Healthcare System Prospects and Challenges in Thailand 4.0

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Abstract

Now, Thailand is coming to 4.0 era which is innovation and technology. There are many digital technologies that makes people's life convenient including healthcare system. Many digital technologies can apply to improve healthcare system. The digital technologies such as social medias, internet, mobile applications, cloud computing, big data, robotics and Artificial Intelligences (AI) are applied to medical services. Hospital can use these technologies to improve their services. Doctors and paramedical personals need to study the new technologies and apply to use in their organizations. Finally, people also study the new technologies in order to get medical treatment sufficiently.

Keywords: Healthcare, Medical, Digital technologies

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เป้าหมายและความท้าทายของระบบดูแลสุขภาพในยุคประเทศไทย 4.0

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บทคัดย่อ

ปัจจุบันประเทศไทยกำลังเข้าสู่ยุค 4.0 ซึ่งเป็นยุคของนวัตกรรมและเทคโนโลยี มีเทคโนโลยีดิจิทัลมากมายที่ทำให้การดำรงชีวิตของประชาชนสะดวกสบายมากขึ้น ซึ่งรวมไปถึงระบบดูแลสุขภาพด้วย โดยเทคโนโลยีดิจิทัล เช่น สื่อสังคมออนไลน์ (social medias) อินเตอร์เน็ต (internet) โปรแกรมประยุกต์สำหรับอุปกรณ์เคลื่อนที่ (mobile applications) บริการประมวลผลข้อมูลออนไลน์ (cloud computing) ข้อมูลขนาดใหญ่ (big data) หุ่นยนต์ (robotics) และ ปัญญาประดิษฐ์ (Artificial Intelligences, AI) ซึ่งสามารถนำมาประยุกต์ใช้ด้านการให้บริการสุขภาพ โรงพยาบาลสามารถนำเทคโนโลยีเหล่านี้มาใช้ในการพัฒนาการบริการ แพทย์และบุคลากรทางการแพทย์จำเป็นต้องศึกษาเทคโนโลยีใหม่ และนำมาประยุกต์ใช้ในองค์กร สุดท้ายนี้ประชาชนควรศึกษาเทคโนโลยีใหม่ด้วย เพื่อรับบริการด้านการแพทย์ได้อย่างทั่วถึง

คำสำคัญ: ดูแลสุขภาพ, การแพทย์, ดิจิทัลเทคโนโลยี

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Introduction to Thailand 4.0

Since 1961, Thailand had the 1st economic and industry development plan. Now, Thailand has economic and industry development plans which are Thailand 1.0, Thailand 2.0, Thailand 3.0 and Thailand 4.0. Thailand 1.0 was the 1st model emphasized in agricultural industry. Many agricultures such as paddies, cassava, para rubber, etc. were exported in this model. In Thailand 2.0 model, light industries using man power mainly were emphasized in order to reduce imported products. In Thailand 3.0 model, heavy industries such as electronic product, vehicle part, petroleum, etc. were emphasized in order to increase exporting value. Since Thailand 3.0 model cannot free the country economy from middle income trap, inequality trap and imbalance trap, Thailand 4.0 model using innovation to drive economy was emphasized. This model is a tool to develop Thailand from middle income country to high income country using technology and innovation as shown in Figure 1.

