

Application of Internet of Things (IOT) in Libraries

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Abstract:

The concept of libraries and information centres has changed as a result of information and communication technology. Libraries today serve as more than just repositories for books and records; they have evolved into information Access Centres where, with the aid of the Internet, a variety of ideas, trends, and activities involving human connection and information are being developed. The current study highlights the applicability and impact of IOT on a variety of library tasks, including circulation, document preservation, theft management, RFID, tracking resource movement, and inventory control. The study examined how diverse human-based performances were replaced by machine-based activities, particularly in libraries and information centres, by information and communication technology.

Keywords: Internet of Things, Library and Information Centres, Information Communication Technology, Smart Libraries

Introduction:

The history of information technology is outlined by Will Brady and Jeffery Elkner in four stages, starting with the pre-mechanical era and moving through the mechanical era and electromechanical era. They classify the time period between 3000 B.C. and 1450 A.D. as the pre-mechanical age, during which time people began to establish languages, signs, and other forms of communication for the purpose of exchanging ideas and information. During this time, alphabets containing the straightforward images and patterns known as Phoenician alphabets were invented. They claim that Indians discovered the number system (1-9) in the year 1000 A.D. The development of calculating machines was based on the number system. They estimate the mechanical era to be between 1450 and 1840 A.D. During this time, numerous novel technologies were created, such as the slide rules used in analogue computers for calculation, the Pascaline device by Pascal, and the difference engine concept by Charles Babbage. In this era, fundamental laws, ideas, and theories were introduced, laying the groundwork for modern information and computer technology. Between 1840 and 1940, the third stage—known as electromechanical—was developed. Several

significant inventions, including the telegraph, Morse Code, and the telephone by Graham Bell in 1876, were made during this time.

The radio was developed by Marconi in 1894, marking the beginning of the electromechanical era. The second phase saw the creation of Marc 1, the first automatic computer device, in a Harvard University lab in 1940. In the fourth stage, Brady and Elkner describe how the US Army created the first high-speed digital computer, known as ENIVAC, at the dawn of the modern computer era. Vacuum tubes were employed in the first generation of computers, which were developed across five generations. In second-generation computers, transistors took the place of vacuum tubes. Integrated circuits took the place of transistors in third-generation computers. A very large scale integrated chip including memory, logic, and controlled circuits was introduced in the fourth generation of computers. The central processor units that form the basis of fourth-generation computers enable their small size. Because of this, fourth-generation computers, sometimes known as personal computers, quickly found a position in homes and workplaces. A new era, known as the age of artificial intelligence, has now replaced the information and computer age. Artificial

intelligence is often defined as the ability of a computer to carry out a specific task or set of tasks in a manner that is similar to that of a human being with natural intellect. Artificial intelligence is being employed in a wide range of practical applications, including those related to healthcare, automobile design, banking and economics, government operations, video games, the military, creative visualisation, product advertising, and auditing. In the current situation, artificial intelligence is essential for controlling the information system. To improve search efficiencies and tactics, certain databases have been created with incorporated artificially enabled characteristics. These days, holdings management software is being created using artificial intelligence technologies. In order to facilitate connectedness of job execution for better results and efficient outcomes, regular functions in knowledge-based institutions as well as in daily life are now being controlled by the world. The Internet of Things is the technology that will allow electronic items to be connected for improved control and impact over daily or specific human tasks. Artificial intelligence has now been implemented with the Internet of Things for data collecting, information evaluation, and algorithm storage depending on those evaluations and results.

Internet of Things: Concept and Definition

Internet of Things (IoT) is defined by the Global Standards Initiative on Internet of Things (2015) as the networking of physical objects, including devices, vehicles, infrastructures, and other non-living things, which are compatible to embed electronic systems with system and application software, sensors, and internet connections for enabling these devices with a view to collecting and exchanging information or data. This explanation of the term "Internet of Things" clarifies that it simply refers to the internet-based connectivity of physical objects, such as household appliances and electrical and electronic devices used by people in their daily lives, as well as the use of software and sensors to facilitate communication among them. On the other hand, the Internet of Things is defined by China Communication Standards Association (CCSA) (2011) as a network that maintains connectivity between people and objects as well as between objects and objects to allow for the execution of commands to govern their functionality as needed. The CCSA decides that this network is presumptively used to gather data for manipulating actual physical things through

processes including calculating, executing, and communicating with actual physical objects. ITU, often known as the International Telecommunication Union, describes the Internet of items (IoT) as a worldwide interface that enables advanced functionality through the actual and virtual connectivity of items for ICT interoperability.

