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The development and policies of ICT supporting educational technology in Singapore, Thailand, Indonesia, and Myanmar

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ABSTRACT

This study has an objective to identify the development and policies of educational technology application in ASEAN countries. Through the literature review and analysis, this recent study has compared the issue of educational technology development and policies in ASEAN countries. The reviewing country has been chosen based on the Information and Communication Technology (ICT) index amongst the ASEAN countries, that are Singapore (as the highest rank), Thailand & Indonesia (as the middle rank), and Myanmar (as the lowest rank). The result of the study shows that the majority of the countries focused to improve network capabilities in supporting online learning, and the policies of each country showed a similarity in improving the technology equity for the learner. However, Singapore shows more advance technological implementation such as the application of broader Artificial Intelligence in classroom activity, while the use of Artificial Intelligence (AI) in Thailand and Indonesia still in developing progress. In conclusion, the technology education development in ASEAN countries has moved forward through the past year and the policies of educational technology for each country have been similar in strengthening the ASEAN plan.

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1. INTRODUCTION

Education essentially defines as a process to transform the information to others. In more advance definition, education is the process of facilitating people to gain knowledge, skills, values, beliefs, and habits. Achieving the goal of education is not supported only by a better approach and learning model, but also the tools to deliver learning material has become the most important thing such as the newest technology. By involving technology in the learning process, it can improve the output of the education process.

In the 21st century, the fast-shifting of technology trends has affected the all human aspect including the educational system. The implication of using the technologies as tools to transfer the learning material improves the performances and learning experiences and supporting constructivist learning by providing the authentic learning environment. Although the implementation of technology already shows positive values, the consideration of various aspect should be included in its application such as national policies, educational stakeholder readiness, and facilities distribution. The need of technology for the learning process had been used since 2000 years ago, which has a function to understand and to enhance human learning in terms of what, where, when, how, and why a person learns. Nowadays, the integration technology in the teaching and

learning process has been known as Educational technology approaches. Educational technology approaches present massive and rapidly improvement in recent years to include such devices and approaches [1]. There are several impacts of technology such as powerful media to transform learning information, to build advance relationships between educators and learners, to reinvent our approaches in learning and collaboration, to overcome long-standing equity and accessibility gaps, and to fulfill the needs of all learners by improving learning experiences [2].

Most educational experts [1, 3-5] defined educational technology as an effective way of using the technologies as tools and media to transfer the learning material, improving performances and learning experiences. Moreover, association for educational communication and technology (AECT) defined educational technology as the theory and practice of design, development, management, utilization, and evaluation of resources and process for learning activities [4]. On the other hand, educational technology has emerged to mean such as: 1) The development of physical and mental form is deployed systematically that constantly enhance the optimal learning and teaching environments; and 2) The structured development of tools, materials, methods, and processes that constantly supports the educational context of learning [6]. Additionally, there are several foundation pillars of education technology which strongly influence what people do when in instructional situations, that is: communication, interaction, environment, culture, instruction, and learning [3].

The technology devices and approaches are categorized into educational technology as long the devices or approaches fulfill one of the domains of educational technology, that are: 1) as a tutor/guides; 2) as a technology tool; and 3) as a learning tool [5]. Whereas the other perspective describes educational technology should consist several aspects which explaining the intellectual and technical development, that are: 1) as the theory and practice of educational approaches to learning; 2) as technological media that help in the communication of knowledge, and its development and exchange; 3) for learning system management (LMS) and education management information systems (EMIS); and 4) as an educational subject [4, 5].

In the early age of educational technology development, it has shown an important contribution to educational technology devices and approaches until today. The first technology was used to train the military personnel about military tactical and survival in World War II by using motion picture and film in the 1940s. The next decades, the rise of several theories and movements had affected the educational technology trend and development, such as Benjamin Bloom [7] developed the taxonomy of educational objectives as the context of online learning. During 1970-1980, the microcomputer was used for the first time as an instructional computer. At the same period, several educational technology approaches were introduced to the public such as computer-based learning (CBT), computer-based learning (CBL). In 1990, the World Wide Web and internet were introduced as a learning instruction and show great improvement until today.

