“Emerging technologies and its uses in the library reducing the work stress of library professional”

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ABSTRACT

Owing to the emerging technologies libraries have shunned the mantle of being mere repositories of books and print martial. The advent of technology made innumerable changes to the library from storehouse of books to e-library. This present paper attempt has been made to explore emerging technologies and their uses and necessity in the library. Information becomes the essential commodity of the human being. The development of present technology made it easy to get information of any form sitting at home in just one click. Library and information professionals were dealing with the problem of information management for a long time, which was required huge routine work, time, and staff. The development of different technologies proves to be a boon for the library. Nowadays libraries are equipped with modern technologies to provide information technology-based services to its users at the right time in the right place to the right person. The main objective of this paper is to discuss the development of emerging technologies its uses and benefit in the library which also reduce the work load simultaneously work stress.

Keywords: Robots, Barcode, RFID, IoT, Web 2.0, Cloud computing, Big Data.

Materials and Methods

The paper is presented on the basis of a non-systematical study. To prepare the paper main tool was a literature search. All the primary and secondary sources were used which includes books and journals. The online search engine was used as a tool to find and gather resources. After going through various gathered materials required materials were selected for the present paper which includes both foreign and Indian material.

The objective of the study
This paper is a kind of communicative type. The objective of the paper is to commutate with the librarian’s community about the emerging technology its application in the library and its necessity. The present paper will help the librarians’ society to know the emerging technologies which can be used in the libraries to provide better and modern services to its user.

**Introduction**

Technology, as the computer scientist Bran Ferren memorably defined it, ‘is stuff that doesn’t work yet’ interestingly, Jonscher sees the development of information and communication technology as a ‘curious turn’ that society took four decades ago way from mechanical and engineering developments and into microelectronics, giving birth to the digital age. We are living in a technological era, it is desired that information must be present in digital form and must accessible in any corner of the world. The immense development of information technology has impacted libraries a lot in terms of their management and services. Olise (2010) stated that information and communication technology is an upcoming technology that can’t be overlooked and it is one of the most important tools which must be applied in the library.¹

Technologies are playing a pivotal role in both corporate as well as government organizations and libraries are not lacking behind. Developing technologies have changed the working paten of the information canters. Library services are available 24 hours in digital form. It can be accessed with one click of a mouse sitting in any corner of the world. Libraries are now representing themselves as e-library. Ojha and Oters (2000) explained regarding e-library in their study named “Impact of IT on libraries: A futuristic approach” in that study it was stated about the impact of information technology and the changing scenario of the Indian libraries. It is stated that the application of technology will lead libraries to paperless libraries in the 21st century.² Proper application of technologies may further help the library professional to reduce the work stress by doing many library activity in automated way.

**Emerging technologies of library.**

Library and its services are changing with the development of technology. We can see the changes of a library from the storehouse of the library to the preset mobile library. Some of the important emerging technologies which are become part of the library for its management and services are discussed below.

**1. Robots in Library.**
The Robotics Library is a new and upcoming concept; it is a self-contained C++ library that includes motion planning control and kinematics. Its functionality is based on software, hardware abstraction, motion planning, mathematics, dynamics, visualization, and collision detection.¹

Artificial intelligence and Robotics technologies are being popularized in libraries. Guided humanoid robots are successfully used in different libraries of Japan. “Pepper” is an example of a humanoid robot developed by Softbank. In the present scenario, many developed libraries use robots to perform different jobs of the library besides auto book circulation, auto storage, and retrieval. Hybrid Assistive Limb (HAL) developed by the University of Tsukuba helps in lifting work; it lifts a bookcase onto a bookmobile. Similarly, a game named KOKORO has a system that recommends children’s books according to the test. There are many examples where libraries are using robots in their library to perform different work of the library, though it is in the initial stage, it is expected in coming days robots will play a very crucial role in the library.

Some functions performed by robots are mentioned below.

- **Library Guide** functions are performed by using Semi Humanoid Robot. “Pepper” is a robot used in the libraries of Japan. “Pepper” is developed by Softbank Robotics.

- **Library Information Display** functions are performed by guidance robots. It is different from the Pepper robot, for example, animal type guidance robot named “Koro”. It is developed by Masahiro Tanaka and others; KORO is still at the R&D stage.

- **Help Desk Support** - “An-San” robot which looks like a human is installed at the help desk of Konan University to provide reference services. “An-San” was developed by Dr. Tomohiro Umetani, associate professor of Konan University. Though “An-San” does not generate automatic answers to quarrries, but the reputation of “An-San” from users is high.

