future business decisions.

Characteristics of Big Data Analytics

1. **Variety** Variety of big data analytics refers to structured, unstructured and semi-structured data, i.e. gathered from multiple sources. While in the past, data could only be collected from spreadsheets and databases, today data comes in an array of forms such as E-mails, PDFs, Photos, etc.
2. **Velocity** It essentially refers to the speed at which data is being created in real time.

   In a broader prospect, it comprises the rate of change and linking of incoming data sets at varying speeds.
3. **Volume** Big data indicates huge volumes of data that is being generated on a daily basis from various sources like social media platforms, business processes, machines, networks, etc.

Applications of Big Data Analytics

1. **Government** When government agencies are harnessing and applying analytics to their big data, they have improvised a lot in terms of managing utilities, running agencies, dealing with traffic congestion or preventing the crimes.
2. **Heathcare** Big data analytics had already started to create a huge difference in the healthcare sector. With the help of predictive analytics, medical professionals can now able to provide personalised healthcare services to individual patient.
3. **Banking** The banking sector relies on big data for fraud detection. Bit data tools can efficiently detect fraudulent acts in real time such as misuse of credit/debit cards, etc.
4. **Manufacturing** Using big data analytics, manufacturing industry can improve product quality and output by minimising waste.

Virtual Reality

It is a computer interface which tries to mimic real world beyond the flat monitor to give an immersive 3D visual experiences.

It is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment.

On a computer, virtual reality is primarily experienced through two of the five senses, i.e. sight and sound.

Virtual Reality (VR) technology is applied to advance fields of machine, engineering, education, design, training and entertainment.

Applications of Virtual Reality

1. **In Gaming** Virtual technology's devices are used for virtual gaming experiences. Along with this, devices such as Wi-Fi Remote, Playstation Move/Eye, Kinect are based on virtual reality which track and send input of the players to the game.
2. **In Healthcare** Healthcare is one of the applications where virtual reality could have the most significant impact. Healthcare professional can now use virtual models to prepare them for working on a real body.
3. **In Education** Virtual reality has been adopted in education too. It improves teaching and learning process. With virtual reality, a large group of students can interact with one another within a three dimensional environment.
4. **In Entertainment** Virtual reality is being used in the entertainment industry to boost experiences with 3D films and increase emotional connection with them and/or the characters.
5. **In Business** Virtual reality has also been adopted in business. It is now being used for virtual tours of a business environment, training of new employees and this also gives new employees a 360° view of every product.

Artificial Intelligence (AI)

AI is an area of computer science that emphasises the creation of intelligent machines that work and react like humans.

The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

Knowledge engineering is a core part of AI research. Machines can often act and react like humans only if they have abundant information relating to the world. Artificial intelligence must have access to objects, categories, properties and relations between all of them to implement knowledge engineering.

Types of Artificial Intelligence

1. **Weak AI** It embodies a system designed to carry out one particular job. Weak AI systems include video games such as the chess and personal assistants such as Amazon's Alexa.
2. **Strong AI** These are the systems that carry on the tasks considered to be human like. These tend to be more complex and complicated systems. These kinds of systems can be found in applications like self-driving cars or in hospital operating rooms.

Applications of Artificial Intelligence

1. **In Business** Robotic process automation is being applied to highly repetitive tasks normally performed by humans.
2. **In Gaming** Over the past few years, AI has become an integral part of the gaming industry. Infact, one of the biggest accomplishments of AI is in the gaming industry.
3. **In Healthcare** Companies are applying machine learning to make better and faster diagnoses than humans. One of the best known technologies is IBM's Watson. It understands natural language and can respond to questions asked from it.

4. **In Banking** A lot of banks have already adopted AI based systems to provide customer support, detect anomalies and credit card frauds. AI solutions can be used to enhance security across a number of business sectors, including retail and finance.
5. **In Autonomous Vehicles** Just like humans, self-driving cars need to have sensors to understand the world around them and a brain to collect, processes and choose specific actions based on information gathered.

Blockchain Technology

The blockchain is an encrypted, distributed database that records data. It is a digital ledger of any transactions, contracts that need to be independently recorded.

In financial sector, with blockchain technology the participants can interact directly and can make transactions across the internet without the interference of a third party.

With all the fraud resistant features, the blockchain technology holds the potential to revolutionise various business sectors and make processes smarter, secure, transparent and more efficient compared to the traditional business processes.

