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The Internet of Things in information institutions :Concept, use and challenges

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Abstract

One of the most significant technological developments of our time is the Internet of Things (IoT). Many countries have begun to incorporate these technologies into various aspects of life, such as educational institutions. Indeed, educational institutions should keep up with the latest technological developments and work to develop and improve their services to ensure their long-term viability. The purpose of this study was to explore about IoT and the challenges that information institutions face when attempting to benefit from IoT technologies. This study adopts the descriptive approach, by surveying and analyzing the intellectual published output. We collected information by reviewing intellectual production and literature data, analyzing it, and extracting the most important conclusions from previous research. The findings of this study were most notable in that most international and advanced information institutions are rapidly adopting internet of things technology due to its numerous benefits. Despite the fact that (IoT) applications face a number of challenges and issues such as poor internet networks, data piracy, and confidentiality. The study recommended that adequate support and infrastructure be provided for the adoption of Internet of Things technologies.

Key words : Internet of Things (IoT), Internet of Things (IoT) apps, information institutions.

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1. Introduction

Today, the Internet hosts billions of connections and exchanges, making it the most powerful tool ever invented for information sharing. It has become the driving force behind profound transformations in the lives of businesses, individuals, and institutions in just a few decades. This trend is not going to disappear, and engineers and technicians, industrialists and service companies, researchers from all disciplines, and political leaders are already designing the Internet of the Future in all countries. We note that the information service sector is the final product obtained by the information beneficiary is the result of the interaction of the material and human resources available to the information devices, as well as the implementation of specific technical processes and procedures. These services are linked to the nature and activity of beneficiaries, as well as their patterns of information needs (Nuba, 2013).

Knowledge has emerged as the most important resource for differentiating today's organizations, including information institutions, which have recognized the importance of adopting the concept of knowledge management to activate the knowledge they possess, through processes related to the production, organization, and sharing of this knowledge, in a way that contributes to the improvement of service activities in these institutions. With the emergence of advanced applications of the Internet of Things (IoT) concept, it can be used in knowledge management in addition to the development of information and communication technologies, as Internet of Things technologies have the ability to link physical entities and support interaction with the human element.

The Internet of Things (IoT) is one of the most significant inventions in human history, as it has enabled internet access or data transmission and reception in virtually every aspect of our lives. It is a technique for connecting everything; things are communicated and understood online without the direct intervention of many of us, whose characteristics are beginning to take shape and become the title of this stage of human life; as they became a part of our lives, we coexist and deal with them without feeling. Indeed, the Internet of Things (IoT) is an evolving Internet concept in which all things in our lives can connect to the Internet or to each other to send and receive data in order to perform specific functions via the network (Nasser, 2015).

With the emergence of Internet of Things applications, this has increased in information institutions, wich include specialized, public, school, and university libraries that provide various sources of information with the goal of organizing and making them available to beneficiaries (Ismail, 2009). IoT has many aspects that can be benefited from through these applications. It is concerned with the advancement of technology, as the number of devices associated with its work has grown. It is worth noting that over the last two decades, information institutions, including libraries, have been affected by technological advancement and the diversity of Internet uses, creating grounds for the possibility of

benefiting from the Internet of Things in them, including knowledge management activities, which are aspects that give rise to optimism in the importance of seeing the future of various information institutions and how they will look like.

New and developing technologies will inevitably have an impact on how knowledge is managed within institutions in the context of the Internet of Things and in ways that improve knowledge-related activities. From this perspective, this study discusses the intellectual output and literature published worldwide on the concept of IoT, its applications, particularly areas of benefiting from Internet of Things applications in supporting knowledge management activities in information institutions, and the challenges that face IoT applications.

. **Objectives and *Questions***

Internet of Things applications are expanding in many areas of life, and organizations seeking excellence and survival are working hard to keep up with Internet of Things developments. This situation also applies to information institutions that are witnessing successive developments in the era of information and knowledge, as they are institutions concerned with knowledge and dealing with it, and the needs and interests of beneficiaries have become constantly changing and renewed, and as a result, these aspects stimulated the need to conduct this study and know the aspects of the relationship between the Internet of Things and knowledge management in information institutions. In addition to identifying the challenges of internet of things applications in information institutions.

Research questions:

This study seeks to provide answers to the following questions:

- What identically is the Internet of Things?