Most educational scholars believe that the integration of technologies (devices and approaches) into the educational system will improve in the future by following human needs. The use of technology as the instructional media in the classroom has given several advantages, including: improving educational open-access, giving chance for non-full-time students on continuing education, improving interaction between students and teacher, training the student to solve learning problem independently, improving student's technological skill, no age limitation for students to learn for any level of knowledge (students can go at their own pace), minimizing travel cost, accessing the learning material easily, increasing student motivation, wide and global participation for educational program, improving students writing skills, assisting teacher to conduct an assessment and other tasks [4].

Moreover, several experts argue that the effectiveness of technology can become the advantages of technology as the instructional media such as the computers used for instruction, students usually learn more in less time when receiving computer-based instruction and they like classes more and develop more positive attitudes toward computers in computer-based classes. Additionally, the concept of attractiveness, which is students are more motivated to learn when they are interested in the subject matter, which can be enhanced by using technologies in the classroom and by targeting the need for screens and digital material [8]. This recent study is attempting to investigate several points about educational technology in South East Asian countries, including the national policy, ICT plan, and recent technological development for education.

2. RESEARCH METHOD

This study is conducted by using a literature review method known as library research. The library research is collected by reviewing and analyzing other studies both published or unpublished articles and reports [9]. This recent study is conducted using secondary data as a collection method. This type of data comes from previous study or survey and it is considered to be used for the new study [10]. Generally, secondary data can be obtained from different institutions, such as private databases, government databases, or federal agencies statistics [11]. This recent study has obtained the data and information from printed and

online articles, journals, books, reports, and database records from several institutions. The information analysis is conducted by carefully synthesized and identified the information which focus on explaining national policy, ICT plan, and recent technological development for education.

3. RESULTS AND DISCUSSION

Nowadays, most countries technology preference is influenced by the trend of technology itself. However, there are several obstacles faced by countries to apply recent technology, such as economic development, national infrastructure, policies, and human resources. Consequently, every country shows different preferences of technology (devices and approach), especially for educational purpose. There are several examples of technology preferences for education based on economic and infrastructure perspective. In the USA, the cost of internet broadband is about 1.1% of per-capita income, while in a country such as Bangladesh, the annual cost of connection to the Internet is sufficient to feed a family for the whole year. On the other hand, there is different infrastructure support for each country such as in European countries in which the schools have access to the internet connection, while in Africa only 9.6% of the population can access the internet [12].

Similar phenomena are faced in the South East Asia Region (ASEAN), development gaps such economic growth, education context, human resources, infrastructure, and policies make a great impact to the technology preferences and educational technology perspective between ASEAN countries. For example, Singapore is more focus on the development of thinking through the role of ICT in the future socio-economic problem and preparing its future workforce. Other nations such as Indonesia, Thailand, Philippines and Vietnam may have slower rates in the spread and development of ICT infrastructure. However, the large populations of these countries showed excellent prospect ICT markets. Lastly, the rising interest in Myanmar from international investors and aid organizations provides a unique opportunity for the nation to experiment with a variety of ICT based programs, based on the experiences of other countries in ASEAN. According to different status and development for each country in ASEAN, this paper is initiated to analyze the educational technological development in the 21st century based on countries educational policies and technological trends through literature review for each ASEAN country. This study is reviewed by several countries such as Singapore, Thailand, Indonesia, & Myanmar. All of these countries are chosen based on the ICT index level which Singapore is the highest rank, while Thailand and Indonesia are in the middle rank, and Myanmar is the lowest class for ICT Indexes.