- **Guidance to the Bookshelf** - A robot named “Uta-San” is installed in the library to guide the user to a bookshelf. A robot looks like a rabbit, developed by Dr. Takashi Kawamura of National Institute of Technology (KOSEN), Oyama College. The robot reads reflected light of reflective tape laid on the floor. “Uta-San” stops in front of the needed bookshelf.²

2. **Barcode technology.**

Barcode technology is very commonly used nowadays we can see in the malls, warehouses, libraries, etc. In the library, it is used for circulation. Barcode technology is self-contained
information encoded in thick and thin bars and blocks of different breadths and white spaces between every bar. These bars and the spaces contain digits or characters. These codes can be read by a barcode scanner which sends messages to the computer and recodify. Now day’s libraries are using barcodes for circulation.

Some of the important 1D popular barcodes are

- EAN-13, EAN-8.
- UPC-A, UPC-E.
- Code128.
- ITF-14.
- Code39.

Important 2D barcodes are:

- PDF417. ...
- MAXICODE. ...
- AZTEC.

Nowadays QR codes are being used QR stands for “Quick Response” code. It is a 2D code and it has the capacity of storing more data and has the capacity to read at high speed.³

3. **RFID (Radio-frequency identification).**

RFID stands for “radio frequency” (RF) and “identifier” (ID). This technology is a wave of a wireless radio frequency or electromagnetic field to transfer data to identify different objects. RFID tags are attached with an object which allows the RFID reader to capture and read the information on it automatically. Normally tags contain on it a chip and an antenna. RFID is modern technology.⁴ RFID have the capacity to read the hidden tags in an object. A tag can contain information of many bytes which is an advantage future of it. Mario Cardullo's was the first person to develop the first RFID and it was patented in the year 1973.⁵ Passive radio transponder with memory was used in the banning. But the first patent with the abbreviation RFID was granted in the name of Charles Walton.⁶

**Different Components of RFID.**

An RFID has different Components which are integrated in a manner that it performs its action in the desired way.

1. RFID Reader.
2. Tag.
3. Antenna.

1. **RFID Reader** - Readers function is to read radio frequency wave of the tag attached with books or an object.

2. **Tag or label** - Tag consists of microchips. It processes and stores information with the presence of transmitter and receiver. Three types of tags are normally used.4
   - **Active Tag** - This tag can be read by the RFID reader up to 100 meters. Active tags are powered by a battery like AIDC- Automated identification and data capturing.7
   - **Passive tag (Battery assisted)** - Passive tag is battery-assisted which activates in the presence of RFID reader.
   - **A passive tag (Without Battery)** - Passive tag does not have a battery on it. It uses radio energy transmitted by the reader. It is smaller in size. Its reception range can be adjusted from one feet to thousand feet.8

3. **Antenna**: It is a kind of detector; magnetic fields are created so the tags can be read by the reader.

4. **Application infrastructure**: Proper function of the RFID is required information technology and application software.

4. **Internet of Things (IoT)**

Internet of Things or IoT is popular and emerging technology of the present era. Internet enables things to interact with other devices which are capable of creation, extraction, analyzing of data and all this is done by IoT system. IoT's aim is to connect different devices through the internet to perform an action. It interacts with human to machine or machine to machine. This system contains sensors and microcontrollers.

Sensors contain data that are connected with the cloud computing software via the internet.9 IoT uses variety of technology that support each other to perform the work. We heard about smart house. It makes the house by using many technologies simultaneously like Wi-fi, sensors, camera, sounds and mobile phone.

**Component and working system of IoT.**

The main component of IoT is 1. Sensors, 2. Network connectivity, 3. Data processing, 4. Interface.10
1) **Sensor**: Important component of IoT is a sensor and its function is to gather data from the surrounding area.

2) **Connectivity**: Sensor sent collected data to the cloud computer or IoT platform. To transfer the data from sensors to cloud platform, there is a need of a medium like an internet. These medium can be a Bluetooth or a Wi-Fi, mobile hotspot and WAN connection. The efficiency of IoT depends on internet speed.

3) **Data Processing**: Cloud server receives data and software process the data.

4) **User Interface**: Processed data is sent to users through notification alert on mobile. Some IoT systems are pre-programmed which perform a work automatically. Like regulation of AC temperature which is auto-adjust as per the pre-set temperature. Some systems have the facility to perform an action as per the need with some useful gadget.

**Application of RFID and IoT in the library**

RFID technology offers greater advantages than barcode. IoT has much more advantage in comparison to RFID. RFID act as part of an IoT system. Both the technologies have some common application for the library services and its management. These are -

- **Inventory Control**: RFID and IoT technology are used as a technique of inventory control of the library. All this are done by applying sensors or tag on different library item. The system can track the movements of each item in the library.