- What are the most notable aspects of the connection between the Internet of Things and information institutions?

- How can the Internet of Things be used in information institutions? What are the prerequisites for implementing the Internet of Things in educational institutions?

- What are the advantages of using the Internet of Things to improve knowledge management in information institutions?

What challenges and barriers must information institutions overcome in order to benefit from IoT technologies?

Significance of the Study:

The significance of this study is that it sheds light on the most important aspects of the connection between the Internet of Things and knowledge management in information institutions, an aspect that has received little attention. As a result, there is a need to delve into the literature on this subject and highlight the areas of benefiting from the Internet of Things in supporting knowledge management activities in information institutions, as well as the most significant challenges that face internet of things application in these institutions. It is hoped that the findings of this study will help to improve the interactive nature of knowledge services provided by information institutions. The findings of this study will help to improve the theoretical and practical aspects of this subject. Furthermore, it will help to raise awareness of the importance of IoT applications in the development and promotion of information institution services, as these institutions are critical in providing accurate and timely information to various sectors of society in order to build the foundations of development.

Study objectives:

The primary goal of this research is to identify the Internet of Things technology and the challenges that information institutions face in order to benefit from IoT technologies through the following objectives:

- Definition of the Internet of Things and its benefits.
- Identify IoT applications, particularly in information institutions.
- Examine IoT technologies used in information institutions and identify services from which they can benefit.
- Identify the challenges to IoT implementation.
- provide a set of findings and recommendations to enhance the theme of the Internet of Things in information institutions and the use of new technologies in information institutions..

2. Literature Review

The Internet of Things (IoT) is a platform that combines supported devices (both electronic and software), sensors, engines, smart devices, and name things; these things communicate with one another using existing communication methods such as the Internet (basic means),

mobile networks, Wi-Fi, and Bluetooth. According to the Oxford English Dictionary, the Internet of Things is a proposal to develop the Internet by allowing things to access networks and send and receive data (Oxford University Press, 2018). The Internet of Things is also defined by the International Telecommunication Union as the global infrastructure of the information and knowledge community based on the interoperability of information and communication technologies to provide advanced services, whether physical, concrete, or virtual services (Abdel-Zahra, 2019).

Many studies have been conducted to examine the potential uses of the Internet of Things in developing and upgrading library services to smart information services, such as reviewing libraries' use of IoT applications to develop and improve the efficiency and quality of their information services using the curriculum. A recent study was conducted to determine whether this transformation is possible by highlighting current information services and then determining how each service benefits from the benefits of IoT applications and what development this service will bring when the Internet of Things is applied to it (Al Tayeb, Zainab, 2021). Another study sought to ascertain the reality of the use of (IoT) applications in some Egyptian libraries. Using an analytical descriptive approach, the study discovered that 99.4% of Egyptian library employees support the use of internet of things applications, and that one of the most significant challenges faced by workers when implementing the Internet of Things is a lack of awareness of internet applications of things and financial resources. The study advised holding workshops and training courses to explain the role and importance of (IoT) applications in libraries, especially since the term "libraries of things" has emerged. Creating infrastructure in Egyptian libraries and providing adequate internet connection speeds when switching to the Internet to the Internet of Things (Kanawi, 2021).

One study aimed to introduce IoT (technology and its role in the development of information services, identify the most basic requirements for employing its applications in the field of providing information services in university libraries, and analyze the most significant challenges and difficulties preventing them from benefiting from them in the context of IoT introduction. The descriptive analytical approach was used in the study, and intellectual production was reviewed as a source of data and information collection.

According to the study, IoT applications are now an unavoidable requirement for information institutions in general, and university libraries in particular. The study advocated for the adoption of a clear policy to take advantage of IoT applications to provide information services that keep up with technological innovations in the current age and satisfy the hopes and aspirations of the beneficiary community (Al-Khader, 2021). Internet of Things applications provide libraries with numerous opportunities to improve their competitive value and service efficiency, while also posing frightening challenges and an environment in terms of security and privacy concerns. The Internet of Things' possibilities and applications can be used to benefit beneficiaries' comfort and productivity by providing better services, increasing the productivity of all services, improving library staff, and improving the library's environmental quality (Bouanaqa, 2019).