3.1. Singapore

As one of the modern countries today, Singapore has an outstanding development and improvement in their educational system. This successful path has shown by the intention of The Ministry of Education of Singapore to integrate ICT as the part of their education system by establishing Educational technology as one of educational organizational structure in Singapore MOE, which has the mission to be the catalyst in harnessing information and communication technologies (ICT) to enrich learning and teaching. Moreover, The Singapore government has supported by spending about 12.8 billion Singapore dollars (9.2 billion USD) for education in 2018 [13].

In 2017, ICT Development Index data showed outstanding progress for Singapore rank. Singapore became the highest rank in ASEAN, while 18th in the world. This achievement was supported by the Technology Master Plan which was arranged by the Singapore government to pursue a systematic and systemic approach to promote the ICT for learning into schools and continuing support for its effective adoption and deployment for teaching and learning process. According to UNICEF article [14], The Singapore Technology master plan consisted of fourth stages.

The first Master plan (1997-2002) known as “Building the foundation for technology” is preparation phase which aim is providing schools with the basic infrastructure to provide training to use technology, the curriculum time was targeted to have ICT-enabled lessons about 30%, to create teacher mindset to embrace ICT as the instructional tool, and introduce telecommunications tools as collaborate media for student to resolve problems. Following the initial master plan, the second Master plan (2003-2008) known as ‘Seeding innovation in schools’ is focusing on introducing baseline ICT Standards to achieve at certain milestones, to develop alternative pedagogies, to stimulate innovative use of ICT in schools in daily learning, and to have schools produce digital content and expand to share for other. Strengthening the progress of previous master plan, the third Master plan (2009-2014) known as ‘Strengthening and scaling technology’ which aim were to strengthen competencies for self-directed learning, to set the learning experiences based on student learning style, to promote advance and deeper learning for students, and students could learn anywhere. Finally, master plan 4 offered a vision for future ready and responsible digital learners, where quality learning is in the hands of every learner, empowered with technology. In this vision, teachers were designers of learning

experiences and environments and school leaders are culture builders [14]. The aims were to bring ICT into the core of the education process, focus on improving the capabilities and skill sets of teachers, improve the sharing of best practices and successful innovations, and further build up infrastructure. In 2015, Singapore released iN2015 (Intelligent Nation 2015) plan which is suggested as a master plan for the next 10 years. The iN2015 will support the national policy of Singapore to establish a society to have accessibility to the technology and enhance the development of technology to promote the competence in the competition of all sectors in the economic system [15].

Since the master plan had been released, the IT was heavily utilized in Singapore schools and lead Singapore as a world leader of educational technology. The World Bank data showed the user of the internet in Singapore was increasing steadily, which is 84.45% from a total population that can access the internet in 2017. By the high number of internet users in Singapore, the government was prepared for the new era of the Internet such as to provide next generation broadband network (NGBN) for all Singapore schools, which will provide ultra-high-speed wireless connectivity. As the availability of modern advanced telecommunication support, e-learning products became a trend in Singapore education and become an ideal platform for e-learning. The popularity of E-learning was caused by the ability to balance between technology application and pedagogical innovation [16]. In the following years, the other educational technology product had developed such as multimedia field trips, 3D interactive educational games with simulations, digital textbooks, digital storytelling, flipped classroom, and Blogs & Open-source Software Applications [17, 18]. Recently, One World International School states some of the technology trends for education in Singapore international schools include such as coding, robotics, data analytics and the creative use of video and music technology.

The most ICT contribution in Singapore curriculum can be seen through the learning activity trend which has changed from teacher-centered into student-centered learning. Which is learning subject was taught more interactive and efficient [19]. Moreover, the survey which conducted in 2001 had proved more than 70% of surveyed pupils reported that ICT helped to increase their knowledge [16]. The impact of the high-tech trend in education will change the educational faces and attitude in the future, such as: 1) The ease accessibility to the latest learning resources by using learner own learning devices; 2) Via ultra-high-speed broadband networks will support to deliver learning content; 3) Learning anytime and at any place, supported by wireless access; 4) Individual will easy to conduct collaborative learning over the network; 5) Educators role not just to dispense the knowledge but to guide learners; 6) To deploy independent learning to search integration and construction of knowledge and the skills.