Advantages of Blockchain Technology

1. It allows smart devices to speak to each other better and faster.
2. It allows the removal of intermediaries that are involved in record keeping and transfer of assets.
3. It provides durability, reliability and longevity with decentralised network.
4. The data that is entered in blockchain based systems is immutable which prevents against fraud through manipulating transactions and the history of data.
5. It brings everyone to the highest degree of accountability.

Challenges of Blockchain Technology

1. To verify all the transactions, huge power, i.e. electricity is required.
2. Blocks in a chain must be verified by the distributed network and it can take time. So, transaction speed can be an issue.

3D Printing / Additive Manufacturing

3D printing is a manufacturing process where a 3D printer creates three dimensional objects by depositing materials layer by layer in accordance to the object's 3D digital model.

It uses data Computer Aided Design (CAD) software or 3D object scanners to direct hardware to deposit material, layer upon layer, in precise geometric shapes. As its name implies, additive manufacturing adds material to create an object.

How does 3D Printing Work?

Here are the steps taken in creating a 3D object

1. Produce a 3D model using CAD or equivalent 3D design software.
2. Convert the drawing to the STL (Standard Tessellation Language) file format, which is a format developed for 3D printers.
3. Transfer the STL file to the computer that controls the 3D printer. From there, you can specify the size and orientation for printing.
4. It prepare for a new print job based on the requirement of the 3D printer. This may include refilling whichever additive you are using to make your object.
5. Begin the building process. Since, each layer is usually about 0-1 mm thick, this can be take anywhere from hours to days to complete depending on the object's size.
6. Remove the object from the printer and avoid any contact with toxins or hot surfaces.

7. Performs any post processing needed, which may involve brushing off residue or washing the object.
8. Use your new printed object.

Examples of 3D Printing

- Architectural scale model and maquettes.
- Eyewear.
- Dental Products.
- Design (lamps, furniture, etc).
- Reconstructing bones and body parts in forensic pathology.
- Reconstructing heavily damaged evidence. retrieved from a crime scene.

Robotics Process Automation (RPA)

RPA is the use of specialised computer programs, known as software robots, to automate and standardise repeatable business processes.

Robotic process automation does not involve any form of physical robots. Software robots mimic human activities by interacting with applications in the same way that a person does. Robot process automation enables business professionals to easily configure software robots to automate repetitive, routine work between multiple systems, filling in automation gaps to improve business processes.

Applications of RPA

1. **Customer Service** RPA can help companies offer better customer service by automating contact center tasks, including verifying E-signatures, uploading scanned documents and verifying information for automatic approvals or rejections.
2. **Healthcare** Medical organisation can use RPA for handling patient records, claims, customer support, account management, billing, reporting and analytics.
3. **Supply Chain Management** RPA can be used for procurement, automating order processing and payments, monitoring inventory levels and tracking shipments.
4. **Financial Services** Companies in the financial services industry can use RPA for foreign exchange payments, automating account opening and closing, managing audit requests and processing insurance claims.
5. **Accounting** Organisations can use RPA for general accounting, operational accounting, transactional reporting and budgeting.

Fifth Generation (5G)

5G standard is for broadband cellular networks, which cellular phone companies began deploying worldwide in 2019. It is designed to improve network connections by addressing the legacy issues of speed, latency and utility, which the earlier generations and the current generation of mobile networks could not address.

5G is promised to deliver data speed at a rate 100 times faster than 4G networks.

Globally, 5G network deployment is rapidly moving from trials to early commercialisation. In India, network operators like Airtel, Vodafone, Idea, Reliance, Jio, etc., have already partnered with vendors like Ericsson, Huawai and Samsung for planned trials sometime by the end of year 2020, before the service's forecast commercial rollout in 2020.

Advantages of 5G

1. **Greater Speed in Transmission** Speed in transmissions can approach 15 or 20 Gbps. By being able to enjoy a higher speed, we can access files, programs and remote applications in direct without waiting.
2. **Lower Latency** Latency is the time that elapses since we give an order on our device until the action occurs. In 5G, the latency will be ten times less than in 4G, being able to perform remote actions in real time.
3. **Greater Number of Connected Devices** With 5G, the number of devices that can be connected to the network increases greatly, it will go to millionaire scale per square kilometer.

All connected devices will have access to instant connections to the internet, which in real time will exchange information with each other.

4. **New Technology Options** As speed of network has improved, more and more tasks are being transitioned to the world of smart devices from the world of computers. With the rising network speeds, this could open new doors for smart devices that may not have been available.

