

## LIBRARIAN ROLE IN LIBRARY 4.0 ERA

Dewi Endah Wasitarini  
IT Staff of Library Automation Sub Division  
[dewi\\_wasitarini@perpusnas.go.id](mailto:dewi_wasitarini@perpusnas.go.id)

Chaerul Umam  
Head of Library Collaboration Sub Division  
[chaerul\\_umam@perpusnas.go.id](mailto:chaerul_umam@perpusnas.go.id)

According to Library Act No.43 of 2007 concerning library Article 1 Paragraph 1, Library is an institution which professionally and systematically manage collections of written, printed and recorded works in order to meet the users' needs of education, research, preservation, information and entertainment. To improve the function of library as stated in the Library Act No.43, the role of competent librarian who obtained competencies from a librarianship education and/or training is important to face Library 4.0 so as to promote excellent services and reading habit to public.

Today, most libraries in Indonesia, for instance university libraries, public libraries and special libraries, have put ICT development into practice and implemented Industry 4.0 technology in the form of integrated library services. Due to lack in competencies, however, librarians have not optimally benefited from industry 4.0 technology developments. Thus, it can be concluded that librarians in Indonesia have not been prepared for Library 4.0. The National Library is a non-ministerial government institution in the field of libraries. In the effort of improving its function as stated in the Library Act No.43 concerning library as a chief institution of libraries in Indonesia, the National Library is expected to be able to improve librarian competencies to face Library 4.0 toward librarianship education and training center. Librarianship competencies recommended are professional skills in *Internet of Things, Digital Technology, Big Data Analytic, Autonomous Robot, Cyber security, Cloud Computing, Augmented Reality*. In addition, other recommendation for librarianship individual skills are ability as a lead auditor to audit and evaluate Library 4.0, ability to design digital library system, ability to analyze ICT implementation in libraries in Indonesia, as well as ability to analyze library information technology policies.

Keywords: *Library 4.0, Industry 4.0, Smart Library, World Class Library*

### I. INTRODUCTION

The National Library is a government organization in the field of public services. To improve its function as a chief library for all libraries in Indonesia and in line with the Library Act No.43 of 2007 concerning library, the National Library has a key role in improving librarians competencies in Indonesia toward librarianship education and training as stated in Article 1 Paragraph 8 No. 43 of 2007 that a librarian is one who has competencies obtained from librarianship education and/or training and who is in charge of implementing library management and services. A more competent librarian plays an important role in facing the fast-moving ICT development, more importantly the Library 4.0 era. With *smart library* concept, the National Library has currently put ICT-based library services into practice in which integrated library services are applied supported by sophisticated information technology infrastructure toward a world class library. Although the implementation of *smart library* concept has utilized Industry 4.0 technology developments, the competence of librarians in implementing industry 4.0 technology is not yet satisfying. Therefore, in the effort of implementing industry 4.0 technology, the National Library is highly expected to be able to improve librarian competencies in Indonesia toward librarianship education and training so that they can play a role in providing excellent library services by utilizing and adopting information technology development as designed in Library 4.0.

## II. LITERATURE STUDY

### A. INDUSTRY 4.0

According to Erchan dan Samet (2018), Industry 4.0 is defined as a methodology to generate a transformation from dominant manufacturing to digital manufacturing. Industry 4.0 has established since industrial revolution occurred in the late 18th century (Fraunhofer, 2016). There were 3 revolutions and now the 4.0 revolution has begun. According to Fraunhofer (2016), the history of industrial revolution occurred in the late 18th century. Revolution 1.0 began through the use of steam power to perform mechanization in production process. Later, in the beginning of 20th century, revolution 2.0 began through the use of mass production by cross-production which was supported by the use of electrical energy. Furthermore, the beginning of revolution 3.0 occurred through the use of electronics and information technology to automate production processes including management (ERP). Now, there is revolution 4.0 through the use of advanced computer

and telecommunication technology (internet) to form a production system of cyber physical, which is the unification of the real world with the virtual world.

