

**PREPARING THE LIBRARIES FOR THE FOURTH
INDUSTRIAL REVOLUTION (4th IR)**

Muhammad Akmal Ahmat and Rabiahtul Adauwiyah Abu Hanipah
Hamzah Sendut Library, Universiti Sains Malaysia,
11800 Gelugor, Pulau Pinang.

akmal_ahmat@usm.my, rabiahtul@usm.my

* Paper was presented at the Emerald Librarian Conference 2018 (ELC2018), 17 April 2018, Kuala Lumpur, Malaysia.

ABSTRACT

The disruptive changes of the 4th Industrial Revolution era to the libraries come from many aspects and the common discussion is about managing the technology innovation. There are general propositions on how to handle disruptive changes but the specific description for the library to take comprehensive strategic actions are still unexplained. Therefore, this article intends to explain four strategic actions that could be taken to control the disruptive changes as preparation for the libraries. The four strategic actions are explained on the aspects of reshaping the organizational behavior, redesigning business model, restructuring business process workflow, and; remaking job descriptions and roles. After the strategic steps have been taken, the library could focus on reacting accurately towards assumptions, challenges and opportunities, and emerging trends. These are the important matters that one needs to be concerned with to ensure libraries remain relevant for upcoming years.

Keywords: 4th Industrial Revolution (4th IR), Library management, Librarianship, Library science

ABSTRAK

Gangguan perubahan era Revolusi Perindustrian ke-4 terhadap perpustakaan datang dari banyak aspek dan perbincangan lazim adalah mengenai pengurusan inovasi teknologi. Terdapat cadangan umum mengenai bagaimana mengendali gangguan perubahan tetapi penerangan spesifik bagi perpustakaan untuk mengambil tindakan strategik yang komprehensif masih tidak dapat diterangkan. Justeru, artikel ini bertujuan untuk menjelaskan empat tindakan strategik yang boleh dilaksana oleh pihak perpustakaan sebagai persediaan bagi mengawal gangguan perubahan. Empat tindakan strategik yang dijelaskan adalah tentang membentuk semula tingkah laku organisasi; mengubah reka bentuk model perniagaan; menyusun semula aliran proses kerja pengurusan; dan mengubah semula deskripsi pekerjaan dan peranan.

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

Dengan langkah-langkah strategik yang diambil, perpustakaan kemudian dapat memberi fokus untuk bertindak balas dengan tepat terhadap andaian; cabaran dan peluang; dan kewujudan trend baru. Ini adalah perkara-perkara penting yang perlu diambil perhatian untuk memastikan perpustakaan kekal relevan untuk masa akan datang.

Kata Kunci: *Revolusi Perindustrian Keempat, Pengurusan perpustakaan, Kepustakawan, Sains perpustakaan*

INTRODUCTION

The Libraries' Changes Over the Last Half-Century

According to Lewis (2004) as derived from Buckland, Gorman and Gorman (1992), libraries have encountered three phases of development over the last half-century. The phases are:

- i. Firstly, the emergence of automation system in the libraries where paper began to be used less. It started in late 1960s with Machine-Readable Cataloging (MARC) development process which was widely discussed among professional librarians until 1990's when libraries have Online Public Access Catalog (OPAC), and audio-visual media system as well as web-based indexes replacing the printed predecessors.
- ii. Secondly, electronic libraries' dominance that began in early 1990s with the development of CD-ROMs, full-text databases, the Internet, and the Web. During this era, some of the established technology used since 1960s were getting disrupted. For instance, analogue audio-visual record that were being stored in cassette tapes have started to be replaced and the media information became more easily available and cheaper on the Internet.
- iii. Thirdly, the advancement of new technology that were rapidly used to complete more complex tasks. The new tools were created to provide powerful features to process data, text, sound and images and can be easily sent to distant collaborators. The new technology is also capable to do analysis of large sets of numeric data on the computer screen.

Critical Issues About 4th Industrial Revolution

Klaus Schwab, a founder and executive chairman of the World Economic Forum stated that by entering the 4th Industrial Revolution (4th IR) era, there are megatrend drivers within physical, digital and biological environment that disrupt the common ways of human lifestyle, industrial production and government policies. They also give a huge impact and mass progress or might give overturn effects in certain countries in terms of economic growth, business landscape, government service efficiencies, as well as society and individual inequality issues.

