



Smart Learning Based on Internet of Things

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ABSTRACT

Internet of Things (IoT) refers to the interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data. this paper aims to describe the IoT services and applications have the potential to make an important and fundamental change in the infrastructure of educational organization, the paper concluded that learning based Internet of Things has provided many solutions to improve efficiency, quality, Speed and easier, learning will be improved by correctly applying the IoT technology and it will also have a healthy learning environment. The goal of using IoT in this paper is to assess the potential benefits in learning and how overcoming its challenges and reducing the associated risks.

Keywords: Internet of Things (IoT), internet, learning, services, applications, infrastructure.

1. Introduction

One of the most influential aspects of technology is the Internet of Things (IoT). The Internet of Things is an extension of the internet connection to physical devices and daily things. The concept of the entire system is characterized by effective forms of devices, electronics and internet connection with an endless support from the Internet of Things, The Internet of Things (IoT) is a variable dynamic in the field of education adapting digital tools not only makes learning present everywhere, but also makes traditional learning systems more efficient and inclusive , IoT can help students communicate with their classmates locally or remotely, exchange information, analyze educational materials and comment on them in the actual time and reach distance to learning tools such as remote laboratories. Traditional learning at the present time faces several problems, such as old curricula, unified tests for all students that do not take into account the disparity in interests and capabilities, and the feeling of bored students during the learning process, lack of qualification and training for some teachers, in addition to consuming a lot of time to organize lessons. Therefore, the attention of many experts and organizational and educational authorities is currently on the emerging techniques to improve the learning process, and the Internet of Things tops the list of technologies that will lead the next learning revolution. [1].

The LMS is a shortening (Learning Management System), Learning management systems are one of the e-learning requirements, and it appeared as a result of the urgent need to organize electronic educational content and manage the educational process, in addition to following students and trainees and preparing the necessary reports and tests. It is a software program designed to help manage, follow up and evaluate continuous training and education and all learning activities in various educational and training facilities. It is also possible to interact with the trainees to discuss topics, virtual meetings and forums, IoT is used by many other fields, such as sales and services banking, hospitality, and electric power infrastructures, to increase their efficiency and transparency in business operations, water consumption, and technologies for wireless power Internet of Things (IoT) technology has an important impact on the learning field The Internet of Things is not only changing traditional teaching practices but also creating change on Infrastructure for education organizations [2]

The effect of e-learning. E-learning has grown in significance as an educational tool just like technology has developed and progressed over the years. Interestingly, there have been more efforts at advancing technology than on attempting to understand the needs and learning styles of individual learners and instructional design.

Internet of Things has revolutionized the distance education at all levels. It has appeared e-learning or virtual education, as a new way of learning, complementary to classroom teaching and as substitute of the present education. Smart learning is an auto-assisted learning system. The student will be able to assimilate knowledge, which "is dictated" by a program, by means of a computer. The student feels more comfortable and can repeat the lesson all the times he needed it [3].

2. Applications of Internet of Things

The Internet of Things (IoT) is a network of intelligently connected things with embedded sensors and actuators which can be used to collect data and share it with other things, fig 1 shows architecture of Internet of Things.[4]