- **Act as a Security device**: RFID is used in the library as a security device. At the entrances door an electromagnetic security strip is installed, which alert the library authority by giving a beep sound in case of unauthorized movement of the objects. In an IoT system whole inventory are attached with a special tag, so the movement of items is keeps tracing.

- **Self-service checkout**: RFID and IoT provide facilities for Self-service checkouts. As RFID reader can read a tag attached with objects. RFID readers tags while the books are in motion. IoT has the facility to check overdue books on their mobile app.

- **Stock verification**: Portable readers have the capability to read whole-shelf inventories within seconds. RFID reader reads tags shelved on the rack. RFID reader automatically counts available books on the shelf and stock verification is done in a short span of time. In the IoT system sensors are used. The sensor read library in a short time. Missing sensors indicate the lost item on the premises.
• **User reorganization:** IoT system equipped with sensors and cameras which perform face recognition of the visitors.

• **Fire Detection:** The fire detection devices are connected with the IoT system in the library for fire detection. In case of any emergency, devices send messages to the library authority and fire department.

• **Library Assistance:** IoT facilitated the user to request required resources, the user can ask for directions to the sources in the library by voice command through a mobile app, which is connected with the library IoT system.

• **Virtual tour and Book Tracking:** IoT provides facility have a virtual tour of the library using their mobile app connected to the IoT system.

• **Book availability and Book reservation:** Users of the library are provided with a mobile app connected with the IoT system of the library. Availability of books can be seen in mobile app and request a book for reservation can be made.

• **Monitoring of library by a librarian:** The library head may monitor the library sitting anywhere using the mobile app which is connected with the library IoT system.

5. Web.2.0

The term web 2.0 is a technology that uses www (worldwide wave) technology and web design to increase the creativity and sharing of information and increases the function of the web interactively. In web 2.0 users can take part actively in the creation and sharing of the information. In the year 2005, Michael Casey coined the term library 2.0. In library web, 2.0 users interact with the resources and services present on web. Users are interactive on the web. 2.0. This technology is socially and technically open. In the present era libraries are using web 2.0 tools for the user of the new generation.

Web 2.0 technology helps to find out user-generated content. This content has many forms.

• Blogs
• Podcasts
• Walkthroughs.
• FAQ
• Gameplay video footage.
• Clan and personal game player websites.
• Player’s mailing list, forums, and newsgroups.
Cloud computing in simple terms is accessing and storing data is done via the internet, not on our own computer. We search data in our computer over the internet but we get the data from another remote computer where the data are stored. Similarly, data is stored in another computer over the internet is cloud computing. In a banking system, while we go to the bank for withdrawing money, bank workers debit the money from the account. Actually, the account gets debited from the cloud computer located in a different location. E-granthaalaya library automated software developed by NIC (National informatics center, Govt. of India) is a cloud-based software. Those Libraries using e-3 software for their library all the datas are storing in cloud computer. While searching data are retrieved from cloud computer. In cloud computing, the major advantage is not requiring any servers which are very expensive. No need for annual maintenance. Data can be searched from anywhere in the world using the internet.

John Mashey has played a great role in popularizing the term Big data. Big data term is used in the year 1990s. Big data deals to extract information and systematically analyses from data set which are large and very complex to deal with the traditional software of data processing. Big data analysis has great challenges that include the capturing of data, storage, analysis, sharing, search, transfer, querying, visualization, continuous updating, and information privacy.

8. Blockchain Technology.
The concept of blockchain technology is defined as a decentralized; distributed kind of ledger that covers and records all the areas of digital media. This is the newest way to collect and store data.

Bitcoin is an example of an action of the blockchain. It is a form of digital currency which also is popular as “Cryptocurrency”. It has various important applications in the information sector. With the help of blockchain meta data can be prepared for the information centers and libraries to tack digital ownership and the first right of digital sources.

Conclusion
Present society is transforming from the age of technological changes. We can notice from the above discussion that many new technology has emerged. This development is not restricted to a single field. Every field has benefited from the technological revolution. Library is also one of them. There was a time while library was a just store house of books but right now it is a...
information centers. Acceptance of technology in the library has changed its nature. Present day users are also become dynamic in nature they are also take part in information transformation. All the technology whether it is barcode, RFID, IoT, web 2.0 or a robotic library all this theology has brought revolution in the library from management part to information creation and transmission. Once the libraries adopt and implement all useful technologies for its functioning automatically work load will reduce and simultaneously work stress will also reduce.

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