Developing University Libraries by Using Internet of Things (IOT) Mechanism

(1) Faris Sattar Hadi

Information Technology Research and Development Center, University of KUFA,Iraq
Fariss.alkaabi@uokufa.edu.iq

ABSTRACT

All facets of our lives and activities have been significantly impacted by the introduction of clever new technology, smart mobile connections, and online services. The world around us is also greatly impacted by this development. In the modern world, libraries and library services are very influential. The current study's objective is to investigate how Internet of Things, a novel technology, is used in libraries and educational facilities. Librarians should be aware of the various features of IOT in libraries and services since new technologies have raised user expectations from library services. They should also receive training on user behavior and IOT security concerns in libraries. Through construction, collection management, training, data security, information literacy, and other factors, the IOT will continue to have an impact on libraries and the services they provide. This paper also aims to familiarize readers with emerging IOT technologies that libraries might employ to enhance user satisfaction and provide better services.

Keywords: University Library, Internet of Things (IOT), Information Technologies.

Introduction

In the past ten years, the Internet of Things (IoT) has attracted a lot of attention. This amazing innovation envisions a world where billions of intelligent, communicative objects may provide a wide range of services to nearby and distant entities as shown in Figure 1. With IoT, a comfort has surfaced. The first benefit is that smart products are actually intelligent things. They can detect their production process and converse with intelligent machines. Second, real-time process optimization is possible with smart planner. Finally, cutting-edge information and communication technologies (ICT) make it possible for intelligent operators like people to manage and oversee activities.

Highly intelligent products can plan and complete tasks. Cyber physical systems can develop self-learning thanks to machine learning, machine to machine communication, human machine interaction, visualization, and data analysis. When necessary, they can alter their production processes at a factory (Wittenberg, 2016 & Neugebauer et al., 2016).

Figure 1: Internet of things (IOT) applications and services.

Related Works

IoT was first defined by Kevin Ashton in 1999. This definition asserts that by combining common objects with sensors and Radio Frequency Identification Technology (RFID), the internet of things can develop. Despite this criteria, the "Trojan Room Coffee Pot"—the first IoT application appeared in 1991. To seek nothingness, a video camera was placed inside a coffee maker. In this manner, the coffee maker's liquid level was seen. (2012) Lopez de Armentia et al. IoT benefits greatly from RFID's capacity to track objects using Electronic Product Codes. Additionally, ubiquitous sensor devices, barcodes, and large-scale embedded sensors with 2D codes are well-known IoT technologies. These tools' data can flow over computers that are linked to the internet because they can be addressable and connected to it. Through environment perception and interactivity, these objects can clear up misunderstanding. In challenging situations, they can also respond autonomously without assistance from a human (O'Leary, 2013; Kopetz, 2011).

IoT stands for the extensive digitization of many objects in the network architecture. IoT has been tasked with assigning cyber physical systems (CPS), such as AI, robotics, and clouds, to close the gaps between the digital and physical worlds. IoT makes it possible to integrate a variety of gadgets, even partially produced ones. IoT applications are made to eliminate central control conditions of analysis and produce real-time decision-making processes. Because this technology does not require an integrated data process like normal technology does, it is innovative. The equipment in the smart factory can easily and quickly communicate with the central control system and can transform from a simple object to an intelligent gadget in this way.

IoT implementations affect people's daily lives in a variety of contexts, including agriculture, health, security, logistics, transportation, smart homes, and cities, in addition to the smart factory. By measuring humidity and temperature to provide the ideal circumstances for plant growth, IoT aids in plant breeding. Examples of smart home applications include automatic climate control systems and automatically operating home equipment. Particularly, wearable technology simplifies keeping track of one's health. A patient's data can be used to detect incorrect drug

dosage and timing. Wearable technology sends this information to the closest hospital to avoid life-threatening situations. Future medical image processing analysis and biomedical signal processing will be utilized to diagnose potential illnesses based on the electronic medical record system. The Blind Navigation System aids persons who are blind in their shopping. This system divides the store into cells, and RFID tags pin these tags into the navigation system after finding specified locations. WLAN and Bluetooth technology can therefore assist people. By placing sensors and actuators on the roads, IoT contributes to smart transportation. This makes it feasible to pursue moving objects. Additionally, video and pressure sensors help sensor technologies discover and manage parking spaces. Driver receives necessary instruction via SMS or similar technologies.

IoT has an impact on the business network of the future because of its capacity for self-organization and ability to transmit real-time replies among multiple factories, businesses, suppliers, resources, customers, and every type of organization. By real-time optimizing their configuration, entire actors can maximize their profit with minimal resources.

IoT not only offers folks new, inventive improvements for their daily lives, but it also makes life simpler and removes limitations. Innovating methods and tests are carried out to enhance communication, object identification, and integration.