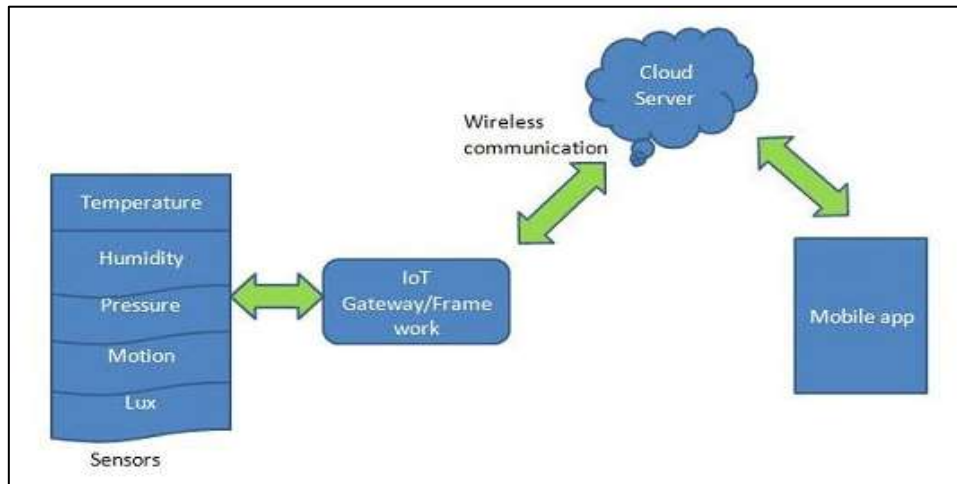


Fig 1. Architecture of Internet of Things

IoT applications is finds in almost every field - healthcare, business, transportation, agriculture, management and learning etc. the most important of these applications are show in fig 2

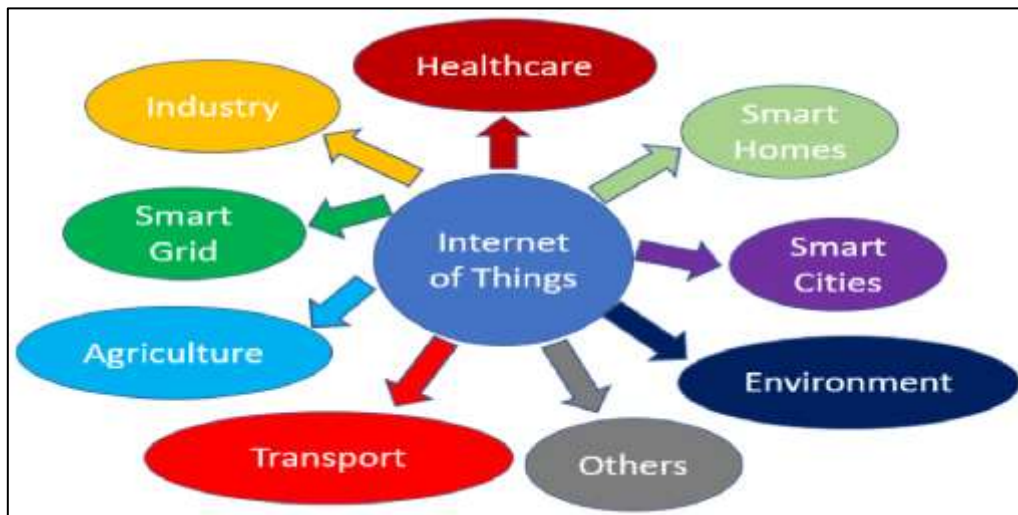


Fig 2. Application of IoT

1. Smart Home

A smart home is a home that contains devices that have the ability to communicate with each other and with its physical environment. The smart home gives the owner the ability to customize and control the home environment to increase security and energy efficiency management.

2. Healthcare

IoT technologies in the field of healthcare aim to enable people to live a healthy life through wearable devices and sensors connected to the internet, the data collected aids personal analysis to the health of the individual, providing tailored strategies to control disease and may assist in the provision of care urgently in emergency situations.

3. Agriculture

Smart Agriculture is one of the fastest growing fields in the field of the internet of things and the development of agricultural and farming systems is helps farmers check the health of animals and can easily identify any diseases they carry, and helps farmers to know what kind can be planted at this time of the year.

4. Transportation

The car connected to the Internet of Things is the car that is able to improve the way it operates and maintenance, provides a service to passengers who use sensors and the internet, the internet has helped to enjoy driving cars as it has provided multiple advantages, including maps electronic devices that know the track you want and keep you away from the crowded roads, with the feature of playing music through the internet, the Internet of Things gave cars a distinctive technology which is the cooling properties , automatic heating and display for the places the car driver wants to go .