Disadvantages of 5G

1. **Obstruction can Impact Connetivity** The range of 5G connectivity is not great as the frequency waves are only able to travel a short distance. Added to this setback is the fact that 5G frequency is interrupted by physical obstructions such as trees, towers, walls and buildings. The obtrusions will either block, disrupt or absorb the high frequency signals. To counter this setback, the telecom industry is extending cell towers to increase the broadcast distance.
2. **Limitation of Rural Access** While 5G might bring about real connectivity for the predominantly urban areas, those living in the rural area, they will not necessarily benefit from the connection.
3. **Battery Drain on Devices** When it comes to cellular devices connected to 5G, it seems the batteries are not able to operate for a significant period of time. The battery technology needs to advance to allow for this enhanced connectivity, where a single charge will power a cellphone for a full day.

   Alongside depleted batteries, users are reporting that cellphones are getting increasing hot when operating on 5G.

QUESTION BANK

1. Which of the following is a term generally used to describe a new technology, but it may also refer to the continuing development of an existing technology?
(1) Future technology
(2) Future skills
(3) IoT
(4) Future processing

2. Future technology is usually reserved for ..... that are creating, or expected to create, significant social or economic effects.
(1) processing (2) skills
(3) things (4) technologies

3. Which of the following objects to be controlled remotely across existing network infrastructure?
(1) Future skills (2) IoT
(3) Cloud computing (4) Saas

4. ..... are key components that help you to collect live data from the surrounding environment.
(1) Sensors (2) Connectivities
(3) User interfaces (4) None of these

5. IoT system provides substantial personal data in ..... detail.
(1) minimum (2) maximum
(3) medium (4) All of these

6. Big data analytics is used in
(1) government (2) healthcare
(3) banking (4) All of these

7. Which of the following is the process of collecting, organising and analysing large sets of data to discover patterns and other useful information?
(1) Future skills (2) IoT
(3) Big data analytics (4) User interface

8. ..... of big data analytics refers to structured, unstructured and semi-structured data that is gathered from multiple sources.
(1) Feature (2) Analysis
(3) Privacy (4) Variety

9. Virtual reality is primarily experienced through ..... of the five senses.
(1) Two (2) Three
(3) Four (4) One

10. Which technology devices is used for virtual gaming experiences?
(1) Future skills (2) Virtual
(3) Big data analytics (4) Blockchain

11. Virtual reality technology is applied to advance fields of
(1) medicine (2) engineering
(3) education (4) All of these

12. ..... is an area of computer science that emphasises the creation of intelligent machines that work and react like humans.
(1) Artificial intelligence
(2) Introduction to things
(3) Future skills
(4) Robotics

13. Which type of artificial intelligence embodies a system designed to carry out one particular job?
(1) Weak AI (2) Strong AI
(3) Both (1) and (2) (4) None of these

14. AI is important because it can help to solve immensely difficult issues in
(1) entertainment (2) education
(3) health (4) All of these

15. Which of the following is an encrypted and distributed database that records data?
(1) Automation
(2) Blockchain
(3) Artificial intelligence
(4) Future skills

16. Blockchain mechanism brings everyone to the highest degree of ..... .
(1) Accountability (2) Availability
(3) Performance (4) Analytics

17. Additive manufacturing uses ..... software.
(1) System (2) Application
(3) Utility (4) CAD

18. Example(s) of 3D printing is/are
(1) Eyewear
(2) Dental products
(3) Architectural Scale Model
(4) All of the above

19. RPA is the use of specialised computer programs known as .....
(1) future skills
(2) user interface
(3) software robot
(4) artificial intelligence

20. What is/are the business benefit(s) of RPA?
(1) Increased accuracy
(2) No interruption of work
(3) Low technical barriers
(4) All of the above

21. .....can help companies offer better customer service by automating contact center tasks.
(1) RPA (2) Interface
(3) Additive (4) Blockchain

ANSWERS

1. *(1)*	2. *(4)*	3. *(2)*	4. *(1)*	5. *(2)*	6. *(4)*	7. *(3)*	8. *(4)*	9. *(1)*	10. *(2)*
11. *(4)*	12. *(1)*	13. *(1)*	14. *(4)*	15. *(2)*	16. *(1)*	17. *(4)*	18. *(4)*	19. *(3)*	20. *(4)*
21. *(1)*									