Preparing the Libraries for the Fourth Industrial Revolution (4th IR)

Among other views, Klaus Schwab also emphasized one major issue concerning the talent management comparisons on business capital that will represent the critical factor of business production. Schwab said that:

“This (talent issues) will give rise to a job market increasingly segregated into “low-skill / low-pay” and “high-skill / high-pay” segments, which in turn will lead to an increase in social tensions.”

Moreover, there are a lot of questions on how every industry in every country would be involved in shaping the future of the human versus robotic work field, which may deprive people - a being with heart and soul - to exist and progress in the revolution era within the robotic artificial intelligence (AI) and internet of things (IoT) forms (Schwab, 2017; Razak, 2017).

Disruptive Changes for Libraries

There were notable concerns about disruptive changes beginning in early 2000's. According to Christensen and Overdorf (2000), the disruptive changes are paralyzing established companies' business market via replacements with high innovation value of products, technologies and services. The disruptive change elements consist of:

- i. Sophisticated technology that simplified solutions to customers in ways that make them affordable and conveniently accessible,
- ii. Low cost, innovative business models, and
- iii. Economically coherent value network.

On another part, Ken Chad, a libraries-strategy consultant asserted that the libraries would be disrupted by;

“...innovative services from outside the traditional library domain. These services have substantially grown the total ‘library’ market but have taken ‘market share’ away from conventional libraries. Consumers like the new services and often prefer them to the services offered by ‘new conventional’ libraries” (Chad, 2009).

The means of innovation services mentioned are specifically on:

- i. The delivery of digital knowledge that are being supplied with low cost to customers,
- ii. Functionally rich products and systems that attract customers to use them continuously, and
- iii. Highly multitask skills of staff that are capable to support customers' demands.

The Readiness of Libraries and Librarians towards 4th IR

On 5th July 2017, the International Federation of Library Associations and Institutions (IFLA) conducted a special Global Vision discussion (Church, Butz,

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

Cassell, Kamar, Swindells, Tallman and Snellenberg, 2017). The discussion focused on how a united library field can tackle the challenges of the 4th IR era. They arrived at an agreement stating that:

“Libraries enable literate, informed and participative societies. When we look at the future, according to the debates in our teleconference, libraries will be trustworthy information brokers; will do more with new technology; provide universal access to information and scholarly works, whether it be media or information we already know or new media; preserving and providing access to information in all formats and providing trusted and effective support for political and social engagement. Libraries will be advocates for and facilitators of the Fourth Industrial Revolution, where people create their own devices and objects.”

On the other hand Natalia Fibrich (2017), a Library Training Services Australia General Manager expected that the scope of change (for libraries and librarians) is unprecedented. She added on that:

“Personalisation will be increasingly important. Due to the nature of new technologies solving new and meaningful problems for customers, we will start to see them expecting services on their terms according to their ideals and needs. Thus, we will need to develop new business models that cater to our customers' needs on their terms”

STRATEGIC ACTIONS FOR LIBRARIES

It is about time for the leaders of library, librarians and library support staffs to participate collectively and get prepared with comprehensive action strategies to stabilize any disruptions towards libraries while entering the 4th IR era. Based on several studies that describe library transformation and ways to properly handle disruptive changes, four strategic actions that have to be taken by the library leaders to overhaul the libraries business environment were highlighted. They are:

- i. Reshaping the organizational behaviour
- ii. Redesigning new business model.
- iii. Restructuring business process flow.
- iv. Remaking the job descriptions and roles.

Reshape the Organizational Behavior

It is a common scenario for any organization, for each staff at various rank to settle in various styles of organizational behavior in terms of personality differences, leadership styles, management cultures, and management systems; in every micro-level, meso-level, and macro-level environment (Kwon, Farndale and Park, 2016). Moreover, the interaction of micro-level, meso-level, and macro-level environment need to be examined in terms of mutual understanding,

Preparing the Libraries for the Fourth Industrial Revolution (4th IR)

perceptions, expectations and barriers so that the positive work environment remains sustainable (Erez and Gati, 2004). Therefore, when a new era of disruptive changes come up, the study of interaction of organizational behavior in those levels should be scrutinized again especially in terms of adjusting with the new library missions and business styles parallel with the new government missions as well as stakeholders demands.

As compared to previous times of disruptive changes in the 80's and 90's, now would be different. In recent years, libraries need to examine the trend changes within organizational behavior comprehensively based on these key factors:

- i. People
- ii. Organization Structure
- iii. Environment
- iv. Technology

i. People

Changing people's mindset is strenuous for any organization in order to embed the 4th IR's working trends. The library leaders need to influence and instill a belief upon their staff that "*change is not a bad thing*"; "*to change is to survive*". However, the critical question is what kind of change elements do one wants one's staff to meet the 4th IR demands? It all depends on the results of study within the organization itself.