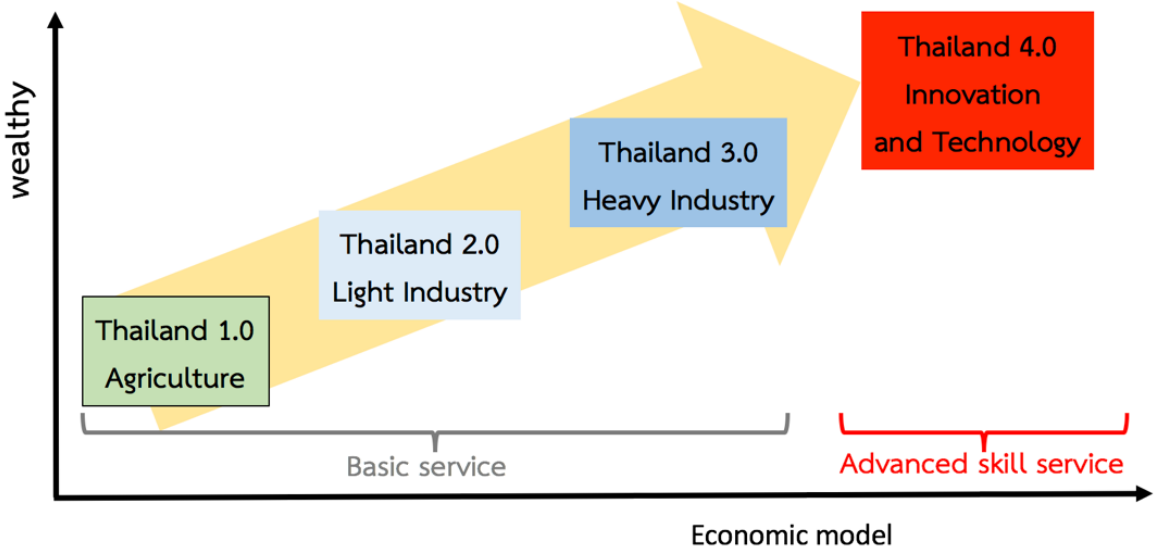

Figure 1. Thailand economic models

According to Thailand 4.0 model, the healthcare system is now changed from analog system to digital system using information technology (IT) as a main tool. Since information technology is part of living activities such as working, living, and relaxing, it can also be used in healthcare system to make more positive result to Thai people. The health institutions in Thailand having stakeholders in this model are the Ministry of Public Health, the Ministry of Digital Economy and Society, private and public hospital, clinic, medicine shop, education institute having health schooling and health research and medical industry.

Technologies for Healthcare System in Digital Era

Now, healthcare system will have great usefulness when it is applied by digital technologies. This section describes how digital technologies can be applied to healthcare system. The 8 main technologies that make healthcare system advanced describe are as follows:

1. Social Medias and Networks

These information technologies are designed for communication connected by social medias and the internet. They are very low cost communication that can distribute not only voice communication, but also texts, images, files and videos. If social medias and networks are applied in healthcare system, it will raise convenience between patient and doctor to exchange health issues. Moreover, doctors and doctors can communicate with any another professional to share their experiences to discuss and improve their knowledge together. Social Medias and Networks also can reduce travelling cost in healthcare system. Finally, people can gain more knowledge about healthcare via these technologies.

2. Internet of Things (IoT)

Since internet system is applied to many products, they are connected with one another in order to send their information to users or other devices. For example, wearable devices can record user activities such as footsteps, walking distance, exercise time including heart rate. According to health information, doctors have very useful information for diagnosis of disease and activity adjustment. Moreover, this technology can track location that applied to track patient or elderly to send their location to the hospitals when they have emergency situation.

This technology has advantage for patients who always need to measure health information such as heartrate and blood pressure.

3. Mobile Applications

Smartphone is now like a part of the body. Therefore, it can send/receive voice, image, video including internet from people to people rapidly. The applications in smartphone can applied to healthcare system in order to reduce waiting time, crowded patients in hospital. The hospital can contact patient directly using mobile application. Some hospitals in Thailand use their mobile application to make an appointment automatically between patient and doctor precisely. Therefore, patients do not need to wait for doctor for a long time anymore.

This technology is suitable for secondary hospital or bigger that has many patients and doctor. In order to use technology, hospital should have online department to manage a lot of information from many patients and doctors.

4. Cloud Computing

Cloud computing is the data storage and processing in huge computer located far away from user, but it can send/receive information via the internet. Therefore, users can reduce their cost in buying high performance computers, huge data storages and expensive **software**. Cloud computing has 3 types; Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

Software as a Service (SaaS) is a software rent service via internet. The processing unit is located to service provider. Therefore, user does not need high performance hardware or software. Moreover, user can do their work anywhere and anytime. The examples of SaaS are Google Docs, Google Apps, Microsoft OneNote, Microsoft Office 360.

Platform as a Service (PaaS) is hardware, software and command packages prepared by service provider. User can send data via internet to use these facilities to develop their project. The examples of PaaS are Google App Engine and Microsoft Azure.