Kevin Ashton coined the phrase "Internet of Things" or "IoT" for the first time in 1999. The following are some of Ashton's wise remarks regarding the Internet of Things: "I might be incorrect, but I'm very sure the term "Internet of Things" first appeared as the title of a presentation I gave at Procter & Gamble (P&G) in 1999. More than merely a clever strategy to attract the attention of executives, the novel concept of RFID in P&G's supply chain was linked to the then-trendy subject of the Internet. It distilled an essential concept that is still frequently misinterpreted.

Internet of Things: Genesis and Historical Development

Many academics and scientists working in the field of computer sciences began to adopt the term IoT after Ashton. In his book "When Things Start to Think," Neil Gershenfeld develops the concept of IoT. with a 1999 article for Business Week, Neil Gross makes the assumption that the world would soon be covered with an internet skin that will serve humanistic purposes by easing human labour. In 2000, LG revealed its first appliance powered by IoT. The International Telecommunications Unit (ITU) published a paper on the Internet of Things (IoT), which is regarded as the global beginning of the Internet of Things era. In 2005, the Violet Company created "Nabaztag," a robotic rabbit that can operate as an alarm clock, express opinions on stock market news, and provide RSS feeds. The genuine emergence of the Internet of Things is acknowledged to have occurred between 2008 and 2009, when the expansion of introducing and connecting objects that use the internet to carry out their functions was more apparent than human progress. Three key components make up the Internet of Things (IoT): embedded sensors, image recognition, and near-field communication payment for payment by phone or other connected devices. IoT is a useful technology for the good of humanity. Some items that use the Internet of Things-based smart technologies include Alexa and Google Talk.

Internet of Things: Applications

Will Kenton (2019) listed a number of benefits of the Internet of Things in his peer-reviewed study that was published on Investopedia. Numerous sectors have seen the effects of the technology. The use of IoT may be traced back to urban administration and planning, where smart chips or devices with IP addresses may be found in congested roadways, alerting the on-duty employees to reroute traffic and prevent any accidents. If smart garbage vans alert when they are full to play a bigger part in waste collection and management, the city rubbish can also be eliminated. When properly planned and implemented, the use of IoT can help lower company expenditures. Businesses may keep track of their accounts and inventory items by adding smart chips to their inventory regulators. The manufacturing company can alter the quality and quantity of its products in accordance with the individual needs of the client, increasing profits, if tracking and assessing consumer behaviour factors into the decision to enhance the margin of sale. The use of IoT in medicine is also significant. For instance, keeping track of patients' information with smart, linked devices helps speed up treatment and decrease the wait time for patients arriving at hospitals. The Internet of Things must consider certain difficulties in light of privacy concerns. Technology must provide a specific check and balance in order to mitigate the hazards associated with the excessive usage of these applications in order to overcome the regulatory hurdles.

Internet of Things: Library Application

Bansal et al. (2018) go into detail on a number of applications for the Internet of Things that improve the delivery of library and information services. They go into detail about the different areas of libraries where applications of IoT can be found, such as access to the library and its resources, document circulation and inventory control, theft management, user identification, tracking of movement and inventory control, collection development, information literacy, and appliance management.

➤ **Access to Library and its Resources**

Using the Internet of Things to access the library's resources is incredibly effective. In the IoT example, the users punch their cards to mark their entrance

into the library, utilising the smart card concept. The development of RFID technology has given the books their own chip. These chips include the book's address tag, which contains bibliographic information and a shelf location number. The OPAC allows users to find out whether a book is available in the library. The library staff can quickly locate books for patrons to use with the aid of an electronic book tracing system.

➤ **Circulation of Documents and Inventory Control**

A great example of how lots are used in libraries is the circulation of documents with the use of sensors or RFID chips. The chip holds data about the actual documents, and many pieces of technology are employed for document circulation, including the auto-return book drop box, issue platform, and RFID book tracing device.

➤ **Theft Management**

Theft protection in libraries may be achieved by applying EM Tags to books, CDs, hard drives, and other electronic equipment. The best strategy to protect library resources is to use library gates equipped with RFID and EM tag-compatible sensors. Typically, alarms are built into the gates. Sometimes cameras' sensors can also send shots to mobile devices to take pictures of defaulters.