Another research focused at the library's internal procedures and services through the lens of IoT, employing techniques such as RFID radio frequency identification, WSN wireless sensor network, mobile applications, and wearable body sensors, and assessing how improved IoT technologies are in providing library services. According to the study's findings, the Internet of Things paved the way for identifying silent objects from information sources, devices, and office furniture and connecting them to the Internet so that they can exchange information and make decisions on their own, resulting in the effective and efficient provision of library services (Arnepalli, 2021).

On the other hand, there are numerous challenges associated with IoT application. A study looked at (IoT) applications in information institutions and identified the most significant challenges, the most important of which was concern about information privacy and human beings' ability to continue to control their own lives, and to resist The study recommended additional research on the relationship between information institution services and work and (IoT) applications, as well as efforts to raise awareness of the role of the Internet of Things in developing information institution services (Kaladhar, 2017).

Abdul Zahra, Ahmed Majed (2019) Internet of Things and its Role in Library Intelligence: A Descriptive Study. Working Papers of the Twenty-fifth Annual Conference of the Association of Specialized Libraries Arabian Gulf Branch: Internet of Things: The Future of

Interconnected Internet Societies: Association of Specialized Libraries Arabian Gulf Branch, Abu Dhabi: Association of Specialized Libraries Arabian Gulf Branch and Department of Culture and Tourism.

Internet of Things history:

The term Internet of Things has been used because it can include anything we can connect to the Internet, and there are many examples of things connected to the Internet, such as smart wearables from IoT devices and coffee shops that can also be considered IoT devices if connected to the Internet, surveillance cameras and aircraft engines that some companies have connected to the Internet in order to analyze and collect all data, and although the term is somewhat misleading, The actual life began in the 1970s, specifically in 1974, when ATMs, one of the models of the Internet of Things, were introduced. Despite this, some studies have found that approximately 87% of users in the true sense of this term or exactly what it shows.

These are very surprising paradoxes because, according to Cisco, there were more internet-connected devices than people on the planet in 2008, a figure that reached nearly five billion devices in 2015, and there are many examples of devices that are not connected to the internet. In today's IoT, computers, smartphones, smartwatches, smart glasses, and TVs are all practical examples of IoT devices, and for some cars, such as Tesla cars connected online, they communicate with each other to improve the quality of self-driving and data sharing, as a home monitor is installed accessible and monitored using any device at any time without forgetting the bell, and when the bell rings, an alert is sent to the mobile phone for the user to see who is on the door (AL-Khatib, 2020).

Internet of Things components:

Devices for remote control panels, device control servers, and sensors are among the hardware components used in IoT systems. Several of the devices are examined in the following subsections.

Sensors

Sensors are the most important parts of an IoT system. The primary function of sensors in IoT applications is to collect data from the environment. A sensor typically consists of several modules, including energy, sensing, and radio frequency. All IoT systems generate analog electrical signals that are proportional to a physical property, which are then converted to digital data by analog to digital converters. Sensors can measure common electrical properties such as current, voltage, resistance, capacitance, and inductance (Moyer, 2019).

Microprocessors

In an IoT system, once the sensors have collected various data, the data must be processed before being sent to the server or cloud. Processing levels typically vary depending on the complexity of the sensor and the amount of processing required to produce sensor data. A security camera is an example of a complex system because it may not record video in digital format unless a detection algorithm of the view flags off an event. There are basically four classes of processing platforms for IoT hardware to handle the complexity and processing power requirements of the IoT systems. This includes systems with embedded microprocessor units (MPUs), PCs, mobile systems, and microcontrollers. The performance and capability options provided by microprocessor-based embedded systems are improved to address specific product requirements for consumer industrial controls, consumer electronics, communication systems, and medical devices (Sehrawat, 2019).

Internet of Things properties:

The Internet of Things has several features, including:

Interconnectivity: With reference to the Internet of Things, anything can be linked to the worldwide information and communication facilities (Vermesan, 2014).

Things-related services: Within the constraints of things, the IoT can provide thing-related services such as privacy protection and semantic consistency between physical things and their associated virtual things. Both physical and information technologies will change in order to provide thing-related services within the constraints of things (Vermesan, 2022).

Heterogeneity: The devices in the Internet of Things are heterogeneous because they are based on different hardware platforms and networks. They can communicate with other devices on various networks (Patel, 2016).

Dynamic changes: The state of devices, such as sleeping and waking up, being connected and/or disconnected, as well as the context of devices, such as location and speed, change dynamically. Furthermore, the number of devices can fluctuate dynamically (Serrano, 2015).