According to Prof. Chao Lung Yang (2018), production facilities in the industrial era 4.0 consist of:

1. Physical components
2. Smart components, which are able to regulate and control processes based on process information collected through various sensors
3. Connectivity components, which is a connection with other facilities including products / parts to be processed
4. Some functions of the facilities are not placed on the facilities but remotely through the *cloud system*

Based on production facilities in the industry 4.0 era above, it can be said to be a cyber-physical-system that can be demonstrated through Key Technology of Industry 4.0 in the following figure:

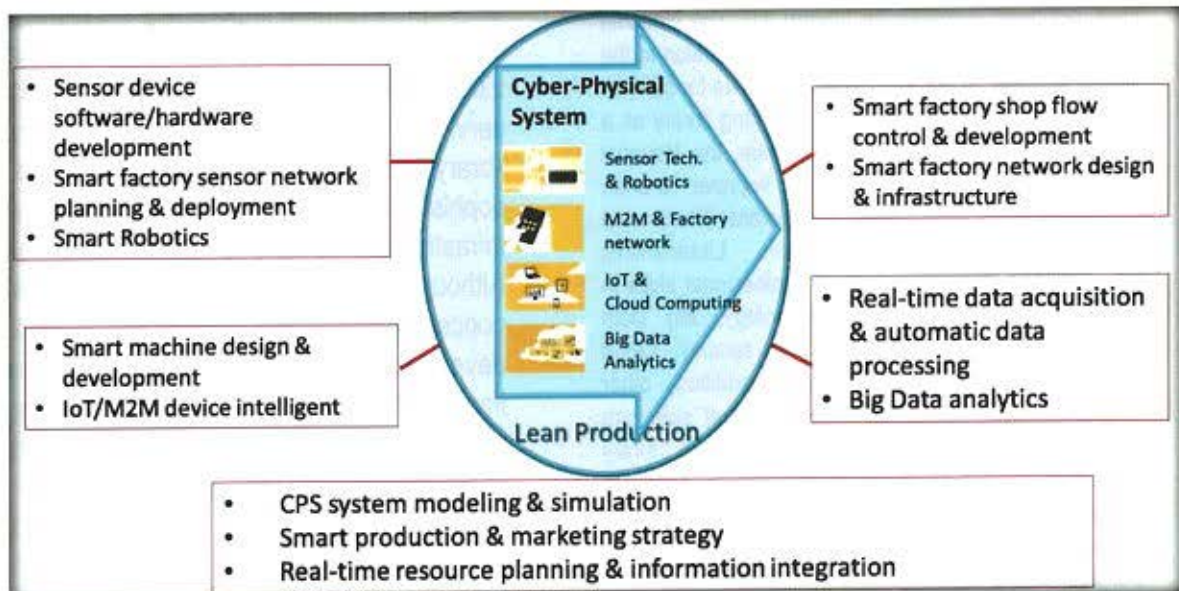


Figure 1. Key Technology of Industry 4.0 (Prof Chao Lung Yang, 2018)

Based on production facilities of industry 4.0 era delivered by Prof. Chao Lung Yang (2018)

through the description of the Key Technology Industry 4.0, it can be concluded that there are several advantages and challenges in facing Industry 4.0, as follows:

A. Advantages:

1. Highly efficient, save time, minimize costs, workers, work mistakes during production and increase product accuracy and quality
2. Meet the needs of high-skilled workers
3. Improve industry competitiveness

B. Challenges:

1. The initial investment cost is quite high
2. Reduce job opportunities
3. Require efficient industrial basic infrastructures

According to Roland Berger (2014), there are four characteristics of Industry 4.0, namely:

A. Vertical network of various intelligent production systems

In this characteristic, it is explained that:

1. Intelligent production systems can organize independently according to the real conditions captured through sensors such as the following:
  - Ordering stock
  - Adjusting process parameters in real time
  - Revising the production plan
  - Detecting damages to the machine (predictive, maintenance), etc.
2. Production systems can be placed in different locations
3. It is possible to make use of highly efficient resources

B. Horizontal Integration through a new generation of global value chain networks

In this characteristic, it is explained that:

1. Integration occurs from inbound logistics, warehouses, productions, outbound logistics and services
2. All product status is recorded in the value chain network so that it increases traceability
3. Specific customer requests can be made at the time of product planning
4. Integrated transformation allows overall flexibility and optimization
5. It generates a new business process model

An overview that shows the characteristics of industry 4.0 at this point can be shown in the example of industrial application through RFID technology as follows:

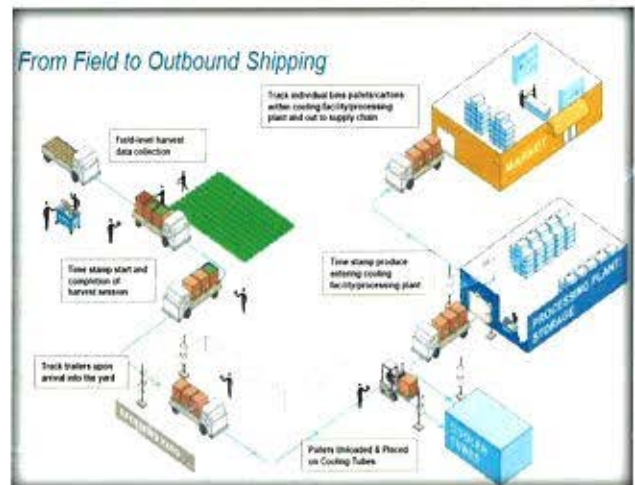


Figure 2. RFID Technology (Roland Berger, 2014)

C. Comprehensive engineering at all stages of added value

In this characteristic, it is explained that:

1. A comprehensive and integrated engineering process can be carried out from the initial stages of design to the next stage: engineering, production, distribution and service
2. Product development and production processes become integrated and produce new synergies

An example of applying the characteristic of Industry 4.0 at this point can be shown in the figure of the Integrated Engineering Process as follows:



Figure 3. *Integrated Engineering Process* (Peter Marsh, 2013)

#### D. Acceleration through exponential technology.

In this characteristic, it is explained that:

1. Industry 4.0 is supported by exponentially fast-developing technology. These technologies include: Artificial Intelligence, Robot Technology, Sensor Technology, Data Processing (Big Data Science), Nanomaterials, all of which produce intelligent production systems.
2. A technology that has exponentially developed is 3D printers.

The example of the characteristics of Industry 4.0 at this point can be shown in the following figure:

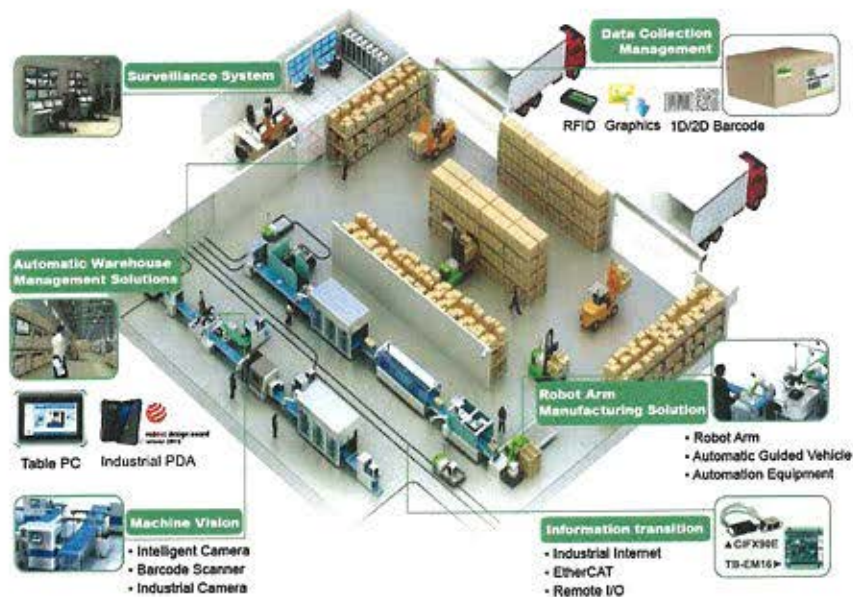


Figure 4. *Industry 4.0 Implementation* (Roland berger, 2014)

Based on the characteristics of Industry 4.0 above, the role of librarians is mapped through librarian competencies to deal with Industry 4.0 through the Library 4.0 concept.