People's behavior does not change easily. Rather, change in behavior, especially habitual behavior, occurs continuously through a cyclical process. There are multiple behavioral theories and systems that can be applied to various stages where they may be most effective. For instance, Transtheoretical Model (TTM) posits that individuals move through six stages of change: precontemplation, contemplation, preparation, action, maintenance, and termination (Prochaska, DiClemente and Norcross, 1992). Different approaches and intervention strategies are needed to move the person's mindset to the next stage of change, step by step, until it reaches the maintenance stage, which is the ideal stage of behavior. It takes two years and above to change people's behavior.

ii. Organization Structure

Next, is the changing of the organization structure. There are various types of organizational structures that already exist in today's business landscape. There are:

- a. Traditional hierarchy structure
- b. Flatter structure
- c. Flat structure
- d. Flatarchies structure
- e. Holacratic structure

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

It is recommended for the libraries to assess the suitability in adapting other types of organization structure instead of remaining with the traditional hierarchy structure. Jacob Morgan (2014), the writer of book entitled: *'The Future of Work: Attract New Talent, Build Better Leaders, and Create a Competitive Organization'* provided a statement about the traditional hierarchy structure:

“An organization that remains with this (traditional hierarchy) model will be facing with a great deal of challenges. This type of model is riddled with bureaucracy and is extremely sluggish. It opens up the doors for competitors and new incumbents to quickly take over. When an organization is still stuck with the rigid hierarchy, it is going to be difficult to attract and retain top talents“

To catch up, libraries can apply either one of these two structures of organization in the upcoming years.

- a. First, the holacratic structure. The reason is that the structure system brings new form of governance, which enables and motivates staff to participate in decision-making and be more innovative. Since leaders are not required to run all the decision making, the chances for things to get done are higher.
- b. Secondly, the flatarchies structure. For Universiti Sains Malaysia (USM) Library, the process of adapting this structure has been implemented; which is apparent in terms of the running of Strategic Program in Research Support Service (SPiRESS) program, corporate programs and other types of ad hoc programs (Ahmat, et al, 2016). The flatarchies structure is especially good for those departments dedicated to innovation and new product development.

Moreover, in order to instill new culture that comes along with the new organizational structure, the libraries should also consider moving out of the classic culture in organizational behavior. Libraries should move forward from Autocratic style and Custodial Model to a far more dominant models called as Supportive Model and Collegial Model, adapted and proven by organizations focusing on customer services to having better impact on positive working environment (Itani, Jaramillo and Chonko, 2017; Kwiek, 2015; Lesniaski, MacPherson, Fister and McKinzie, 2001).

iii. Environment

To gain overall views of the risks of environmental changes, there is a need to analyze both the external and the internal contexts (Cadle, Paul and Turner, 2010). The PESTLE (Political, Economic, Social, Technological, Legal, Environmental) analysis tool provides the external context leading to an

Preparing the Libraries for the Fourth Industrial Revolution (4th IR)

assessment of opportunities and threats; whereas the internal context can be determined by a review of strengths, and weaknesses.

The combination of an external focus with the internal context enables libraries to assess the opportunities and threats from outside of the organization and the strengths and weaknesses within the organization itself.

iv. Technology

One of the most common effects of technology is the ability for library staff to work on mobile, enabling them to engage more with their users or customers. Until today, libraries are developing diversified technology towards Library 4.0 targets. Library 4.0 are currently described in the context of intelligent system, Makerspace, context-aware technology, Open Source, Big Data, Cloud Service, Augmented Reality, State-of-the-art Display, and Librarian 4.0 (Noh, 2015).

Having said so, however, libraries are recommended to take forethought actions in choosing the best among available options during the process of buying or subscribing multiple types of hardware and software. According Tucker and Kimbrell (2013), the library should avoid bringing in the technology tools that are:

- a. Underutilized and undervalued technologically,
- b. Difficult on technical glitches,
- c. Focused on being placed more on quantity as opposed to quality,
- d. Making the library staff having difficulty in keeping up with the technology and having to spend instructional time familiarizing themselves with that technology,
- e. Minimizing library business efficiency and increase maintenance cost, and
- f. Poor in performance, with loose security, less ownership and high limitations.