Vast scale: The number of devices that must be managed and communicate with one another will be at least an order of magnitude greater than the number of devices currently connected to the Internet (Vermesan, 2022).

Connectivity: Sensors and systems must be linked to an item or to one another, as well as to the Internet or another network (Vermesan, 2022).

Ecosystem: It reflects the place of IoT technology for technologies, communities, and other goals, and it provides the right environment for its presence by connecting everything, adopting the right platform, and forming strong partnerships (Musleh, 2019).

Requirements for Internet of Things applications in information organizations

The Internet of Things requires protocols, energy, and computing requirements in the transformation of collected data into the actual application of knowledge, and the prerequisites for each of the two types of computing differ. There are three categories of technical requirements that must be met in order for the Internet of Things to be activated in information management authorities, including (Al-Farsi, 2019):

1- Identity verification: According to statistics from various entities, billions of devices are connected to the World Wide Web, and this necessitates that each device have a unique identifier that does not match another device, which can be accomplished through the use of IPV advanced Internet protocols, RFID, and other mechanisms used to track and identify entity data.

2- Sensors: Devices and entities connected to the Internet of Things must contain elements that allow them to perceive, interact, and send data about their current state

or any changes to them, which is accomplished by installing sensors on them to measure the entity's various and multiple aspects and dimensions. It must be able to communicate with what has been measured as part of its connection to the World Wide Web or other entities, and sensors must collect and process data to detect any possible change in the status of physical entities and to sense any transfer to information sources and shelf locations.

3- Central server: The central server collects data and information from all entities connected via the Internet of Things and enables the human element to detect, act, control, manage, and analyze what is happening through smart phone applications (Al-Farsi, 2019).

The potential applications of the Internet of Things in information organizations

Access to information institutions and their sources: Information organizations that use mobile applications can provide membership cards to their members, allowing them to access and use the organization's resources. When a beneficiary uses the information organization index to find a resource, the Information Foundation app is downloaded to their phone, and the information organization map is displayed to help the user determine the location of the resource. It can also provide more information about the source by contacting Amazon, allowing recipients to learn more about the source before borrowing (Makori, 2017).

Group Management: RFID tags are attached to each item in an information enterprise group, allowing them to be represented by default and identified using computers and RFID readers. The circulation of collected and collected items can be greatly simplified by integrating the RFID card into the complementary card of the information organization. The Internet of Things will be able to notify beneficiaries of overdue books and the amount of fines owed to information agencies, allowing them to return overdue books and pay fines without having to wait in line at the information agency's loan office. Smart digital shelves might be able to recommend content based on customer loan history and online search history. Inventory management will also benefit from the Internet of Things (Parwekar, 2011).

Service Recommendations: The Internet of Things (IoT) can use the recipient's data to make personalized recommendations based on the borrowing history in real time. When the researcher searches the database for sources of information on the subject of his research, the Internet of Things will be able to recommend other sources of interest to him. Even when the beneficiary next visits or is near an information facility, the Internet of Things will be able to inform him of the availability of newly arrived resources in his field of work or the availability of loaned books, which he has been working on during the previous research visit. The Internet of Things can improve inventory efficiency, reduce sourcing workload, achieve GUI management, data download, and early warning functions, demonstrating RFID technology's enormous benefits (Da, Xu, 2014).

The Internet of Things will assist information organizations in providing location-based services. If the client creates his favorites list in the information agency directory using his account at home or office, then visits the information agency using a mobile device that supports the Internet of Things, he will be able to access his favorite collections. The book is already on the shelf to assist him in finding interesting addresses and metaphors about the subject. Information agencies can also provide a reading room, discussion room, printers, scanners, and other computer availability by displaying peak and off-peak times on their website, or users can view the information agency using their mobile application (Abbas, 2014).

Device Management: The Internet of Things can assist information organizations and their users in better managing available devices, resulting in lower energy costs. While some of these characteristics exist in some information organizations, they may extend not only to the information organization's employees, but also to the beneficiaries. Consider a beneficiary walking to an information facility and using a mobile phone with Internet of Things to control lighting, air conditioning, and other amenities (Makori, 2017).

