A PROPOSAL TO SAVE ENERGY IN COMPUTER ROOMS AT THE PUBLIC AUTHORITY FOR APPLIED EDUCATION AND TRAINING IN LIGHT OF THE INTERNET OF THINGS STRATEGY AND ADVANCED COMPUTING TECHNOLOGY

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ABSTRACT

The study aimed to try to use the Internet of Things to save energy in computer rooms at the Public Authority for Applied Education and Training in light of the Internet of Things strategy and advanced computing technology. The study attempted to identify some literature and previous studies to determine the extent to which previous studies have used the Internet of Things in this regard, and reached results. The study indicates that the Internet of Things has many uses, as many countries, represented by various institutions, have relied on it to use the Internet of Things to save energy, human effort, and save time. Its use also has many advantages and benefits in terms of accuracy and better completion of work

KeyWords

Energy Saving - Computer Rooms - Public Authority for Applied Education and Training - Internet of Things Strategy - Advanced Computing Technology .

Introduction :

Today we live in the era of technology and its developments, where successive technological developments have contributed to Save a lot of the life requirements of the individual and society, as governmental and private institutions have come to rely heavily on technical means with all their components. In light of this tremendous development in the field of technology, it has become necessary for educational institutions and workers. Education to develop their abilities with the latest modern technologies. Internet technologies have changed many features today and have allowed everyone to communicate easily without the previous complications. They continue to develop day after day and the technology continues to draw a new shape for the world in the coming years. One of the most recently developed areas of the Internet is the so-called Internet of Things (IOT). A modern term whose beginnings go back to the end of the last century, where all things in our lives have the ability to connect to the Internet or devices to communicate with each other to send and receive data to perform specific functions through the network, as this technology is supposed to make life easier by connecting various things through specific sensing media. And control it via the Internet. (Zhida, et al., 2023).

The Internet of Things is also known as a new model of wireless frequencies and communications in our daily lives that relies on sensors, actuators and mobile phones able to interact with each other via the Internet. (Rongjun, et al., 2023)

The Internet of Things is one of the revolutionary concepts as it connects a group of things with each other to be able to interact and exchange data in a way that is consistent with each other and driven by common goals. (Chen, et al., 2022)

It is defined as an interactive connection through the Internet with computers and smart devices and with many things, making them capable of receiving and sending data. (GuoWen et al., 2022)

Some define it as innovative contemporary technologies that connect devices with each other via the Internet to exchange information and data, providing different channels for communication and interaction with humans. (Roberta, et al., 2023)

As Banica and others (2018) defined it as a network of physical objects that contain interactive technology to communicate with the internal and external environment. (Pingzheng, et al., 2023)

Through the previous definitions, we find that most studies have agreed that the Internet of Things is about sensors that can pair with each other over the Internet to send and receive data and information, which leads to humans interacting with them. The Internet of Things can be defined in this study operationally as "a group of devices." Smart devices and multiple sensors that are directly connected to the Internet, making them able to send data and information and interact with them by workers to save energy in the computer rooms at the Public Authority for Applied Education and Training in light of the Internet of Things strategy and advanced computing technology".

The use of the Internet of Things will increase and will enter strongly into communities, governmental and private institutions, and will change a lot in our daily lives, and will be relied upon greatly in the future. If educational institutions need continuous development to keep pace with technological developments, the Internet of Things will come to provide a new form of services and applications in the educational environment and bring about A qualitative shift in the method and services of education, which contributes to the development of educational services and meeting the needs of beneficiaries in easy and accessible ways. Some studies mention the importance of integrating the Internet of Things into the daily activities of educational institutions, in tracking the main resources of educational institutions, improving the educational process, creating smarter educational plans and designing safe educational institutions. The Internet of Things also has advanced uses for managing virtual classrooms with Great potential to remove obstacles. In education, such as geographical location, language, and economic situation, educational institutions can also use the Internet of Things to manage emergency communications, vital laboratories, and experimental situations. (Ramadan, et al., 2022)

There is no doubt that these services provided by the Internet of Things and the use of this technology by educational institutions will improve the work climate in them and develop the services they provide to students, faculty members, employees, and the community at the Public Authority for Applied Education and Training in the State of Kuwait.

Study Problem :

The world today lives in the era of technology and its developments, and technological developments have contributed to providing many of the life requirements of the individual and society, and educational institutions have become largely dependent on technical means with all its components. A study (Haitao, et al., 2021) indicated the importance of developing the technical field in educational institutions. The Internet of Things is an important technical revolution as it presents a new form of Internet services and applications in the university environment, and leads to a qualitative shift in the style and type of services provided by universities. The study also indicates the reluctance of educational institutions to benefit from this technology in their educational methods and daily management.