Infrastructure as a Service (IaaS) is virtualization computer service sometimes called virtual desktop. The IaaS is storage and processing rent service. For storage rent, user can backup their data via internet, and the storage size can be adjusted by user such as DropBox, Google Drive and iCloud. For processing rent, user can send data via internet to service provider to process. Then, service provider sends the result to user. The examples of IaaS are Google Compute Engine, Amazon Web Services and Microsoft Azure. The cloud computing structure is shown in Figure 2.

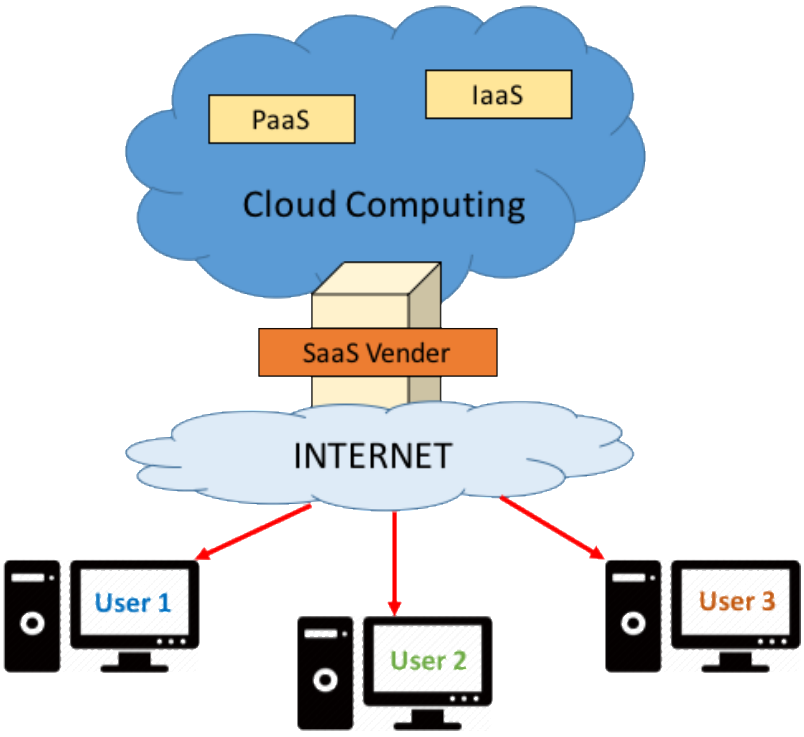

Figure 2 : The cloud computing structure

In healthcare system, cloud computing can reduce cost from computer storage for patient medical history and computer processing such as X-ray image processing. This technology is suitable for affiliated hospital that has many branches.

5. Big Data

Since digital storage technology is now advanced today, Enormous data can be stored with very low cost. Therefore, the detail of health information can be recorded finely, and it will help doctor to analyze the disease in order to diagnose precisely. Doctor does not need to ask patient about their health history, treat history or drug allergy. According to enormous health data, doctor can analyze data to find the suitable way to treat the patient.

This technology has advantage for Artificial Intelligences (AI) in order to learn a lot of information to improve its accuracy.

6. Robotics

Robotic technology always develops to commercial use. In health care system, robot can help doctor to do fine work such as surgery robot. The surgical robot can reduce surgical incision, recuperate time and doctor hand vibration. Moreover, robot can remind medicine time, detect abnormal status or call for help in emergency situation.

This technology is suitable for precision surgery that need a lot of accuracy in order to reduce human error.

7. Artificial Intelligences (AI)

Artificial Intelligences known as AI is a technology for autonomous system. Since today is big data era, computer can learn from enormous data called machine learning. Now, it has many AI related in people's life such as social media advertising. AI learn what people interesting one by one, and it will suggest product advertising to each people specifically. In healthcare system, AI can learn and analyze enormous treatment histories, and it can suggest patient without any doctor. Therefore, AI can reduce doctor's workload and increase their performance to patients.

8. Data Security

The data security is a system that protect access authority. The objectives of data security are secrecy, integrity, availability and rick assessment. In the digital era, data security is very important, because a lot of information is now digital file. Therefore, if the data has low security, criminal can hack the personal or secret information.

There are many data security systems. In this paper the examples of data security will be explained as follows.