Mobile Reference Services: This type of application facilitates the development of reference services for information institutions and allows beneficiaries to ask reference questions, receive answers inside or outside the information agency, receive answers, and participate in a dialogue with information institution staff, which is one of the mobile

reference services, where the licensed beneficiary, in addition to conducting conversations, sending questions, and receiving answers, To protect intellectual property, verify its identity before sending digital content to its device for viewing and reading rather than saving, printing, or copying and pasting. One of the mobile reference services that can complete all borrowing and return notifications, scheduling, querying, and so on is employee monitoring or assistance in the information agency's lobby. There is no need to go to the headquarters of the lending service and the headquarters of the reference services every time because the service is on site and the presence within the information institutions (Bandyopadhyay, 2011).

Internet of Things technology models in information organizations

iBeacon Technology: One of the Internet of Things devices that is based on sending messages or alerts directly to a smartphone or tablet, via a small device that is hung on a wall or shelf that sends and receives wireless signals via Bluetooth technology, and these signals contain the person's location and directions, as the application Bluebeam implemented by Orlando Public Library in November 2014, it is based on the application of iBeacon technology. It is delivered to users' mobile phones based on their geographical location within the library and contains notifications about the library such as events, presentations, help navigating the library, and so on (Burzacca, 2014). Capira Technologies has launched an iBeacon technology supported application for information organizations that have Capira Mobile applications as a service to interact with their beneficiaries via blue pollution technology and represent the technologies in (Tsai, 2018):

- Lending service: informs the beneficiary of the books to be returned and the dates of return, as well as renewal dates, books booked, and any other data related to the loan of books.
- Follow events: send notifications about events that occur within the library.
- Shelves: When you pass in front of a certain shelf of books, send notifications to the beneficiary of the containers on the shelf, and then you can take advantage of the view of the most recent versions received by the library when the beneficiary passes in front of those vessels.

- Tracking: Information organization staff can follow the beneficiary around the library, noting where they go and how long they stay.

According to the company, this system is distinguished by the following features:

1- The service enables information organizations with limited personnel resources to provide better customer service.

2- It is another way to communicate with customers.

Challenges that university libraries face when implementing IoT technology

Internet of Things technology, like other modern technologies whose emergence has been accompanied by some concerns due to its use with the developments of this age that we live every day from the birth of the Internet until the emergence of another, has been accompanied by some concerns due to its use with the developments of this age that we live every day from the birth of the Internet. Its applications are known as the Internet of Things, which is a promising technology that allows many services, particularly for information institutions. It faces many challenges in the field of benefiting from the applications of this technology to develop its services to a community, but it is the beneficiaries of them, which we analyze in the following points (Mukhopadhyay, 2014):

- Data and information piracy: without a doubt, information organizations require information when using Internet technology to share their data and information with many parties, which may jeopardize the security and privacy of those data and information, leading to its hacking and hacking by hackers, making them vulnerable to risks and viruses, causing them to lose many sources and halting most digital services that rely primarily on Internet technology to function.
- Expensive: Investing in the operation, maintenance, and security of the Internet of Things necessitates significant capital.
- Energy consumption: The number of devices connected to the Internet of Things is expected to grow dramatically, necessitating a greater consumption of electrical energy than is currently required (Chen, 2012).

- Laws and legislation: The proliferation of IoT technology will cause a slew of serious issues, and there are currently no laws that specify penalties for infringement and manipulation of caller data.

- Big Data: relying on the Internet of Things will result in the emergence of massive amounts of data in various areas of life, which will then need to be processed and stored in order to reap the benefits.

- Health and psychological challenges: relying heavily on the Internet of Things will force many people to manage their lives from the comfort of their own homes, leading to a rise in diseases such as obesity and social isolation.

- In terms of programming standards, communication protocols, language differences, and other differences, this technology is incompatible with the infrastructure available in information organizations.

- A lack of experience among all employees in libraries and information institutions in managing and benefiting from Internet of Things systems and applications.

- The constant increase in the number of devices connected to the Internet may cause problems in controlling them, which causes some parties who want to benefit from this technology to be concerned.

- Due to network complexity, some beneficiaries may be delayed in responding to the IoT world (Amadeo, 2016).

Experiences of global information institutions

North Carolina State University's Hill Library has embraced the Internet of Things in its office operations and as an educational tool. Where the devices Internet of Things by monitoring furniture traffic, counting visitors, providing magnetic card access, and controlling digital signage, the IoT program in libraries also encourages practical exploration of embedded technologies, connecting students with relatively low-cost materials to develop practical applications that solve real-world problems (McLaughlin, 2000).