5. Smart Cities

Intelligent monitoring, intelligent automated transportation, energy management systems and intelligent environmental monitoring are all examples of Internet of Things applications for smart cities. Smart cities are the real solution to people's problems they are usually encountered to overpopulation, pollution, poor infrastructure and supply shortages energy, smart cities have many examples such as smart trash cans and smart parking and smart lights Sensors making, it more serviceable to the citizen and more energy efficient.

6. Learning

Smart learning environment unlike the traditional learning environment provides the learners access to learning systems in a ubiquitous manner i.e., learning can be done at any time and at any place. Such environments even provide tools to analyze the best place and the best time for the learner to study. Smart Learning Environment is more effective and engaging. Internet of Things technologies can be used for the implementation good learning environments.[5]

3. E- learning Concept and Types

E-learning is defined as an educational process through mobile phones or computers, whether through internet connection or through CDs, and this process allows the learner to learn at anytime and anywhere, and e-learning includes a presentation Texts, video, audio clips, animations and virtual environments, thus creating a very rich learning environment that can outperform the traditional classroom environment. With the use of many effective designs and the guarantee of a highly qualified and specialized educational team; E-learning becomes an ideal learning environment and an attractive and valuable means for students, which is an opportunity to learn at any time, in addition to that e-learning includes the insert of computers, smartphones and tablets into the classroom and offices and makes use of them on a large scale. [6]

E-learning includes three basic types, which are as follows:

- **Synchronous Learning:** This type includes the interaction of the teacher and his students via the Internet at the same time, through a video call, an audio conference, or through chat and instant messaging, and through this type of learning it is possible to record all the lectures and play them at a later time and track all the activities required during them, The teacher can also monitor his students, correct their mistakes, and allocate to each student what he would like to teach him, and also gives students the opportunity to communicate and cooperate with each other.
- **Asynchronous Learning:** This learning includes the interaction of the teacher and his students via the Internet at different times and not at the same time, so that educational courses and lectures are available on computers, in CDs, or through dedicated websites that can be accessed through the Internet, and this education allows learners to access They can access courses whenever they need them and at their own pace, and they can interact with each other via message boards, bulletin boards and discussion forums.
- **Blended Learning:** It is a type that combines synchronous and asynchronous learning, so that the teacher and students interact via the Internet at the same time that the training courses are given, then these courses are transferred to CDs for later use for self-study separately from the teacher. [7]

4. Smart Learning Using Internet of Things (IoT)

The concept of smart learning to connect the learning environment to the internet and contains variety of things/objects such as: (windows, doors, projectors, printers, classrooms, laboratories, buildings, etc.) using devices (Sensors, Radio Frequency Identification Service (RFID), Nearby Field Communication Service (NFC), Quick Response Codes (QR Codes)" and other Internet of Things technologies [8] fig. 3 shows the main components to create a smart learning system, It can be summarized in the following :

- **The smart classroom based on the Internet of Things (IoT):**

The concept of smart classrooms means an intellectual environment equipped with advanced teaching methods based on the latest technology or smart things. These smart objects can include cameras, microphones and a variety of sensors, which can be used to measure and evaluate students' level of learning smart learning provides ease and convenience for classroom management. using Internet Things (IoT) may help for the classroom in creating and providing a better and more appropriate learning environment for knowledge.

- **The smart lab based on the Internet of Things (IoT):**

Smart or virtual labs through the Internet of Things can provide an advantage to any learning system. Laboratories based on the Internet of Things (IoT) in the learning system leading to a better educational future and Internet of Things (IoT) devices are given to students the ability to access and control the laboratories remotely, and it also allows teachers the ability to measure and track student learning progress in real time.

- **The smart environment based on the Internet of Things (IoT):**

Smart learning environment is a system that combines many smart things below are examples of the smart environment:

- Smart learning application with the Internet of Things (IoT).
- Internet of Things (IoT) sensors to share notes
- Points of contact that support the internet of things in the educational environment

In addition to the above, a smart environment may contain many smart features others such as: (smart parking , smart stores, smart lighting, and smart tracking to students)[9].