Another study also touched on the major shortcomings in the use of artificial intelligence, including the Internet of Things, in educational institutions, and that educational institutions must invest in building the artificial intelligence workforce, and that by 2030, many jobs will be eliminated and replaced with skills that depend on artificial intelligence. (Shams, et al., 2023).

Dennis's study also confirmed that the Internet of Things greatly helps in managing educational institutions and facilities and assists in decision-making based on the analysis of collected data and information. (Joey, et al., 2023).

In light of the above, benefiting from the Internet of Things and its uses in the university environment contributes significantly to improving the educational environment and provides a qualitative shift in the services provided by educational institutions in various fields. Hence, the idea of this study came to answer the following questions :

Study Questions :

1-What is the Meaning of Internet of Things, and its working mechanisms ?

2-What are the most prominent opportunities and uses of the Internet of Things to save energy in computer rooms?

3-What are the most prominent challenges facing the Internet of Things to save energy in computer rooms?

Objectives of Study :

1-What is the Meaning of Internet of Things, and its working mechanisms?

2-What are the most prominent opportunities and uses of the Internet of Things to save energy in computer rooms?

3-What are the most prominent challenges facing the Internet of Things to save energy in computer rooms?

Importance of Studying :

The challenges imposed by technology today and the rapid development in the field of communications force educational institutions to keep up with this development continuously, especially since many of these developments are closely related to the educational environment and labor market outcomes, and based on the communications revolution and the uses of the Internet of Things in many economic, cultural, social and educational fields, it has come This study is an attempt to present a proposed vision for the Internet of Things in the Public Authority for Applied Education and Training, drawing on some of the experiences of various educational institutions. Therefore, the importance of the study lies in the following :

1- Shedding light on the concept of the Internet of Things, its multiple applications, and the areas that can benefit from it in educational institutions.
2- The General Authority for Applied Education and Training needs continuous development in many areas, including the technical field, to achieve quality and competitiveness with educational institutions.
3- The concept of the Internet of Things and its multiple applications has prompted many advanced educational institutions to use it in internal and external operations, which requires identifying the most prominent uses of these things and benefiting from them in educational institutions.
4- It is hoped that the results and recommendations of the study will be used by decision makers in the General Authority for Applied Education and Training.

Limits of the Study :

Objective boundaries: This study examines the multiple uses of the Internet of Things in the General Authority for Applied Education and Training, and reviewing studies and literature that dealt with this field and benefiting from them in the General Authority for Applied Education and Training.

Time limits: The study was conducted at the beginning of 2023 AD.

Study Approach :

Based on the problem and questions of the study, the current study chose the descriptive approach as it suits the nature of the study.

Previous studies :

This aspect of the research addresses some studies that dealt with the concept of the Internet of Things and its uses in educational institutions, arranged from newest to oldest as follows :

The study (Suiting, et al., 2023) targeted the return of Internet of Things applications on education to contribute to education in terms of the benefits to the actors in the educational process, including professors and students. The study reached a set of results, which included presenting the most important challenges such as the lack of preparedness of the infrastructure, the lack of... Regulatory legislation for Internet of Things applications, fears of violating the privacy of users' data. The study also presented the most important features and benefits of the Internet of Things in the educational environment, including the possibility of effectively contributing to the development of information institutions' services, scientific research service, and the development of artificial intelligence capabilities, which contributed to the increase in things connected to the Internet.

The study (Truong, et a., 2023) also addressed the use of the Internet of Things in education, justifications, fields, and services, as it sought to explore the phenomenon of things and their applications in practical life in general and in education in particular. The study reached several results, the most important of which are the justifications that call for The necessity of benefiting from the Internet of Things technology in the educational field, and the areas in which the Internet of Things can be used to develop the services and activities of educational institutions.

The study (Muhammad, et al., 2022) also discussed the historical development of the Internet of Things, providing a general perception of the concept of the Internet of Things and its applications, and knowing the limits within which this technology can be utilized in the field of education. The study concluded that benefiting from the applications of the Internet of Things and the opportunities that... Making it possible in the educational process requires systematic work and the ability to provide an equipped infrastructure. The Internet of Things can also be used in educational institutions in several areas, including tools for interaction between students and professors, the necessary bandwidth in architectural design for interaction and wide communications, voice and messaging. Unified central control, increased communication speed and wireless coverage throughout the educational institution, provides the necessary data especially in the field of research.

