

BIOMEDICAL INDUSTRY 4.0 AND ROLE OF LIBRARY SERVICES

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Abstract:

The biomedical industry is very vast and has global importance. The article describes the basics of Industry 4.0, which is the latest industrial revolution denoting a current trend of automation, digitization and communication of proper information to proper users at a proper time. It is a name given to the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet, cloud computing, big data, information and library science and cognitive computing. Industry 4.0 is more useful in biomedicine and its industrial products, where everything is correlated to public health, life as well as death. It is already being used and applied in the various biomedical device sector viz. diagnoses, treatment, integrating electrocardiogram capability or blood pressure cuffs within a device increases its value. Hence, biomedical industries have no option but to adopt tricks, techniques and technology of Industry 4.0. Libraries must provide effective and efficient information services to Biomedical Industries to cope up with new technologies.

Keywords: Library Services, ICT, Biomedical Industries, Biomedicine, Information Services, etc.

Introduction

Industry 4.0 is a name given to the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing. Industry 4.0 is commonly referred to as the fourth industrial revolution. Industry 4.0 is already being applied in the biomedical device sector. For example, integrating electrocardiogram capability or blood pressure cuffs within a device increases its value. The Internet of Medical Things (IoMT) brings together technology, medical devices and applications that enable personalised patient-specific devices and care programmes. Mobile devices that can track chronic and lifestyle associated diseases such as diabetes. The libraries will provide Lib 4.0 services. They will make use of makerspace, Google Glass, context aware technology, internet of things, more personalized services, big data, cloud computing, and augmented reality as a symbiosis web, reading, writing, and executing simultaneously, web OS, middleware, and a massive web allowing intelligence interaction just like a human brain.

Review of Literature

The extensive application of information technology in all supply chain activities will change the way of doing business (Porter and Heppelmann, 2014). In 2011 Germany coined the expression "Industry 4.0" for the digital transformation of manufacturing, an allusion ex-ante to the Fourth Industrial Revolution (Lasi et al., 2014). Industry 4.0 is a name given to the current trend of automation and data exchange in manufacturing technologies. Industry 4.0 is commonly referred to as the fourth industrial revolution. Industry 4.0 fosters what has been called a "smart factory". Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real-time both internally and across organizational services offered and used by participants of the value chain.

Library 4.0

Industries have undergone three revolutions Industry 4.0 and Library

4.0 is an impact of Web 4.0. Library and information centres play important role in growth and development of these revolutions and will provide services in present fourth generation also through Library 4.0.

Chauhan (2009) wrote that Library 4.0 must include not only software-based approaches but also technological environment development such as makerspace, Google Glass, context aware technology, digitalization of contents, big data, cloud computing and augmented reality.

Libraries will be able to survive only by cooperating with various professional academic networks in the era of Web 4.0 and Industry 4.0. He also said that the form of that cooperation will become Library 4.0, and it will be constructed in a virtual library environment where all the services are provided in virtual space.

Library 4.0, as a future library, will become an intelligent library where not only inference and research are available, but the system will analyze information by itself and discuss findings with users like a colleague (Chauhan, 2009). We

can imagine an environment that fuses platforms, services, and large amounts of content (massive web), a library that allows librarians, users, and machines to coexist (symbiotic web), technology that allows humans and machines to read, write, execute, and concur at the same time (read-write-execution-concurrency web), and a library that thinks, makes decisions, and provides library services using reasoning (intelligent library).

Context-aware Computing Technology

Libraries will use context aware computing technologies. Context-aware computing technology is a system designed to search and provide the services that users require in their current situation by analyzing and identifying the available contextual information (the current situation of the user) such as the user's current location, time, people and devices in the vicinity, and the user's behavior and inputted data (Noh, 2013). Context aware services applicable to libraries are book status information (book location checks and guidance service using augmented reality technology, checks and guidance service for books being moved or returned), book content

information, My Library management service, library internal information, providing and lending electronic books, and connection with relevant agencies (Lee, 2013). Noh (2013) wrote, in an example of an application of context aware technology to the library, that the library may recognize the user and provide customized service to both new users and existing users. In addition, it can provide information suitable to the circumstances of users, context aware reference and book lending service, and identify the user in an emergency by recognizing their behavior, route, and temperature. Besides this, as an environmental comfort service, temperature, humidity, and lighting can be adjusted for different users, books, and equipment (Song et al., 2008; Noh, 2010).

Next Generation Digital Libraries and Displays

Library 4.0 will make it possible to realize a cutting-edge display environment equipped with recognition capability. The technologies and products making that environment possible have already been launched, and applying them well to the developing NGDLs (Next Generation Digital Libraries) will be the

key to success. Representative models of this cutting-edge display equipment are Google Glass, HUD, Flexible Display, and Transparent Display. Google Glass is a kind of wearable computer equipped with Head Mounted Display (HMD), which is under development as an R&D project titled "Project Glass" and will make it easy to realize a ubiquitous digital environment (Furlan, 2013). Google Glass can use many other Google applications including Google Now, Google Map, Google Plus, and Gmail. Google Glass can presently display functions including showing information in a hands-free form, interaction through voice command in natural language, video recording, picture taking, video calls, image search, translation, directional guidance, message sending, weather search, and providing flight information. These functions are only the beginning and can be extended, strengthened, and enhanced as much as is desired (Noh, 2015). Displays presently available or at a stage of commercialization to be applicable to the library in the near future are HUD (Head-Up Display), Flexible Display, and Transparent Display (Fig. 1). The future library will construct display environments using these technologies.



Fig.1. Changes of Display Environment (Source: Noh, 2015)

HUD (Head-Up Display) is a device which allows the pilot of an airplane to accurately view information from instruments and CRT within his or her view, designed to display operating information on the windshield glass of an automobile or airplane (Newman, 1995). At present, it is used for reducing automobile accidents. Flexible Display is a paper like display known for realizing the same picture quality even if it is folded or bent (Kirschner & Muller, 1987). This technology will replace existing screens on laptops, PC monitors, and televisions, and is expected to be embraced by the electronics market thanks to the reduction in screen size and volume it represents. Transparent Display is a collective name for a display that is completely see-through when turned off, and remains partially transparent when turned on. This technology, which combines augmented reality and touch screens, has many everyday applications, including living room windows or indoor and outdoor advertisements and PSAs.

Infinite Creative Space

Combining infinite creative space with library services is an innovative idea which will have a positive impact on the lives of library users. Infinite creative space in libraries will allow users to see the world differently and give them an opportunity to explore or imagine new possibilities or a future they will create. The concept of infinite creative space is meant to facilitate the creation of something using technology, but

does not include only STEM activities. The space is intended to draw creative people, and the infinite creative space movement centered in libraries helps to teach users to think creatively and explore solutions. It is a space where people gather and create new things with certain technologies.

Conclusion

The internet age has made users aware of the many different ways to acquire knowledge besides physical books, and therefore librarians have reached for new identities within their core mission of information community helpers. However, the current study could provide only a limited range of applications and service provided by Library 4.0 to Industry 4.0. Hence, further studies must also concentrate on detailed apply Web 4.0 and Library 4.0 concepts to provide services to Industry 4.0 to maintain and improve user satisfaction.

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