Redesign New Business Model

Facing the 4th IR, examining the suitability and necessity of redesigning new business model is an activity that libraries should partake particularly towards strategizing their business framework and activities. The current successful business organizations are using Osterwalder (2010) Business Model Canvas (BMC), which is a tool that helps to visualize, map, discuss, design and invent new business strategies. The Osterwalder's BMC uses nine building blocks of elements; customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. There are five reasons why BMC is being chosen as a preferred tool nowadays (Featherstone, 2015):

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

- i. It helps structure discussions - BMC is an easy guide for brainstorming. Grouping comments and ideas under the nine headings quickly gives shapes to ideas.
- ii. It is fast - using the BMC to write a one-page business model to see if the idea has values if the organization wants to launch a start-up venture services with low fixed costs.
- iii. It is great for developing a portfolio of ideas - the team members of an organization only need to spend minutes or hours sketching business models for multiple ideas and be mindful of bad ideas.
- iv. It intuitively makes sense - in its simplest form, it makes the team members of the organization reach and make benefits from customers.
- v. Appreciate the value proposition as important blocks - the customer value proposition is at the heart of the BMC. It forces the team members of the organization to think deeply about what product or services venture to be delivered to the customer, which problems it helps solve, and which customers' needs are satisfied.

Restructure Business Process Flow

Restructuring business process flow is an activity to write up a blend of recipes to guide staff as well as customers through a specific structured process that produces a specific service or product for customers. There are three main types of business processes (Hopwood, 2016; von Rosing, Kemp, Hove, Ross, 2014):

- i. Management processes that govern the operation of a system. Typical management processes include corporate governance and strategic management.
- ii. Operational processes that constitute the core business and create the primary value stream. Typical operational processes are purchasing, manufacturing, marketing, and sales.
- iii. Supporting processes that support the core processes. Examples include accounting, recruitment, and technical support.

Libraries are advised to examine the suitability and necessity to restructure the business process flow especially ones that are involved with removing any outdated and manual processes that slow down the efficiency of service delivery to customers. It is time to deploy high automation capabilities in any process levels (Chang and Huynh, 2016; Noh, 2015).

Remake the Job Descriptions and Roles

Libraries are encouraged to study and remake the new context of job descriptions and roles at every rank of staff. The element of changes are:

- i. For support staff, the manual routine tasks are would be replaced by robots; which brings about less work on those outdated manual tasks. It is about time for them to retrain themselves by introducing new skill sets and

Preparing the Libraries for the Fourth Industrial Revolution (4th IR)

emerge with multitask jobs that work with the robots. However, there are issues about commitment and motivations capabilities of gaining new specialties of working skills within the prescribed time frame before deploying it effectively within new environment (Pfeiffer, 2016).

- ii. For professional librarians, there is a pressure to equip oneself with multiple new skills and knowledge. Librarians are forced to merge new technical as well as professional competencies derived from various professional talents such as data scientist, digital content developer, digital user advisor, and community engagement and outreach officer. Some descriptions of such talents are:
 - a. Data scientist's talent capabilities; the ability to *"identify patterns, apply context and intelligence, extract relevant information hidden in the large volumes of data, design and implement data models and statistical methods, integrate research and best practices into problem avoidance and continuous improvement"* (De Mauro, Greco, Grimaldi and Ritala, 2018),
 - b. Digital content developer and digital user advisor's talent capabilities; the expertise to interact values of digital content which consist user-user interaction, contents-user interaction, and system-user interaction (Changsu and Jongheon, 2017), and,
 - c. Community engagement and outreach officer's talent capabilities; by being knowledgeable in the social skill areas to develop social network, coordinate relationships, and has strong connections to the community partners that being served (Harden and Loving, 2015).
- iii. For the library leaders, there is a need to develop new enlightenment perspectives about handling library issues within 4th IR era. For instance, there is a need of high intelligence capability to develop succession plans to encounter any types of unseen challenges that may threaten library's main roles in term of providing information services for its community, a role that could be taken over by other parties. Moreover, it is crucial for the leaders in making effective decisions for the stability and efficiency of library management in the long run of times. There are also concerns on leadership 'righteous' play roles especially on empathy, vision, communication, flexibility, delegation, and integrity (Miska and Mendenhall, 2018; Allard, Qayyum and Mehra, 2017; Marcum, 2016; Arabella Advisors, 2015; Chow, Rich, Chow and Rich, 2013).