Study (Hind, et al., 2023) where the study aimed to identify the use of the Internet of Things in daily life and how to employ it in the educational process in universities. The study reached a set of results, the most important of which is that educational applications via the Internet of Things are creative tools that change the normal way of teaching and learning, and they also It enables professors and students to create 3D graphic books, the Internet of Things helps increase efficiency in educational activities, some technologies contribute to monitoring student behavior around the clock, and the possibility of designing sensors and smart devices that control, monitor and manage things on campus.

The study (Naveen, et al., 2023) also aimed to identify the motivation of faculty members in the Information Studies Department to use the Internet of Things, and to identify the extent to which bachelor's students in the Information Studies Department accept Internet of Things technology in the educational process, and to reveal the obstacles to using the Internet of Things in the educational process. The results showed One of the most important motivations that encouraged faculty members in the Information Studies Department to use the Internet of Things is its use in the educational process, as it allows the teacher to quickly complete attendance registration, as well as to receive costs and assignments. There is also acceptance by undergraduate students in the Department of Information Studies to use the Internet of Things. Because it facilitates the understanding process, and the use of Internet of Things technologies by students is considered easy for them, as for the most important obstacles, they are the weakness of the infrastructure qualified to use the Internet of Things, and the fear of electronic attacks and violations.

The study (Xiaoyan, 2023) aimed to identify how to make schools and universities smarter using the Internet of Things. The study reached several results, the most important of which is that the Internet of Things has a broad ability to significantly change the pattern of education and teaching, and the implementation of the Internet of Things in the environment Education faces several difficulties that must be overcome, including the importance of creating an effective infrastructure and environment that supports knowledge in the educational institution. The study (Voore, et al., 2023) also discussed the new concept of information and communications technology, represented by the Internet of Things and its applications used in the field of higher education. The results of the study concluded that the concept of the Internet of Things has great potential to remove all spatial and physical barriers to reach faster, simpler and better education. The study also found To formulate a model for the smart university by expanding the use of Internet of Things platforms using cloud computing services.

The study (Sarika, 2022) addressed the concept of the Internet of Things and its great potential in improving human life in all sectors, such as smart cities, security, industrial control, logistics services, agriculture, health, and education. The study conducted a survey of registered students at the University of Targoviste (Targoviste) in Romania. In the technical specializations to know their opinions on the various aspects related to the Internet of Things and to know the extent of their readiness to learn some skills related to the Internet of Things. The study concluded that the skills of students in using the Internet of Things in universities are minimal and very limited, which represents a real challenge in their professional and future lives, and the introduction of Internet content Things at the secondary level will contribute to improving the performance of students when they reach the university stage, which will help them to be able to compete in the labor market.

The study (Ramadan, et al., 2022) aimed to develop a system for evaluating students in educational institutions instead of manual evaluation, by using specialized applications in the Internet of Things. The study found an automated alternative system to facilitate the evaluation of student performance through the use of sensing capabilities everywhere and extracting Important results by discovering the daily spatial and temporal patterns

of students and creating data and information about every activity carried out by students within the educational institution. The study (Haitao, et al., 2021) also aimed to identify the concept of the smart university and methods of enhancing it through Internet of Things technology based on controllers and physical sensors. The study came up with a model for forming smart classrooms and university campuses through Internet of Things applications composed of controllers. And interconnected sensors enhanced by cloud computing technologies.

The study (Shams, et al., 2023) dealt with the concept of the smart campus and a review of recent achievements in the field of smart cities and university campuses in particular. One of the most prominent results of the study was the development of a proposed strategy for developing the smart campus via the Internet of Things and cloud computing as a supportive infrastructure that includes several applications such as the smart card. , electronic card, smart classrooms, energy management, adaptive learning, smart transportation, smart utility services, security and safety data.

The study (Joey, et al., 2023) touched on the concept of the Internet of Things on the campus of the University of Malaga in Spain and its infrastructure and some of the problems that the University of Malaga faces with regard to the Internet of Things. The study concluded the importance of using new technologies through Internet of Things applications at the University of Malaga to achieve the concept of the smart university. Capable of supporting senior management, educational activities, research activities, growing needs, and environmental challenges.

The study study (Haitao, et al., 2021) aimed to identify the new technical generation and its uses in smart universities and how to benefit from the Internet of Things in the field of human resources and cloud computing in developing work on multiple systems at the university. The study concluded the importance of using new technologies that are capable of taking care of transparency and providing information. And the data the university needs, cybersecurity, and reducing energy consumption.

The study (Pingzheng, et al., 2023) aimed at the concept of artificial intelligence and the roles it plays in higher education and its contributions towards innovation through the Internet of Things. The study reached important results related to smart watches equipped with many sensors containing a large amount of data to help students learn and improve the performance.