3.2. Thailand

Over the past two decades, Thailand government had shown their initiative to focus on implementing ICT in education and improving the technological skills of teachers and students such spent at least 400 million baht per year from 2002 [6]. Strengthening the claim, the Bangkok Post stated that Thailand government expenditure on education through the Ministry of Education is about 511 million baht in 2017. Moreover, Thailand Government supported Educational Technology development by announcing the ICT Master Plan which consists of several phases and improvement for each year. According to the global perspective, the improvement of Thailand ICT is categorized for average level. The International Telecommunications Union shows the global rank of Thailand ICT indexes is 73rd, while in ASEAN is the fourth rank after Singapore, Brunei, and Malaysia.

Thailand government started the first phase of ICT for Education Master Plan from 2000 to 2002, which created a framework for ICT in Education development in Thailand. It aimed to prepare learners and educators for an IT society and knowledge society. The focus was to distribute computers and networks in schools, ICT professional development and acquisition of digital content and development of the curriculum. The second phase of ICT for education master plan (2004-2006) was providing learners and educators equal access and benefit. This phase was focusing on ICT for effective management, professional development, and information infrastructure [20]. Both of these early phases had covered the first Thailand National ICT Master Plan (2002-2006) which had a major goal towards the knowledge-based economy and society [20, 21].

The third phase of ICT for Education master plan was promoted in 2007-2011. The master plan was promoted National ICT master plan (2009-2013) to create Smart Thailand with information literacy. Smart Thailand was associated with the ICT application and development by Thai society in a smart manner and applying the principle of the sufficient economy philosophy. Every individual in Thai societies should be smart and information literate which leads to benefits for themselves and the whole Thai society. Moreover, effective of ICT should be properly managed with the smart government to support the improvement of knowledge development and innovation based on society and economy that are sustainable and stable [22]. Ministry of Information and Communication Technology of Thailand had revealed the main goals of this

National ICT master plan that are: 1) To increase the societies knowledge and capacity to access, create and use information by 50% in order to improve the quality of education, work, and daily activities; 2) As an effort to increase the country ranking of ICT readiness in the Networked Readiness Rankings (the top quartile group); and 3) To involve the ICT industry role in the national economy. Through the Master Plan for ICT in Education (2007-2011) proposed several missions such as: 1) Teach students to use ICT so they can compete in a global society; 2) Integrate ICT into the classroom to unlock its pedagogical potential; 3) Further develop ICT infrastructure in the education sector; and 4) Take advantage of ICT to more effectively manage the school system. As the follow up for the Educational master plan 2007-2011, Thailand's Ministry of Education revised the 2008 basic education curriculum by adding capacity for technological application. The technological application capacity is one of five key competencies to be included in the teaching process in all subjects and make ICT a topic of study in all grades. In the recent year, the Ministry of Information and Communications Technology has prepared a master plan of the 3rd edition in 2014-2018 by promoting ICT 2020 policy. In this period, the government has prepared the country to sustainably participate in the Digital Economy generation [15].

Following the pace of global technology development and technological shift trends from offline to the online system, the Thailand government shows its intention not only by providing an educational plan but also advance infrastructures. Based on the educational ICT for Education Master Plans, 2007-2011 and 2011-2013, MOE allocated funds to provide hardware, software and digital contents for every school under the national Thai Kem Kang project. Between 2011 and 2014, the first eye-catching project in Thailand named the one tablet per child (OTPC) policy was introduced. Initially, this national project was provided prathom 1 (primary school, grade 1) child, which contains about 336 learning objects for five subjects including mathematics, science, Thai language, social studies and English language. The next move of the project has delivered about 800,000 tablets to Primary students across Thailand [23, 24]. The main objectives of OTPC are promoting self-learning and allowing learners to study based on their own pace and ability. As a result, this project also shows the benefit for the teacher that used the tablet as a media for learning and improving e-literacy, while the other uses the tablet to promote self-learning. However, the program was stopped in 2014 by the several teachers complaining such as lack of infrastructure procurement, a proper training program for teacher, ICTs capabilities and attitudes, and evaluation [24]. Following the OTPC, there are several projects that the Thailand government promote during the same period such as Thai Teachers TV, Model ICT schools and Lab schools, and Education Provision Project for Disadvantaged Children in the Highlands and Marginal Areas.