### B. Concept of Library 4.0

Based on the development of information and communication technology that can be adjusted into Industry 4.0 concept, the management and service of the library can be adjusted to aspects related to Industry 4.0. Therefore, in understanding and utilizing Industry 4.0 concept, it can be concluded that the Library 4.0 phase is a phase in which a library in any case utilizes cyber physical system technology, namely sensor and robotic technology, M2M networks, the Internet of Things (IoT) and Cloud Computing, and Big Data Analytic in managing library collections and providing services to the public.

### C. Current Library 4.0 Implementation

Several libraries in Indonesia have implemented Library 4.0, one of which is the National Library. The National Library as the chief institution of all libraries in Indonesia has implemented Library 4.0 by utilizing Industry 4.0 technologies, namely the Internet of Things and Digital Technology. Based on aspects of Library 4.0, there are two aspects of industry 4.0 technology used. Likewise with several libraries in Indonesia that have implemented Library 4.0 in particular aspects of digital technology. The current implementation of Libray 4.0 in Indonesia is listed in the following table.

Table 1. Current Implementation of Libray 4.0  
(Source: Dewi Wasitarini, 2018)

Current Implementation of Library 4.0	Aspect of Library 4.0
√	Utilization of Internet of Things (IOT)
√	Digital Technology
X	Big Data Technology
X	Autonomous Robot

X	Cyber Security
X	Cloud Computing
X	Augment Reality (AR)

Based on the current implementation of Library 4.0, there are several aspects that have not been implemented by libraries in Indonesia because it needs good preparation through strategies to deal with Library 4.0 by paying attention to several aspects including Information Technology Governance, information and communication technology infrastructure, Human Resources (HR). Therefore, in dealing with Library 4.0, it is necessary to improve librarian competences through librarianship education and training.

### III. LIBRARIAN COMPETENCE

According to Kellam and Thomson (2016) in Alexandre Ribas, et.all (2017), most librarians have certain basic competencies, knowledge of library metadata standards, and research discipline practices. Then, according to McCaffrey and Giesbrecht (2016) in Alexandre Ribas, et.all (2017), the recommendation of competencies and skills to be possessed by librarians is as follows:

Competences:

- a. Able to process data management and data curation
- b. Able to implement data visualization and geospatial representation
- c. Able to implement available reference services
- d. Able to adapt to new experiences and professionally keep seeking updates.

Skills:

- a. Interpersonal skills
- b. Skills in understanding the characteristics of users' behaviors
- c. Communication skills
- d. Writing and analyzing skills
- e. Skills for conducting research on

- organizations and the environment, institution policy related to funding
- f. Skills in evaluating researches
- g. Specific skills for data use, including understanding qualitative and quantitative data, standards and metadata, creative and legal systems, and data preservation.
- h. Skills related to information technology knowledge such as programming languages (Python, Structured Query Language, Java and Extensible Markup Language), database design and structure, Natural Language Processing (NLP) tools, Internet of Things, and Big Data.

According to Supriyanto (2006), the competencies of librarians at least include two things:

- a. Professional competencies related to knowledge in the fields of information sources namely technology, management, training, and ability to use knowledge as a basis for library and information services
- b. Individual competence which is a unity of behavioral skills and values possessed by librarians in order to be able to work effectively, to become good communicators, to increase knowledge, to show added values, to be able to adapt to changes and developments in the work field.

According to Deffi and Nunung (2007), in increasing reading interest so that expectations, demands and information needs for the users are achieved, librarians need to achieve several competencies summarized as follows:

- a. Able to increase the number and the

development of the latest collections in various fields of science needed by the community.

b. Able to continuously promote the library to public through print and electronic media, exhibitions, seminars, workshops, book reviews, competitions, etc. according to the needs.

c. Able to develop programs in improving library service human resources (HR) in particular and library human resources (HR) in general which aim to optimally improve the sustainable library services quality.

d. Able to provide ideas through new breakthroughs to increase reading interest.