CONCLUSION

Libraries need to, with good financial budget, start reshaping high positive organizational behaviours, designing new business model, restructuring business

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

process flow, and introducing new job descriptions as well as roles rather than placing concerns solely on purchasing and subscribing any great artificial intelligence (AI) machines and high-end technologies in the libraries. All the mentioned components, if unattainable, make libraries fail to optimize their services at its highest level, and eventually makes it impossible to produce inclusive impact for people to recognize the libraries' contributions.

On top of that, library leaders need to publish mutual understanding statements to deal with 4th IR challenges that would be taken as a guideline of best practices for any library. Consequently, the best practices will be dispersed to all libraries and being followed worldwide.

Lastly, it is also important for library staffs at any rank to create new attributes of skills and improvise themselves by learning new knowledge with a determination at changing the working styles that meet the 4th IR trends. Having said that, let us not forget that an integral part in a librarian role is to help people with information services. Librarians should continuously be prepared to empower people in terms of knowledge and skill capabilities, especially by making them understand how the future world of technology works and become technology literate for them to be able to use the knowledge properly and would not be left behind.

ACKNOWLEDGEMENT

We wish to thank the Chief Librarian of Universiti Sains Malaysia, Emerald Publishing and others who have supported this article's publication.

REFERENCES

- Ahmat, Muhammad Akmal; Misaridin, Shahriza Fadly; Azmi, Noor Adilah; Muhammadan, Lizawati; Hassan Basri, Jamilah; Mohamed Ghazali, Musa; Ismail, Abd Halim; Mohd Napiyah, Mohd Kamal; Che Jaafar, Cik Ramlah; Hussain, Husriati; Wan Jan, Noor Azlinda; Ahmad, Rosnani; Ismail, Mohd Ikhwan; Ghadzali, Mohd Pisol; Hj. Abd Rahim, Ali and Hj. Mohd Rashid, Mohd Nasir. 2016. *The Establishment of Strategic Program in Research Support Service (SPIRESS) in USM Library*. In: Seminar Perpustakaan Islam Serantau Merekayasa Perkongsian Pintar ke Arah Perpustakaan Unggul, 28-29 September 2016, Perpustakaan USIM, Bandar Baru Nilai, Nilai, Negeri Sembilan.
- Allard, S.; Qayyum, M. A. and Mehra, B. 2017. Intercultural leadership toolkit for librarians: Building awareness to effectively serve diverse multicultural populations. *Education Libraries*, Vol.30, no. 1:5-12.

Preparing the Libraries for the Fourth Industrial Revolution (4th IR)

- Arabella Advisors. 2015. *Cultivating Global Library Leadership: A Review of Leadership Training Programs for Librarians Worldwide*. San Francisco, CA: Arabella.
- Buckland, M. K.; Gorman, M. and Gorman, M. 1992. *Redesigning library services: a manifesto* (Vol. 19). Chicago, IL: American Library Association.
- Cadle, J.; Paul, D. and Turner, P. 2010. *Business analysis techniques: 72 essential tools for success*. BCS, The Chartered Institute.
- Chad, K. 2009. Disrupting libraries. In: *Presentation, 29th Annual Charleston Conference: Issues in Book and Serial Acquisition, Charleston, SC*.
- Chang, J. H. and Huynh, P. 2016. *ASEAN in Transformation the Future of Jobs at Risk of Automation*. International Labour Organization.
- Changsu, K. and Jongheon, K. 2017. Developing a Digital Contents Valuing Model: How users appreciate their values. *Journal of International Technology & Information Management*, Vol. 26, no. 4: 51-82.
- Chow, A. S.; Rich, M.; Chow, A. and Rich, M. 2013. The ideal qualities and tasks of library leaders: Perspectives of academic, public, school, and special library administrators. *Library Leadership and Management*, Vol. 27, no. 1-2.
- Christensen, C. M. and Overdorf, M. 2000. Meeting the challenge of disruptive change. *Harvard business review*, Vol. 78, no. 2: 66-77.
- Church, J.; Butz, C.; Cassell, K.; Kamar, N.; Swindells, G.; Tallman, K. and Snellenberg, R. V. 2017. Global Vision Discussion Report of the Government Information and Official Publications meeting: How a united library field can tackle the challenges of the future. July 5, 2017 (Government Information and Official Publications, Trans.) *IFLA Global Vision: Section and SIG Reports*. Den Haag, The Netherlands: International Federation of Library Associations and Institutions (IFLA).
- De Mauro, A.; Greco, M.; Grimaldi, M. and Ritala, P. 2018. Human resources for Big Data professions: A systematic classification of job roles and required skill sets. *Information Processing & Management*, Vol. 54, no. 5: 807-817.
- Erez, M. and Gati, E. 2004. A dynamic, multi- level model of culture: from the micro level of the individual to the macro level of a global culture. *Applied Psychology*, Vol. 53, no. 4: 583-598.
- Featherstone, T. 2015. *Five big benefits of the Business Model Canvas*. Retrieved 14 February 2018 from: <http://www.shortpress.com.au/five-big-benefits-of-the-business-model-canvas>.
- Fibrich, N. (2017). Libraries and their place in the fourth industrial revolution. *Blog of Library Training Services Australia*. Retrieved 4 February 2018 from: <http://blog.ltsa.edu.au/libraries-and-their-place-in-the-fourth-industrial-revolution>
- Harden, S. B. and Loving, K. 2015. Outreach and engagement staff and communities of practice: A journey from practice to theory for an emerging professional identity and community. *Journal of Community Engagement and Scholarship*, Vol. 8, no. 2:7-15.