Librarians also help students test and improve their prototypes, learn from others, and assess their business. The Oregon Public Library also has the Mat-O-Book (Hillsboro), a self-service kiosk in Central Square that is stocked with new and popular books and films

and is monitored from the main library a few miles away to track usage, alert the library when restocking is required, and identify popular selections for enlightened collection development (Kaur, 2017).

In November 2014, the Orlando Public Library also implemented the) BluuBeam (app, which is based on the iBeacon technology app and sends users notifications of the library via their mobile phones based on their geographic locations within the library, including announcements of events, offers, and help navigating within the library (Bogzala, 2019).

3. Research Method

The descriptive analytical method based on literature review is adopted in this study, which limits the most important literature published globally that dealt with the issue of benefiting from the Internet of Things in information institutions, and deduce the most important aspects of benefiting from it in knowledge management in information institutions, as well as extracting the challenges that face the application of IoT. This approach was used to analyze and criticize the most prominent studies on the subject, as well as to draw conclusions from the most important intellectual production on the subject under study. The study focused on the Internet of Things in information institutions, including how to use it and the difficulties these institutions face.

4. Discussion

The Internet of Things (IoT) is defined as a physical or virtual thing or device that is linked and communicates with one another and is integrated into a network for a specific purpose. To collect data, the Internet of Things employs technologies and devices such as sensors, radio-frequency identification (RFID), and actuators. IoT is about more than just collecting data from sensors; it is also about analyzing it. To prevent attacks, IoT applications must keep out all attackers and intruders. IoT must enable information sharing while maintaining strict confidentiality, and it is about a connected environment in which people and things interact to improve quality of life. IoT infrastructure must be open source, meaning that anyone can develop, deploy, and use it (Raja, 2018). The Internet of Things concept is altering how people interact with their surroundings. It paves the way for the development of ubiquitously connected infrastructures to support innovative services, as well as greater

flexibility and efficiency. Such benefits are appealing not only for consumer applications, but also for industrial applications. We have seen the IoT paradigm make its way into the industry marketplace with purpose-built solutions over the last few years. There are numerous challenges for IoT applications, particularly those related to energy efficiency, real-time performance, coexistence, interoperability, security, and privacy (Sisinni, 2018).

The most potential organization that use IoT are libraries. With the accelerating pace of development in communication technologies, knowledge sharing, and the exponential increase in the amount of information produced daily in various activities of daily life, libraries and information centers must keep up with these changes in order to continue performing their tasks and services effectively. Whereas the Internet of Things has made it simple to track all physical and intangible entities in libraries, such as information sources and computer devices, as well as vacant seats in classrooms and reading rooms. Also, through the use of some sensors, libraries can monitor the number of library visitors and determine peak hours, the most searched topics and the most used sources. This is all information that helps in evaluating the services provided and thus providing better services to the beneficiaries (Pera, 2014).

The world has begun to see the impact that the Internet of Things is having on various application fields by realizing the Internet's full potential. The technologies used in the Internet of Things must undoubtedly overcome the practical implementation challenges. Rapid advancements in the IoT have resulted in the emergence of security architecture as an important subject. Although research is being conducted into the security implementation of IoT, several security aspects require much deeper investigation. Future IoT security research must concentrate on physical hardware security and the privacy of information collected, processed, and transmitted across the network. Aside from appropriate technical strategies, achieving secure IoT necessitates a slew of policies, laws, and regulations to fortify the security system (Matharu, 2014). Because of the vast number of applications, the Internet of Things has the potential to displace humans as the primary consumer and producer of information on the Internet. Low powered wireless embedded devices are inexpensive and require little infrastructure; however, due to a lack of resources, the Internet and its protocols are unsuitable for such devices. The Internet Engineering Task Force developed

IPv6 over low-power wireless area networks (6LoWPAN) for this purpose (IETF). The Internet Engineering Task Force created the standards that the Internet is based on. With some limitations, 6LowPAN allows low-powered wireless devices to behave similarly to any other Internet-connected device (Mukhopadhyay, 2014).

