Technology of Health Services in Industrial Revolution 4.0 Era

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Abstract. This study aims to provide information about the digital health services that use technology. The research method used in this study is qualitative method or literature studies. The results showed that currently health services in Indonesia are using IoT. The biggest opportunity that will change health industry is use of CPS, IoS, IoT, Cloud Computing technology, and many more. Nowadays, there are around 10 digital health services operating in Indonesia. In addition, digital health is predicted to become the next unicorn start up company. This digital health service profession will also help in preparing for the challenges of the coming Industry Revolution 4.0.

1. Introduction

Information needed to achieve certain production is to combine or process selected inputs that include inter-company production processes, organizational structures, and management techniques [1]. In theory about technology it can be seen that technology can process information using selected data that can be used by various organizations. Health technology is an organized application of knowledge and skills in the form of devices, medicines, vaccines, procedures, and systems developed to solve health problems and improve quality of life [2]. Health care is a treatment that focuses on the health of patients and gives full attention to patient's health [3]. This health service starts from the announcement of the importance of health, prevention, care at home or hospital, and diagnostics. Technological advances have created benefits for the business world. New concepts such as the Internet of Things (IoT), Cyber Physical Systems (CPS), cloud computing, and Cognitive computing is a term used in defining the Industry Revolution 4.0 [4]. In other words, Industry 4.0 will play an important role in transforming traditional companies into unicorn startup companies with the help of IoT and CPS.

The influence of the 4.0 Industry Revolution health industry is significant in Indonesia [5]. Previous study also explains the potential and challenges to the use of Big Data in health services for Industry 4.0 [6]. Smart Health enters the industry in creating new value on IoT as it is needed for a long-term focused care for the elderly [7].

Previous study also conducts a research on a list of start-up hotlists engaged in health technology along with business opportunities to invest in the city of Stockholm, Sweden. [8] Industry design principles 4.0 are well suited in the health sector especially in asthma diagnosis and therapy [9]. However, this research will discuss the application of technology in the health service sector in accordance with the components and principles of Industry 4.0.

This study aims to provide information about the digital health services that use technology. The research method used in this study is qualitative method or literature studies.
2. Method
The research method used is descriptive method which explains a problem from several phenomena. We took several theories from literature studies to be used as references.

3. Results and Discussion
3.1 Industry Components 4.0
There are opportunities to develop technological health in Industry 4.0. In addition, the application of health technology in Indonesia has been supported by the Government Regulations, with the presence of Industry 4.0 and the NEXTCORN project on press releases No. 251/HM/KOMINFO/12/2017. This advantage is certainly obtained by all parties in the current Industry Era 4.0. (See Figure 1).

| Search Term (Group)                     | Number of Publications in Which Search Term (Group) Occurred |
|----------------------------------------|-------------------------------------------------------------|
| Cyber-Physical Systems, Cyber-Physikalische Systeme, CPS | 46                                                          |
| Internet of Things, Internet der Dinge | 36                                                          |
| Smart Factory, Intelligente Fabrik     | 24                                                          |
| Internet of Services, Internet der Dienste | 19                                                        |
| Smart Product, intelligentes Produkt   | 10                                                          |
| M2M, Machine-to-Machine                | 8                                                           |
| Big Data                               | 7                                                           |
| Cloud                                  | 5                                                           |

Figure 1. Most Search Results for Industry Components 4.0 [10]

In Figure 1, it is identified that there are 4 main components of industry 4.0 including CPS, Internet of Things, Smart Factory, and Internet of Service [10]. There are 2 components which are not included in stand-alone components from Industry 4.0, namely Big Data and Cloud Computing. Both of these are data services that will be utilized to obtain information during implementation Industry 4.0.

3.2 Health Sector Opportunities in Industry 4.0
An entrepreneur who is an expert in the field of technology can also be a technopreneur [11]. One of the entrepreneurs in the field of technology can be someone from the medical profession who is aware of the importance of technology in this era. 50% of doctors believe that smart phones are now able to attract patients to actively regulate their health [12]. Almost all people in Indonesia use mobile phones to monitor their health through an application. Thus, the data of a person can be collected easily which will help the process of further research and analysis of the health data. In the Start-up Asia Development Discussion, Minister of Communication and Information explained that there are three types of start-ups that have the opportunity to become the next unicorn startup company.

In addition, the existence of telemedicine health services can monitor patient treatment by utilizing communication technology. This can help in data collection and also treatment for the elderly. In the future, telemedicine is also expected to help residents receive the results of health checks without having to go to the hospital.