Muhammad Akmal Ahmat and Rabihtul Adauwiyah Abu Hanipah

- Hopwood, W. S. 2016. Just the Facts 101 Textbookkeyfacts Texbook Outlines, Highlights & Practice Quizzes, Forensic Accounting: Cram101 Textbook Reviews. [n.p]: Aipi. eISBN: 9781467281188
- Itani, O. S.; Jaramillo, F. and Chonko, L. 2017. Achieving top performance while building collegiality in sales: It all starts with ethics. *Journal of Business Ethics*, 1-22.
- Kwiek, M. 2015. The unfading power of collegiality? University governance in Poland in a European comparative and quantitative perspective. *International Journal of Educational Development*, Vol. 43:77-89.
- Kwon, B.; Farndale, E. and Park, J. G. 2016. Employee voice and work engagement: Macro, meso, and micro-level drivers of convergence? *Human Resource Management Review*, Vol. 26, no. 4: 327-337.
- Lesniaski, D.; MacPherson, K. H.; Fister, B. and McKinzie, S. 2001, March. Collegial leadership in academic libraries. In: *Crossing the Divide: Proceedings of the Tenth National Conference of the Association of College and Research Libraries*. pp. 233-39.
- Lewis, D. W. 2004. The innovator's dilemma: Disruptive change and academic libraries. *Library Administration & Management*, Vol. 18, no. 2:68-74
- Marcum, D. B. 2016. Library leadership for the digital age 1. *Information Services & Use*, Vol. 36, no. 1-2:105-111.
- Miska, C. and Mendenhall, M. E. 2018. Responsible leadership: A mapping of extant research and future directions. *Journal of Business Ethics*, Vol. 148, no. 1: 117-134. doi: 10.1007/s10551-015-2999-0
- Morgan, J. 2014. *The future of Work: Attract New Talent, Build Better Leaders, and Create a Competitive Organization*. John Wiley & Sons.
- Noh, Y. 2015. Imagining library 4.0: Creating a model for future libraries. *The Journal of Academic Librarianship*, Vol. 41, no. 6: 786-797.
- Pfeiffer, S. 2016. Robots, Industry 4.0 and humans, or why assembly work is more than routine work. *Societies*, Vol. 6, no. 2: 16.
- Prochaska, J. O.; DiClemente, C. C. and Norcross, J. C. 1992. In search of how people change: applications to addictive behaviors. *American Psychologist*, Vol. 47, no. 9:1102.
- Razak, D. A. 2017. Revolusi Industri Ke-4: Mampukah Menginsankan Teknologi? *Majalah Sains.com*.
- Schwab, K. 2017. *The fourth industrial revolution*. Crown Business.Schwa/
- Tucker, S. and Kimbrell, J. 2013. The impact of web 2.0, web 3.0, and web 4.0 technologies used in distance education. In: *ICERI2013 Proceedings*. pp. 6803-6809. IATED.
- von Rosing, M.; Kemp, N.; Hove, M. and Ross, J.W. 2014. Process Tagging - A Process Classification and Categorization Concept. In: von Rosing, M.; Scheer, A.-W.; von Scheel, H. *The Complete Business Process Handbook: Body of Knowledge from Process Modeling to BPM*. Vol. 1. Morgan Kaufmann. pp. 123-172.