5. Conclusion

The term Internet of things (IoT) refers to embedded devices (things) that have Internet connectivity and can interact with one another, services, and people on a global scale. The Internet of Things' future in information organizations appears bright, both in terms of how it operates and the quality of services provided. Library buildings can be converted into fully smart buildings, allowing the beneficiary to interact with various objects in the library and obtain almost any type of information using various communication devices. This is only possible with a solid technical foundation. According to the literature review, some of the major issues preventing widespread adoption of the Internet of Things are security and privacy. It is worth noting that information institutions, including libraries, have been affected by the advancement of technology and the diversity of uses of the Internet over the past two decades, which created grounds for the possibility of benefiting from the Internet of Things in them, including knowledge management activities, which are aspects that give rise to optimism in the importance of seeing the future of various information institutions and how they will look like. in the next few years.

6. Results

Most global and advanced information organizations are rapidly adopting IoT technology due to its numerous benefits; however, there are a number of challenges and problems confronting IoT applications, including: weak Internet networks, data piracy, and privacy. The Internet of Things promises a prosperous future for information institutions, as well as improved use of their resources and collections, and thus a

7. Recommendations:

- Conducting studies that anticipate the future of information institutions under the Internet of Things, with a need to benefit from global experiences gained through the use of Internet of Things technologies.

- Provide adequate support and infrastructure development for IoT technology adoption.

- Supporting professional associations and federations of information institutions, as well as assisting them in their transformation into smart libraries, through conferences and seminars that discuss how to benefit from the Internet of Things to develop their services and provide consultations.

- Future research in IoT security issues must focus on physical hardware security, as well as the privacy of information collected, processed, and transmitted across the network. Aside from appropriate technical strategies, achieving secure IoT necessitates a number of policies, laws, and regulations to strengthen the security system.

- It is necessary for libraries and information centers to seek to keep pace with the technological changes taking place and to invest in the areas of Internet applications in order to better serve their beneficiaries.

- The desire of information institutions to stay current with developments and benefit from Internet of Things applications.

- Collaboration of information institutions in the fields of training to raise employee awareness through training workshops.

References:

1.   Abbas, R., Michael, K., & Michael, M. G. (2014). Using a social-ethical framework to evaluate location-based services in an internet of things world. The International Review of Information Ethics, 22, 42-73.
2.   Al-Khader, Abu Bakar (2021). Requirements for using the Internet of Things in the development of information services in university libraries: a planning analytical study.
3.   Al-khatib, A. A., Mohammed, B., & Abdelmajid, K. (2020). A survey on outlier detection in Internet of Things big data. Big Data-Enabled Internet of Things; IET: London, UK, 265-272.
4.   ALTayeb, Zainab (2013). Cybrarian Journal GS 61 pp. 1-31.
5.   Amadeo, M., Campolo, C., Quevedo, J., Corujo, D., Molinaro, A., Iera, A., ... & Vasilakos, A. V. (2016). Information-centric networking for the internet of things: challenges and opportunities. IEEE Network, 30(2), 92-100.
6.   Arnepalli, K., & Rao, K. S. (2021). Blockchain Technology: Possibility of Application for Library Networks in India. Pearl: A Journal of Library and Information Science, 15(3), 153-161.

7.   Bandyopadhyay, D., & Sen, J. (2011). Internet of things: Applications and challenges in technology and standardization. Wireless personal communications, 58(1), 49-69.

8.   Bogzala, Hussein Ali. (2019) IoT Applications in Libraries and Information Centers Prospects and Challenges.

9.   Bouanaqa, Suad 2019 Internet of Things applications in libraries and information centers: Prospects and challenges.

10.   Burzacca, P., Mircoli, M., Mitolo, S., & Polzonetti, A. (2014, December). "iBeacon" technology that will make possible Internet of Things. In International Conference on Software Intelligence Technologies and Applications & International Conference on Frontiers of Internet of Things 2014 (pp. 159-165). IET.

11.   Chen, Y. K. (2012, January). Challenges and opportunities of internet of things. In 17th Asia and South Pacific design automation conference (pp. 383-388). IEEE.

12.   Da Xu, L., He, W., & Li, S. (2014). Internet of things in industries: A survey. IEEE Transactions on industrial informatics, 10(4), 2233-2243.

13.   Ismail, N., Ismail, A., & Atiq, R. (2009). An overview of expert systems in pavement management. European Journal of Scientific Research, 30(1), 99-111.