Based on the literature study of librarian competence, it can be concluded that a librarian has to possess at least the following competencies:

1. Able to manage and analyze digital data
2. Able to implement reference services
3. Able to adapt, seek and carry out professional updates
4. Able to communicate
5. Able to analyze organizational policies
6. Able to use, operate, understand the development of information and communication technology
7. Able to use knowledge in the fields of information sources namely technology, management, and training as the basis for library and information services

8. Able to work effectively, be a good communicator, increase knowledge, show added values, adjust to changes and developments in the
10. Able to develop programs in improving library service human resources (HR) to improve the quality of library services optimally and

- work field
9. Able to increase the number and development of library collections needed by the users sustainably
11. Able to provide ideas through new breakthroughs to promote reading interest to public.

#### IV. LIBRARIAN COMPETENCE MAPPING ON LIBRARY 4.0

To find out the improvement of librarian competencies in dealing with Library 4.0, the librarian's current competencies can be mapped as follows:

(Source: Dewi Wasitarini, 2018)

Librarian Competence on Library 4.0	IOT	Digital	Big Data	Robot	Cyber Security	Cloud Computing	AR
Management	√	√	x	x	x	x	x
Analysis	√	√	x	x	x	x	x
Service Implementation	√	√	x	x	x	x	x
Adaptation	√	√	x	x	x	x	x
Renewal	x	x	x	x	x	x	X
Collection Search	√	√	x	x	x	x	x
Communication	x	√	x	x	x	x	x
Making use of the latest technologies	√	√	x	x	x	x	x
Effective working	x	√	x	x	x	x	x
Increasing knowledge	x	x	x	x	x	x	x
Showing added values	x	x	x	x	x	x	x
Adjusting to changes and development in the work field	X	√	x	x	x	x	x
Developing programs in improving library service sumber human resource (HR) to improve the quality of library services	x	√	x	x	x	x	x
Providing ideas through new breakthroughs	x	√	x	x	x	x	x

#### V. RECOMMENDATIONS OF THE ROLE OF LIBRARY AND LIBRARIAN IN FACING LIBRARY 4.0

Based on Table 2 the librarian competence mapping on Library 4.0 aspect, the role of librarian in facing Library 4.0 can be summarized as follows:

1. Librarians can act as managers and analysts for the development of digital libraries through sensor technology that has been implemented by libraries in Indonesia

2. Librarians can act as good communicators in developing digital technology and sensor technology that have been implemented by libraries in Indonesia
5. As a chief institution of libraries, the National Library can collaborate with foreign libraries that have implemented

3. The library promotes the use of industrial 4.0 technologies that has been implemented by libraries in Indonesia
4. The Library promote the implementation of Library 4.0 to public better and more complex Industry 4.0 technologies

## VI. CONCLUSION RECOMMENDATION

### A. CONCLUSION

It can be concluded that in increasing librarian competencies with the intention that can play a key role in facing Library 4.0, the Library Education and Training Center of the National Library can provide education and training as follows:

1. Education and Training for librarians and library computer institutions in Industry 4.0, including:
  - a. *Internet of Things*
  - b. *Teknologi Digital*
  - c. *Big Data Analytic*
  - d. *Autonomous Robot*
  - e. *Cyber Security*
  - f. *Cloud Computing*
  - g. *Augmented Reality*
2. Education and Training for lead auditors of library computer institutions to audit and evaluate Library 4.0 which has been implemented by libraries in Indonesia
3. Education and Training for librarians to possess:

- a. Skill in designing digital library systems
- b. Skill in analyzing the implementation of Information and Communication Technology (ICT) in libraries in Indonesia
- c. Skill in analyzing library information technology policies

### B. RECOMMENDATION

It is suggested as follows:

1. It is necessary to share knowledge to all librarians regarding the phases of Library 1.0 to 4.0
2. The need for information and communication technology governance to support the implementation of Library 4.0, including improving information and communication technology infrastructure and information security



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