Internet Of Things And University Libraries

IOT technologies have the potential to transform libraries into smart, modern structures. Libraries are collaborating with the IT department at academic institutions to implement IOT technology.

The prevalence of smart gadgets will undoubtedly have an impact on libraries' facilities, collections, management, instruction, and security. Smart technologies can give librarians more time to dedicate to tasks that call for human ingenuity. For instance, the library at North Carolina University has implemented a bookBot, a robotic book delivery system, which enables students and faculty to access any of the two million items held in climate-controlled storage with a single click on the catalog. The library was able to provide many more study and gathering spaces for its patrons thanks to the space-saving shelving [24].

IOT can make it easier to access libraries and their resources. The majority of university libraries offer their patrons a digital library card that gives them access to the library and all of its resources. The library app on a user's mobile device will offer a map of the library to help them find the needed materials when they visit the library catalogue [25]. Additionally, it is possible to create international connections that will provide researchers access to untapped, priceless scientific resources. A global online library that can grant everyone access to the human huge knowledge collection can also be created by linking various collections globally [26].

In IOT library technologies, RFID and WSN networks have been employed [26]. Each object in the library collection has an RFID tag, allowing for a virtual representation that can be recognized by computers and RFID scanners. Circulation of goods can be expedited by integrating RFID tags into member cards [25]. A reader picks up the signal of the tag passed on the book as well as the ID Card when the book holders pass the electronic access gate control. The information from the IOT system will be sent to the main cloud system in this area, where it will be available for analysis and presentation before being entered into the monitoring system.

The IOT system can make a previous registration of the loaned book to system, in accordance with the Bayani et al. model [26]. No books or documents will be lost thanks to the WSNs and the micro-sensors attached to them. As a result, another desirable characteristic of adopting IOT tags is the constant online and real-time presentation of the items. The ability to connect to other communication technologies and library management systems is one of the IOT system's additional advantages [26]. Additionally, a

notification will be sent to users' smartphones via the library's IOT alert system when the requested book arrives. The users' smartphones will be notified when the books must be returned.

Information literacy is yet another benefit of IOT systems. To introduce them to a library and its resources, new users are given information literacy lessons. Self-guided virtual tours of the library can be provided by libraries with the use of IOT.

IOT, according to Pujar and Satyanarayana, may assist libraries and their patrons in managing the available appliances better and saving money on energy. Even though some of these items are located in libraries, they may increase control over both library workers and patrons [25].

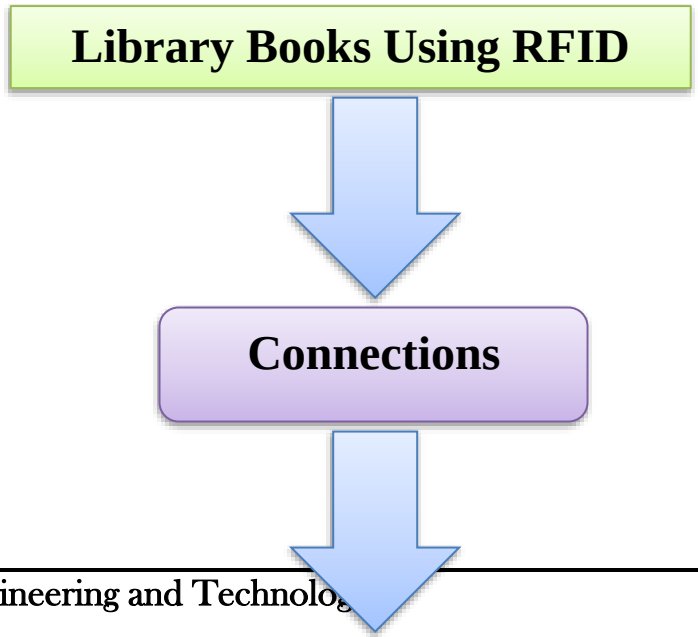
Clearly, IOT could result in significant modifications to library services very soon [27]. Understanding these objects' capabilities, applications, and even threats is crucial. Libraries frequently serve as interpreters for new informational theories and technologies. Resources should be made available to aid in understanding what the IOT actually means. Libraries need to be aware of how IOT could impact services and warn users of potential security risks while utilizing their hardware, software, and networks [28].

Methodology

Researcher preferred topic is creating intelligent model for libraries that include monitoring, registering, circulating, establishing security, controlling, and self-servicing. The method by which institutions produce, deliver, and capture value is known as a library model as shown in Figure 2. A library model so outlines what a library does (what services it gives), how it doses it (how it delivers its services to users), and how it doses it financially. The reference section would be crucial in the digital age (because to its distinctive collections and services). Therefore, creating a model for this part can help to enhance how it operates and the services it offers. Numerous queries can be resolved using this approach, including: When was the reference Platform last used? Who entered the Platform for references? What objectives do reference Platform serve? When was the reference Platform used by more people? Additionally, there may be many other queries.