14.   Kaladhar, K. Somasekhara Rao. (2017). Internet of things: a route to smart libraries journal of advancements in library scineces,29-34, (1)4.

15.   Kanawi, Yara Maher Mohammed 2021: (IoT)applications in some Egyptian libraries: an analytical study and a vision for the future.

16.   Kaur, K., & Kaur, K. (2017, January). Role of RFID technology in internet of things. In International Conference on Recent Trends in Engineering Science & Management, Chandigarh (Vol. 8, pp. 166-174).

17.   Makori, E. O. (2017). Promoting innovation and application of internet of things in academic and research information organizations. Library review, 66(8/9), 655-678.

18.   Matharu, G. S., Upadhyay, P., & Chaudhary, L. (2014, December). The internet of things: Challenges & security issues. In 2014 International Conference on Emerging Technologies (ICET) (pp. 54-59). IEEE.

19.   McLaughlin, J. (2000). Development of an electronic resources web/database system for the University of North Carolina at Chapel Hill Libraries.

20.   Moyer, S. (2019). IoT sensors and actuators. IEEE Internet of Things Magazine, 2(3), 10-10.

21.   Mukhopadhyay, S. C., & Suryadevara, N. K. (2014). Internet of things: Challenges and opportunities. Internet of Things, 1-17.

22.   Mukhopadhyay, S. C., & Suryadevara, N. K. (2014). Internet of things: Challenges and opportunities. Internet of Things, 1-17.

23.   Musleh, Wissam Youssef. (2019) Internet of Things Technology; The Way to Shift to Smart Libraries. Abu Dhabi: Association of Specialized Libraries Arabian Gulf Branch.

24.   Nasser, S., Barry, A., Doniec, M., Peled, G., Rosman, G., Rus, D., ... & Feldman, D. (2015, April). Fleye on the car: big data meets the internet of things. In Proceedings of the 14th International Conference on Information Processing in Sensor Networks (pp. 382-383).

25.   Nuba, Musbah AL -Taher. (2013). Information Services in Libraries and Information Centers. Journal of the Faculty of Arts: University of Tripoli - Faculty of Arts.

26.   Oxford English Dictionary (Oxford University press2018).

27.   Parwekar, P. (2011, September). From internet of things towards cloud of things. In 2011 2nd international conference on computer and communication technology (ICCCT-2011) (pp. 329-333). IEEE.

28.   Pera, M. (2014). Libraries and the Internet of Things. American Libraries, Retrieved September, 30, 2018, from https://americanlibrariesmagazine.org/blogs/the-scoop/libraries-and-the-internet-of-things/.

29.	Raja, S. P., Rajkumar, T. D., & Raj, V. P. (2018). Internet of things: Challenges, issues and applications. Journal of Circuits, Systems and Computers, 27(12), 1830007.

30.	Patel, K. K., Patel, S. M., & Scholar, P. (2016). Internet of things-IOT: definition, characteristics, architecture, enabling technologies, application & future challenges. International journal of engineering science and computing, 6(5).

31.	Sehrawat, D., & Gill, N. S. (2019, April). Smart sensors: Analysis of different types of IoT sensors. In 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI) (pp. 523-528). IEEE.

32.	Serrano, M., Barnaghi, P., Carrez, F., Cousin, P., Vermesan, O., & Friess, P. (2015). Internet of Things Semantic Interoperability: Research Challenges. Best Practices, Recommendations and Next Steps, European research cluster on the internet of things, IERC.

33.	Sisinni, E., Saifullah, A., Han, S., Jennehag, U., & Gidlund, M. (2018). Industrial internet of things: Challenges, opportunities, and directions. IEEE transactions on industrial informatics, 14(11), 4724-4734.

34.	Tsai, M. F., Kiong, Y. C., & Sinn, A. (2018). Smart service relying on Internet of Things technology in parking systems. The Journal of Supercomputing, 74(9), 4315-4338.

35.	Vermesan, O., & Friess, P. (Eds.). (2014). Internet of things-from research and innovation to market deployment (Vol. 29). Aalborg: River publishers.

36.	Vermesan, O., Friess, P., Guillemin, P., Gusmeroli, S., Sundmaeker, H., Bassi, A., ... & Doody, P. (2022). Internet of things strategic research roadmap. In Internet of things-global technological and societal trends from smart environments and spaces to green ICT (pp. 9-52). River Publishers.