Based on the presentation of previous studies, it is noted that they emphasized the importance of the Internet of Things and its effective role in enhancing the educational environment in educational institutions, its uses in the smart university and its multiple applications in the field of higher education. It was also noted that the interests of previous studies were diverse in terms of knowledge of the areas and justifications for the uses of the Internet of Things in the university environment. And its role in supporting smart applications such as virtual classrooms, smart cards, and energy management. The study benefited from previous studies in defining the formulation of the study problem, determining its variables, and identifying the methods and tools used by each study and benefiting from them.

Theoretical Framework :

The world today lives in an era of interconnected technology, where billions of computers are connected to each other and many digital devices and physical objects are able to communicate with these devices with little or no human intervention, which is what is called today the Internet of Things. (Joey, et al., 2023)

The Internet of Things is a network that allows digital identities and physical objects to be directly identified through electronic identification systems, thus enabling it to store, process, and retrieve this data when needed. The Internet of Things has the broad potential to change our world today and bring about a qualitative shift towards a virtual world in many daily businesses and tasks. (Suiting, et al., 2023)

The most prominent opportunities and uses of the Internet of Things to save energy in computer rooms at the Public Authority for Applied Education and Training:

The Internet of Things requires basic supplies to be able to work and perform effectively, perhaps the most important of which are: (Truong, et a., 2023)

- Devices: These devices include the technical components required to communicate with the Internet.
- Protocols: A set of rules that determine how communications occur between two or more devices. Among these protocols used in the Internet of Things are (SOAP) and (REST), in addition to basic protocols such as (HTTP).
- Ranges: This means the cloud, the place where information of various types is stored, and the provision of access points on the device.
- Applications: These are the programs used to carry out the required tasks and define the necessary functions.

The Internet of Things is one of the modern technologies that play a positive role in many different fields, the most important of which is the education sector, as it helps to connect the educational environment and its various data, such as electronic devices, human resources, and electronic materials, to each other, which facilitates the educational process and helps faculty members and teachers perform their work in a smooth manner. It requires less effort than the traditional method. It also facilitates the student's learning process and provides him with many scientific resources, methods and methodologies that help him achieve the desired benefit.

Things will affect all areas of daily life and enter into social and economic fields and new concepts such as smart cities and smart homes, tracking and improving traffic and roads, and working on smart lighting. Monitoring the environment, preventing fires and air pollution, saving energy, assisting agricultural production, animal husbandry, management processes, marketing and education, the spread of e-learning and distance education, building smart schools and smart universities, and other public areas. (Muhammad, et al., 2022)

The Internet of Things in the educational environment means that the educational institution will rely on the Internet, advanced information and communications technology, cloud computing, and wireless sensors to au-

tomatically control the university facility and use the facilities as efficiently as possible and with less energy consumption. (Hind, et al., 2023)

One study discussed that the Internet of Things and cloud computing are the basics of smart educational institutions, and cloud computing is used as a public server instead of a local server or computers to store and manage data. The study also believes that the Internet of Things is simply interconnecting via the Internet to many computers at the university. To process the performance of daily activities by sending data over the Internet. (Naveen, et al., 2023)

Areas of use of the Internet of Things in educational institutions:

- Smart education: It is a method different from the traditional method in which the teacher uses many electronic tools and social media that help him deliver information and data to students in a simple and quick manner.
- Smart classrooms: They are considered a place for comprehensive educational activities and the processes of learning, teaching, and evaluation they contain. The Internet of Things can connect devices with each other to save the teacher's efforts, and also control the components of smart classrooms from electronic tools such as a projector, digital screen, and other devices. Devices that support the Internet and help manage smart education.
- The Internet of Things also helps in proving students' attendance in classrooms using data collected from other devices such as readers, scanners, etc., and it also sends alerts regarding appointments, research projects, etc. (Xiaoyan, 2023)
- The Internet of Things facilitates the education process in a good way. With the presence of this technology, the student can use his smartphone to obtain many answers to questions about the curriculum or scientific subject.
- The Internet of Things allows the student to track his learning progress and evaluate his performance.
- The Internet of Things gives the faculty member a lot of flexibility with regard to the ability to access the appropriate educational material, create special content for students, and send it to them directly on their smart devices. It also gives him more freedom to monitor the progress of his students and communicate with them through the system. (Voore, et al., 2023)
- Smart Learning allows learners to complete coursework on their mobile devices (tablets, smartphones, laptops, connected things...) and learners have full access to their real-time classroom and collaborative learning from their mobile devices. (Sarika, 2022)
- It is also possible to benefit from the Internet of Things in educational institutions to provide safety for students and monitor them effectively, in contrast to monitoring by security personnel, as the technology contributes to determining the three-dimensional location and contributes to monitoring students around

the clock and monitoring student behavior, which helps in controlling security and stopping unexpected incidents. (Pingzheng, et al., 2023)