In conclusion, according to the Digital Economy Promotion Agency (DEPA) analysis, there are 7 crucial technologies in Thailand's Digital Economy. However, there are only four technologies which massively impact in Thailand Education, that is: 1) Internet of Thing (IoT) which is affected on the process to deliver meaningful and interactive learning content; 2) The AI which can enhance seamless management in the learning process from admissions, grading, and student access to resource planning; 3) The integration of data analytics in the education system to assist educator to evaluate classrooms and identifying learner needs; 4) The Next Generation Telecommunication which is enhancing more effective communication and elaboration in the learning process [25]. Moreover, the Next Generation Telecommunication could assist the ability of other learning aid to create meaningful learning.

3.3. Indonesia

Nowadays, the fast-shifting of the technological trend has affected Indonesia education, such a shifting of teaching and learning process from the conventional model into open education. This phenomenon makes the Indonesian government realize that technology integration in the educational program has an important role in creating a strong society for global competition. The plan and development of technology for education was regulated in UU Sisdiknas No 20 the Year 2003 chapter 36 which states one of the provisions in curriculum design must be following the development of science, technology, and art. There are many more national constitutions of Indonesia that are regulating the technology implementation for educational purposes. For example, the regulation of the Ministry of Administrative and Bureaucratic Reform No 28 2017 chapter 6B which explained about the provision in developing technology for learning purposes.

As the biggest archipelago country in ASEAN, the major issue for Indonesia education is the inequity of educational access, especially in the remote and border area. Taking this issue into consideration, The Indonesian government has introduced a famous educational program through television broadcast known as TV Edukasi (TV-E) which was aired in October 2004. This program is aiming to support educational access equity, quality improvement of education, and support of 9-year compulsory basic education [26]. In the same year, the national program IGOS (Indonesia Go Open Source) was released to the public which initiated five ministries of Indonesia, namely: The Ministry of Research and Technology, Ministry of Communication and Information, Ministry of Justice and Human Rights, Ministry of National

Education, and Ministry of State Apparatuses. This program is aiming to save the budget and stimulate educational institutions to use open access in promoting open sources to access learning materials [27].

Recently, education in Indonesia emphasizes the global trending 21st century which is integrating all educational activities with the use of the internet. It is shown by the National Examination which was conducted through the computer-based test (CBT) in 2014. However, the equity of facilities distribution is becoming an obstacle for the government to conduct learning through the internet. Based on the survey data about Indonesian schools' condition, there are about 118.000 schools (out of 208.000 schools) have access to the internet in 2015; it means there are about 90.000 schools that don't have access to the internet [28]. Surprisingly, there are 17.000 schools still experience a lack of electricity especially in remote and border areas. To respond to this issue, The Indonesian ministry of education and the ministry of communication & information have collaborated to develop ICT services known as Universal Service Obligation (USO). This program was funded for several projects such as Palapa Ring project, 3GBTS in remote and border area, broadband access for education, agriculture, and health services.

The massive development of national broadband networks shows the inclination trend of internet users in Indonesia. Based on the survey data conducted by the Indonesian internet association (APJII) in 2018 shows about 171 million population (out of 264 million) are connected to the internet. This user number has increased by about 10 percent since 2017, which internet user is only 54.86% [29]. Moreover, the government effort to develop internet access in Indonesia positively affected the development of educational start-up. Most educational start-ups platform in Indonesia is promoting Learning Management System (LMS), for example, Ruangguru and Quipper School. Both platforms are transforming the teaching and learning process more effectively and efficiently, by providing learning video tutorial, private learning, examination tryout online. The development of ICT in Indonesia especially in Education becomes an effort to achieve the vision Indonesia 2025, which is aiming to build strong connectivity across the country to create equity in economy and infrastructure development.