Our Near Field Communication (NFC)-based IOT solution for managing libraries was created and designed. An NFC device can function as both a reader and a tag, and NFC is intended to be a safe method of data exchange. This special function enables peer-to-peer communication between NFC devices. Books' tags are read using NFC readers.

We also created and implemented a model alert system employing RFID and GFM mobile technology for a book borrowing system. Therefore, libraries will have new opportunities thanks to the Internet of Things.



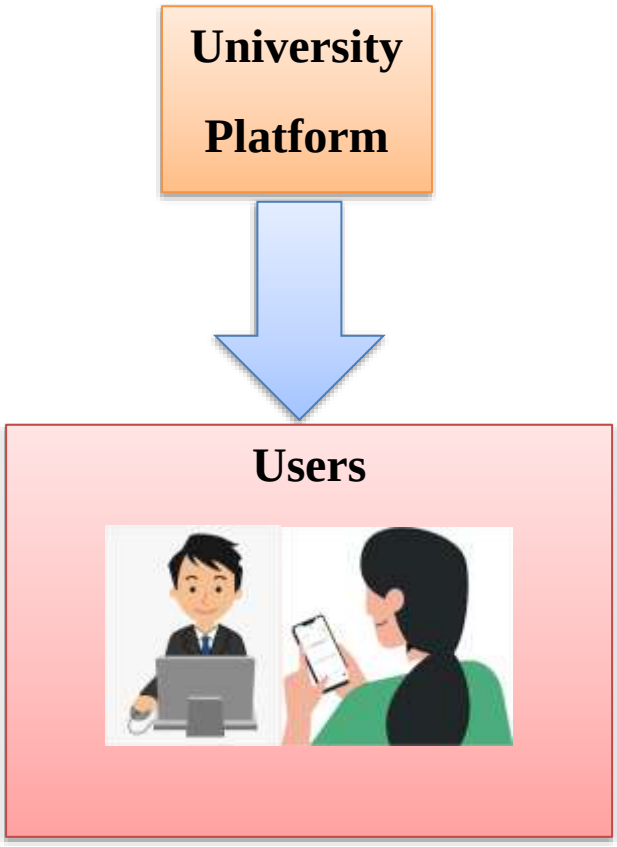


Figure 2: Developed model applied Internet of things (IOT) in university library.

Discussion The Results

According to the necessity for ongoing financial support, the impact of Appling IOT on university libraries has resulted in several libraries having to reduce their offerings or close entirely.

IOT platforms, which facilitate software in IOT connections, are additional crucial IOT components. Hardware, software, connection, and user interface were all used in a full smart system. IOT platforms make it easier for people to communicate, stream data, manage devices, and use apps. IOT platforms are being developed by numerous businesses in response to customer demand, including Microsoft Azure IOT, Google Cloud Platform, Watson IOT, Samsung Electronics' Artik, Thing Worx IOT Platform, Amazon Web Services (AWS) IOT, and others. As a result, we discovered that an appropriate IOT platform can be used to meet the resources, services, and special user needs in libraries, particularly academic libraries.

By putting our concept into practice, educational facilities and academic libraries will have more data, which will be beneficial to both the user and the library. After generating huge data in an IOT setting, data analytics problems are also resolved. Big data can be utilized for making decisions, running analytics, monitoring sensor data, and alerting users to anomalous deviations.

Conclusion

There is uncertainty regarding the future and its uses due to the emergence of new technology. The development of smart technologies in recent

years has fundamentally altered how people live their lives around the globe. This study made an effort to educate readers about the value of utilizing new technology in various library settings and services. Libraries are attempting to integrate IOT technologies into their many services and collections, just like other industrial enterprises. IOT technologies can be helpful for collection management, online services, teaching, and granting access to areas and equipment, as well as for gathering, analyzing, storing, and exchanging information, as specified in the context.

Additionally, the writers made an effort to evaluate the advantages and disadvantages of the Internet of Things in libraries. Through smart platform management, IOT may benefit libraries by maximizing space usage, improving the visitor experience, and protecting priceless items.

New technology and gadgets will undoubtedly present both opportunities and difficulties. IOT can enhance libraries' traditional and online collections and services. IoT's security and privacy are key components. Professionals and designers should be aware of this problem and apply new security methods to protect their user and collection data in this novel setting. Future libraries will be outfitted as quickly as possible with cutting-edge networking hardware. Therefore, having a solid understanding of IOT technologies will be crucial for both users and librarians.

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