Managing classrooms, halls, offices, and public places in any organization requires time and faces some difficulties, but with the emergence of the Internet of Things, managing these resources can be accomplished easily and through specific applications. In monitoring student attendance, the manual system was time-consuming and unreliable, and files may be subject to damage. Or getting lost, while in the Internet of Things, it requires the use of a special application on students' phones to monitor and record attendance processes. The study proposed a model for smart classrooms by using the Internet of Things to manage this class, relying on the smart chair, as the chair was equipped with multiple sensor technologies that can read the student's ID card and know Attendance, lateness, early departure, attendance tracking and classroom interaction. (GuoWen et al., 2022)

Facial recognition algorithms, sensors, cameras, and displays are some examples associated with the IOT environment in classrooms. In these IoT-based classrooms, students can access academic content and materials at any time and in any place, and faculty members can use smartphones to enhance teaching. And student participation. It is also possible to monitor the student's performance, interaction, academic difficulties he faces, and the solution of some problems. (Chen, et al., 2022)

The Internet of Things plays a major role in transforming the university environment into a smart environment, and the most important tools that need to be used are the following: (Rongjun, et al., 2023)

- Sensors and cameras distributed throughout educational institutions.
- Communications networks and protocols linked to an open data platform (cloud).
- Artificial intelligence and big data technology that can analyze data.
- Programs and applications that rely on algorithms.

The Internet of Things in the university environment is capable of performing several tasks, including: (Zhida, et al., 2023)

- Through platforms approved to provide some services, the Internet of Things can reduce the number of employees who perform some administrative tasks, such as entering data into absence or payroll systems, which contributes to improving performance and reducing the effort expended.
- The Internet of Things, using NFC/RFID technology, enables us to track students and faculty members and improve teaching efficiency.
- It automatically controls electrical energy resources and reduces waste in offices, laboratories, and classrooms, as this energy is used when needed.
- You can provide SMS services to inquire about any information and respond to it automatically.

Results :

Educational institutions of all sizes are increasingly turning to the Internet of Things (IOT) to improve their energy management practices. IOT devices are able to collect, analyze and transmit data related to energy use in real time, allowing educational institutions to identify potential savings opportunities faster and more accurately than ever before. Using IOT for energy management can provide educational institutions with a number of advantages. First and foremost, it can provide a more accurate picture of energy use and identify areas where energy efficiency can be improved. By collecting real-time data, educational institutions can better understand the energy use patterns of their operations and identify and address energy-related issues more easily.

IOT can also be used to manage energy operations. For example, educational institutions can set up sensors to monitor energy use and adjust the settings of HVAC units, lighting systems, and other energy-consuming devices accordingly. It can help educational institutions reduce their energy consumption, resulting in lower energy bills.

In 2016, Cisco developed a technical model based on the Internet of Things, which it used in industrial and commercial fields to include the educational sector. This model covers nine main areas and aspects within the framework of Internet of Things applications for smart campuses. These aspects include energy management, mobile learning, and digital signage. Smart, distance learning in virtual classrooms, campus lighting, campus Wi-Fi, improvement of university buildings, smart parking.

Figure

. 1 . A proposal for Internet of Things services in future educational institutions [IOT Services, 2022]

It is clear from the previous figure that the services that the Internet of Things can provide in educational institutions include seven many areas, which are managing and saving energy, maintaining security and safety for humans, infrastructure, and learning places, and improving communication between work teams. (Rongjun, et al., 2023)

Person	Energy saving rate
Delfani	55%
Chen	7.3%
Maetn	56.9%
Chiou	8.92%
Lee , Tsai	9.12%
Yang	No.
Nakamura	6.6%
Shoukourien	No.
Proposed System	16.64%

Recommendations :

Finally, the Internet of Things can be used to create more sustainable operations. By collecting and analyzing data in real time, companies can identify areas where they can reduce energy consumption and take steps to reduce their environmental impact.

Overall, using IoT for real-time energy management can help companies save money, reduce their environmental impact, and improve their efficiency. As technology continues to evolve, companies should consider leveraging it to gain a better understanding of their energy use and improve their operations.

In light of the above, the current study proposes formulating the roles and tasks of the Internet of Things in the Public Authority for Applied Education and Training in the following areas , Energy field, The field of education and learning, The field of human resources, The field of transportation, The field of public facilities, The field of security and safety, The field of data analysis and processing.

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