3.3 Application of Health Technology 4.0 in Indonesia
In Indonesia, the government is currently operating the things needed to build components in Industry 4.0. However, the Ministry of Industry is only focusing on strategies to build a strong manufacturing industry in 5 sectors, namely Food and Beverage, Textile and Apparel, Automotive, Chemical, and Electronics [13]. Nevertheless, the Ministry of Health has developed a National E-Health Strategy which is listed in the Regulation of the Minister of Health of the Republic of Indonesia Number 46 of 2017. This reinforces that Indonesia currently trying to develop Health Technology in accordance with policies set by the government. Implementation according to this regulation will help several issues such as health development that is not yet widely accessible.
At present, several regions have not yet used technology. However, the application of health technology is expected to be able to reach the unreached areas including the data transfer process using the help of the Internet of Things and the Internet of Services. So that this can be in accordance with the strategy and national expectations to; (1) expand and improve services and applications of information and communication technology systems that are able to improve the quality of work processes of health care workers and (2) expand and strengthen information and communication technology infrastructure for e-health implementation widely [14]. One of these strategies can help to develop the application of health technology 4.0.

3.4 Health Services Covering 4 Industry Components 4.0

Based on the 2017 Asia Health Tech Investment Landscape report by Galen Growth Asia, there are 6 categories of health technology services in Asia that have developed rapidly (see Figure 2).

These six services have raised more than $ 2.6 billion in 230 deals. At present, there are 9 countries with a market share of more than 2% and Indonesia ranks 5th with 3% start up health technology [15]. Judging from the report, now many people have started to use health technology services in Asia.

A. Cyber-Physical System

The workings of the Cyber-Physical System use a combination of an internet network that can connect controllers, sensors, and actuators. This system is certainly a physical form that is connected to the internet network [16], and can be controlled remotely using an actuator. One of it is Electronic Medical Records (EMR). EMR is a cyber physic interface design for automatic readings of the body's vital signs. This interface integrates sensors through a cable network that will carry out recording and storing information into the EMR system as structural data [17]. This health service is also included in the Medical Data and Analytics service, where the system will record the body's vital signs and then the data is stored in the EMR system. Many people who currently pay less attention to body health checks can monitor using a technology-based health system that can be monitored remotely without having to go to the hospital continuously.

B. Internet of Things

The Internet of Things can be described as a network of items, each of it is embedded with sensors and connected to the internet [18]. At present, there have been many who have implemented IoT in various manufacturing, one of it is in the health sector, which is Fall-Detecting System. Besides using IoT, this system also uses the application of CPS, Cloud Computing, and Big Data. (See Figure 3)
Figure 3. Flowchart of Fall-Detecting System [19]

Fall-Detecting System is designed to monitor and detect when someone falls using an accelerometer. Then, the system will send a signal or an alarm to the closest relatives or the hospital. This system is suitable by the elderly. This system can identify eight types of postures and seven types of daily activities such as jogging, lying down, sitting, standing, walking jumping, and movement on the stairs [17]. This algorithm works by calculating the difference between body contact when on the ground and the body at rest in a certain time. This health service is also included in the IoT Health and Wellness services as well as Medical Data and Analytics (see Figure 3).

C. Smart Factory

Smart factories have not been widely applied in health machines. Now, factories increasingly have high-quality networks and machines that are integrated [20]. With a smart factory in the hospital, treatment for patients who need emergency help can also be treated immediately, so they can avoid things that are not expected. In addition to handle patients, smart factories can produce robots to help in the lab (See Figure 4).

Figure 4. Classification of monitoring components and types of sensor measurements on various types of manufacturing machines. [20]
This critical component will be able to be monitored by the type of sensor to get the condition of the machine in the form of data. At the smart factory, data retrieved from the component will be sent to the database to the control centre. At the control centre, the data is taken from different sensors. Then, it will be extracted to represent health status assessments.

D. Internet of Service

This internet service has been used a lot. One system that uses IoS is MobiHealth. This system can collect the data from sensor devices that are used and carried by people throughout the day. This system is one of the initial efforts to obtain health data through sensors to monitor a person's medical status. This sensor will collect audio and video signals to provide an initial response in the event of an accident. This health service is included in Medical Data and Analytics and Mobile Health Apps that use CPS, Big Data, and other technologies.

The elderly needs a technology that is easy to use to monitor their health's conditions. The use of components in industry 4.0 and Big Data can be utilized for developers. With these, entrepreneurs can build start-ups to develop software healthtech. This application is certainly has a significant advantage in Indonesia.

4. Conclusion

There are 6 healthtech service categories that are most in demand in the health industry. Besides that, in the six health services it covers the components of Industry 4.0. The combination of technology, it provides a lot of advantages, especially for the elderly. Besides, it seems that the Cyber-Physical System does not need to use HR to collect and record the new information.

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