- **The smart management based on the Internet of Things (IoT):**

Smart management is a tool used to collect data and information about the operations of the learning organization and to provide methods of accessing and analyzing data. smart management for learning can offer ways to help the organization to know the most important factors affecting its educational activities, and thus help the organization to make better decisions.

- **The smart attendance based on the Internet of Things (IoT):**

The registration and attendance of the students Class is a time-consuming activity; Using the Internet of Things (IoT) can save time and effort. QR code can be used by the student to record attendance by himself, a fingerprint device can also be used to record attendance, and a number of other smart options can be used to record students' attendance.

- **The smart users based on the Internet of Things (IoT):**

Smart Users (Teachers/ Students) are would be the end users of this system. they must be 'smart' because they will choose a system of learning that is totally different from a traditional one, the users (Teachers/ Students) will interact with the system using smart devices.[10]

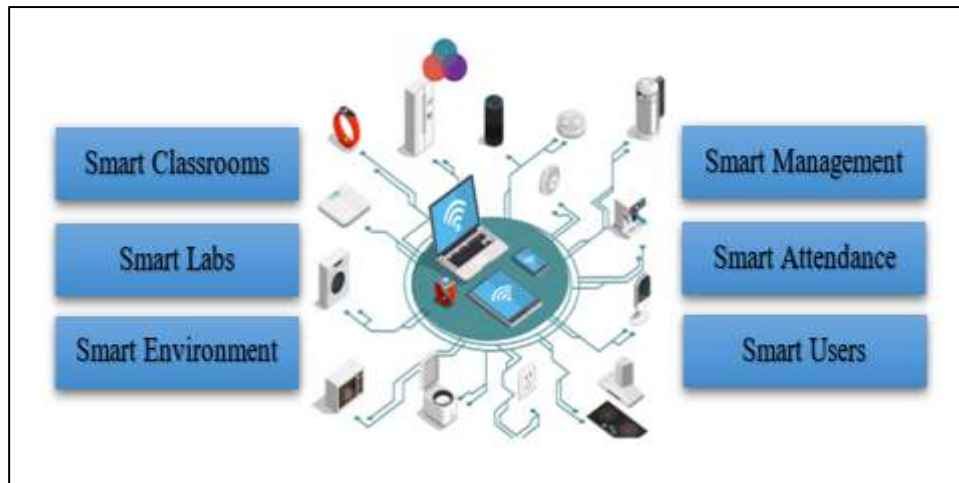


Fig 3. Component of Smart Learning System

The main challenge of smart learning is the ability to access materials and exercises from portable devices such as mobile phones and laptops. advanced technologies need to be accessible to all students in order to eliminate any barriers and enhance the education efficiency, work organization and time management. most teachers are required to move to online teaching almost immediately with no training and tools, Students with learning difficulties may have problems with some courses or paying attention in class.

In general, top challenges facing the adoption and use of smart learning are:

- Budget limitations.
- Lack of professional training.
- Poor network infrastructure.
- Resistance to change.
- Unreliable devices and software

one of the most significant consequences of IoT-based e-learning settings is that the typical responsibilities of students and teachers are fundamentally changed. Because real and virtual items are linked together, students and teachers can interact practically anywhere, at any time, and can participate in scientific projects, assignments, and research.

5. Conclusion

Internet of Things (IoT) is going to expand at a very rapid rate and with it there are going to be huge advancements in every field. This paper explains the use of technology, especially the Internet of Things (IoT) in the field of education, The Internet of Things in learning has provided many solutions to improve efficiency, quality, Speed and ease in the lives of both students and teachers. An educational institution can perform many tasks such as keeping track of essential resources, following up on students, developing access to information and equipment, and designing a safe learning environment. Process of learning can be more productive if it is done through IoT. The applications of the Internet of things in life have become necessary, especially in the education field, and these applications require good infrastructure and communication networks that help build smart learning systems.

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