3.4. Myanmar

According to the ICT development index 2017 released by ITU, Myanmar was one of the countries in ASEAN which had a lower rank of ICT index. Strengthen the claim, The and Usagawa [30] stated that development of ICT in Myanmar educational system has faced various obstacles such as poor telecommunication infrastructure, lack of ICT ability & knowledge, weakness of human resources. Moreover, the statistical data released by UNESCO in 2012 which showed only 5% of Myanmar schools have computer laboratories [31]. The Myanmar Government realized this problem could be affected by socio-economic development. Overcoming this problem, the government has set up the ICT master plan which is aiming to reform the economic and social sector.

The ICT master plan of Myanmar has existed since 2000. The Myanmar ICT master plan consists of four, that is: 1) 2000-2005 ICT master plan has objective run accelerate the implementation of ICT development and the distribution of ICT infrastructure; 2) 2006-2010 ICT master plan has a goal to increase the telecommunication connection rate; 3) 2011-2015 ICT Master Plan has an objective to enhance the ICT competencies and competitiveness of society and facilitating economic growth. For the educational manner, the third master plan was focusing on the incorporation of ICT training into the curriculum, ICT training for the teacher, and installation of network connection for schools; and 4) The present ICT master plan. Supporting the ICT master plan, The Myanmar government released a long-term educational plan for the next 30-year in 2001. The educational development plan was including the utilization of technology in the educational systems [32].

The government is emphasizing the local sector to collaborate with communities to set up multimedia classrooms and computer laboratories in high schools to ensure the society is technological literate, while in Universities level is suggesting to establish IT learning and training centres. Supporting this movement, The Ministry of Education is improving the network by developing an educational intranet system to connect all education institutions [33]. In 2016, the collaboration between Myanmar government, technological companies (Ericsson and Qualcomm), UNESCO, educational software developer and Columbia University had conducted to bring mobile technology into the classroom. The program provided knowledge, technical, and pedagogical support for teachers in applying mobile technology. Recently, the project already provides several infrastructures (such 3,100 tablets and 186 laptops for teachers) and proper instructional training which is more than 270 hours. On the other hand, The Ministry of Education of Myanmar has an effort to improve society ICT skills by establishing 90 computer schools and informal certification programs [33]

4. CONCLUSION

In the last decades, Singapore, Thailand, Indonesia, and Myanmar are showing their initiative to integrate ICT into education. However, each country has different policies to integrate the ICT for education in its National Plan. Singapore has a stand alone sector-wide ICT in education plans, while Thailand, Indonesia, and Myanmar have induced ICT in their national education plans, or the education is one of aspects mentioned in national Master ICT Plans along with other social aspects. The main purpose of each country's ICT master plan for education is targeting the society in the sustainability participation in the digital economy.

Over the decades, equity is still the major problem faced by some ASEAN countries in applying ICT for education. The geographical condition, limited access to ICT devices, and human resources are becoming a major factor. Overcoming this problem, most ASEAN countries focus on building advance network connection, distributing more devices into the schools, and providing proper training for the educational practitioner. Moreover, some countries are collaborating with international private companies, institutions, and organizations to fulfill their national ICT master plan for education.

Nowadays, the popularities of Internet of Things (IoT) have turned the learning environment into internet-based learning. This trend has massively affected the use of the online learning management system and the other online-based learning applications in ASEAN countries. Moreover, countries such as Singapore which has more advances technologies and high index human resources have started to induce Artificial Intelligence on their curriculum. Due to global competition, the use of more advance ICT concepts such as Artificial Intelligence and Big Data Analytics will be more popular in the next decades. However, the key challenges that continue to remain in providing ICT for education are quality, equity, and efficiency.

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