8.1 Adaptive Access Control

The adaptive access control is a controller called Context-aware Access Control. It has profile used to detect different rick depending on situations such as place, device and time. administrator can set the different contexts in order to access to secured data.

8.2 Threat Intelligence

Threat intelligence, sometimes called cyber threat intelligence (CTI), is refined, organized and analyzed information about current or potential attacks that intimidate an organization. The aim of threat intelligence is to help the organizations to understand the risks of the most severe external threats. The threat intelligence consists of the in-depth information about the specific threats in order to help organizations protect themselves from many types of attacks.

8.3 Software-defined

Software-defined is the security system that in not depend on hardware. It mostly uses with system that cannot use hardware security such as virtualization and cloud system. However, hardware security is necessary to use with software-defined for more protection.

8.4 Interactive Application Security Testing (IAST)

The IAST is application security testing form stemmed by a combination of runtime application self-protection (RASP) and dynamic application security testing (DAST) technologies. The result of attack will be reported to developers. The IAST reports help developers prioritizing the frailty findings from the dynamic scans. Therefore, developers can reduce risk effectively while keeping up with production schedules.

The Healthcare Consequence in Thailand 4.0

In Thailand 4.0, the healthcare consequence should have many significant effects for Thai people that can be described as follows:

1. Thai people will be active healthy citizen

In 3-4 years ago, Thai people used various social network technologies. There were a lot of fake sharing information that caused harmful impact to people health. Therefore, the Ministry of Public Health or related departments should control the unofficial healthcare information and share the official information about healthcare to Thai people directly using social network technologies or websites that can cause benefit to Thai people in order to take care of themselves correctly.

2. Thai people will have their personal health information

All Thai people will have personal health information the can be recorded, edited and sent to the doctors starting from birth date in order to plan their treatment correctly

and accurately. Moreover, the big data, cloud computing and mobile application can work together to facilitate doctor's diagnosis. For example, big data can store a lot of personal medical histories such as vaccine history (type of vaccines, taking dates and doses), allergies and congenital disorder. Then, the cloud computing can process the information from big data and display according to mobile application. The doctor can send all medical histories to another doctor instantaneously. It can reduce time for query, medical history searching, service time and medical expenses.

3. Thai people will have convenient, fast and qualitative services from hospital and clinic

Normally, patient need to wait for a long time inside to receive the preschool medicine. It is necessary to reorganize the hospital service system using technologies in order to reduce waiting time. The mobile application can solve this problem suitably. In Thailand 4.0, Thai people can use online booking for taking medical. They need to know number of queues and appointment time before making decision. This application can reduce waiting time and crowded patients who wait to receive the preschool medicine in hospital.

4. Doctors, nurses, dentists or related careers can work as network to reduce diagnosis error or cost.

According to mobile application and social network technologies, doctors will not work alone, but they can work together with other doctors who have more experience or profession with real-time communication. In case of doubt, doctors can cooperate inside and outside the hospital with fast communication and low cost. Moreover, patient who need to transfer to another hospital can send their medical history to destination hospital in order to prepare the availability.

5. The information technology system will collect and analyze health information in order to improve AI system.

The recorded health information can use to analyze in order to improve AI system. The analyzed information from AI system helps doctor to diagnose diseases. For example, the algorithm called CheXNet. It can detect the pneumonia from chest X-rays. The CheXNet is a 121-layer convolutional neural network trained on ChestX-ray14. It currently is the largest publicly available chest X-ray dataset that contains over 100,000 frontal-view images with 14 diseases. Moreover, four academic radiologists already annotated a test set, and compare the performance of CheXNet to the radiologists. The result shows that the CheXNet can exceed the average of radiologist performance on the F1 metric. Finally, they improved the CheXNet to detect all 14 diseases in ChestX-ray14 and achieved state of the results on all 14 diseases.

Conclusion

The reorganization of healthcare in Thailand 4.0 will turn the analog system to digital system by leaps and bounds using many information technologies that completely change the way of services and diagnostics. It will cause advanced benefits to healthcare system in Thailand. The Ministry of Public Health should place importance on these changes. Hospital can use the technology to improve their services. Doctors and related career need to study the new technologies and apply to use in their organization. Finally, people also study the new technologies in order to get medical Treatments efficiently.

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