➤ **User Identification**

Another example of how IoT is used in libraries is for user identification. Users of the library are given RFID-enabled cards. Users must punch or touch their cards to the sensor-enabled machine as soon as they enter the library to mark their presence there. Face detecting technology has recently been developed, and it allows users to be entered by punching in their faces while taking images.

➤ **Reservation of Books**

Users can find out if the books they need for their studies are available. Users can search the Online Public Access Catalogue (OPAC) using their mobile devices. The requested books can be found using a sensor-based search device, which may emit a beep or light when a book is present on a shelf. If the requested book is out on loan to another customer, a reservation can be made through the OPAC window. The user and library staff both benefit from this IoT application by saving time.

➤ **Tracking Movement of Resources and Inventory**

In order to trace the movement of library resources and inventories, IoT may be more important. For a variety of reasons, library materials may be moved both inside and outside of libraries. Users may take documents off of the shelves in the library and place them in reading locations for later reference. When users issue books outside the library or send them for binding or repair, the books migrate. In both situations, the documents' embedded RFID chips allow the library to track them using IoT. Since the introduction of IoT technology in libraries, inventory control has become relatively simple.

➤ **Collection Development and Management**

Today, book recommendations and other materials are sent through mobile devices. Users can submit their suggestions and questions for collection development and inventory management using library management software. OPAC provides information to users regarding the availability of needed books. On the other hand, the librarian can utilise library management software to reconcile the collection as and when user recommendations are received in order to determine the status of a book's availability in the library.

➤ **Information Literacy**

The deployment of IoT has made information literacy very helpful. Libraries of days record or offer pre-recorded training programmes on how to use their collection of print and digital resources. These sessions are paid for via the library websites, and users are notified of the links via mobile-friendly social media. Today, it's fairly typical to use a smartphone app to make library services easier. For its outreach, libraries typically use a display unit to broadcast recorded literacy programmes at the entrance or waiting area.

➤ **Appliance Management**

Another crucial aspect of a library that may be managed with the use of IoT is appliance management. It has to do with the library's opening and closing hours. The library's grounds include a number of appliances. It is necessary to control the lighting system in various library locations. OPAC kiosk printers, scanners, and computer terminals may be managed for greater user utilisation with less resource and energy waste.

Challenges of IOT Applications in Library:

Numerous new doorways that help us in our duties are opened by new technologies. Technology constantly generates new issues related to what it is, how to use it, its limitations, how to improve it, etc. However, utilising technology offers answers.

Similar challenges and issues can arise with the use of IoT in libraries. The following are some significant difficulties that the library might encounter:

a. Security: Mobile data is necessary for the best IoT outcomes. By granting access to documents, images, and other items, anyone can locate the location and infringe privacy.

b. Hacking: Just like IoT, mobile apps have unlimited control over user data and personal information, giving them the ability to track and hack sensitive data.

c. Cost: Tagging library inventory as part of the Internet of Things can raise the price of sensors, actuators, equipment, internet connectivity, etc. These may be pricey. Technology requires ongoing maintenance. This is yet another IoT challenge.

IoT library apps are still in their infancy. Libraries must understand how to use IoT. Different library inputs are needed for various applications. The librarian and staff must be heavily involved in the development of a dependable and accurate system.

However, the IoT applications in libraries necessitate a high level of information literacy from both consumers and staff. Employees need to be properly trained for implementation. Demonstration tools should be made to automate user support in addition to persuading library employees to use it.

Conclusion:

Human life has been impacted by the development of information and communication technologies. ICT not only has a bigger impact on business and education, but also on everyday life for people. The phrase "Internet of Things" first appeared when ordinary chores were performed by electronic objects that were connected to the internet and had computer-based programming capabilities. This increased productivity and efficiency. Libraries will use equipment with IoT technology to carry out their regular operations. It includes using smart cards to access libraries, lending out documents, and maintaining the inventory or stock of the library's books and other materials. The main tasks

carried out with the aid of IoT in libraries include preventing the theft of physical documents, identifying users, reserving books and recalling already-issued books, tracking or tracing books placed on shelves or taken outside of the library for any reason, collection development and management of library documents, promoting information literacy, and maintaining appliances used in libraries.

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