E-LEARNING ADOPTION READINESS IN SECONDARY EDUCATION OF DEVELOPED AND DEVELOPING COUNTRIES: A SYSTEMATIC LITERATURE REVIEW

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Abstract

COVID-19 pandemic forced educational activity to shift from face-to-face to blended learning or full online learning. This situation becomes a problem in different academic levels, especially secondary education as some teachers and students were not ready. This article summarized the influencing factors and issues of readiness in adopting e-Learning in high school, including the technologies and communication tools, as the foundation of analysis. The research objective is to identify and compare e-Learning adoption between developed and developing countries during pandemic. This article used Kitchenham and Charter method which extract data research published in databases such as Scopus and Science Direct. This research found distinct gaps between developed and developing countries in the context of e-learning readiness adoption and factors that influenced the said adoption. The separation of function and variability of technologies for learning and communication in learning is the most prominent evidence of the gaps. We conclude that there are still a numbers of basic internal and external factors that need to be considered for e-Learning adoption, especially in developing countries. The implication and recommendation for the adoption during pandemic aimed to be an insight for future research as there are significant differences in developing and developed countries.

Key words: adoption, developed and developing countries, e-Learning readiness, literature review, secondary education

INTRODUCTION

Situation in COVID-19 pandemic forced a sudden shift in education, changed all learning activities from face-to-face or blended learning to home-based or online learning. The change which came out-of-the-blue becomes a problem in different academic levels and required a huge change in several aspects for teachers and students, causing several problems as teachers and students are not ready [1].

Most research about this topic found major problems aside from such as differences in emotional stability, learning styles preferences, cognitive skill, and learning perspectives [2]. Low completion rate of e-Learning courses without face-to-face session, even before the pandemic situation arise [3], inequality of digital literacy, knowledge and infrastructure [4], unavoidable change of teaching and learning method caused by pandemic [5] and self-directedness, engagement and satisfaction

of students toward e-Learning itself are most definite problems [6, 7].

Definition of e-Learning can be view from various perspective. E-Learning could be defined as all academic activities which supported by technology, equivalent with virtual learning, distributed learning, web-based learning, computer-assisted learning, or ICT-based learning [8]. Adopting e-Learning is more than finding suitable and variety of learning technologies that create dynamic learning environment and learning experience to increase learning and teaching efficiency for learning contents or assignments repository or content delivery [9, 10, 11, 12].

According to prior research, problems in e-Learning adoption could be minimized by readiness of the institutions, teachers, and students in adopting e-Learning [13, 14]. Even though students in this era consist of Gen Z, a true digital native, the previous studies showed that students might still find discomfort in adoption of e-Learning [15, 16].

There are standard instruments that were developed to evaluate readiness from different perspectives [17, 18, 19]. Various factors and challenges are found and influenced by readiness to adopt e-Learning, defined as mental and physical skill in using learning technology to increase learning quality and might differ from each countries or academic levels [20, 21, 22]. Even so, prior studies related to e-Learning adoption mostly focused on a single country. Moreover, discovery of secondary education readiness in e-Learning adoption and elaboration the differences of adoption readiness between developed and developing countries still lack comapred to higher education [23, 24].

Based on the problems, there is a need to explore readiness of e-Learning adoption in secondary education and elaborate the gaps between developed and developing countries. This studies also investigate the learning technology, communication channel and contrasting the adoption of e-Learning in developed and developing countries.

MATERIAL AND METHODS

This research cover e-Learning adoption topic in secondary education which is still limited when compared to higher education or workplace context. This article use literature review approach proposed by Kitchenham and Charter [25], consisting of three steps: planning, conducting, and reporting.

Planing The Research

In this step, we identify research question based on the findings and gaps on prior studies and defining the research question as the guide for this study. According to the problem mentioned, the systematic review will discuss readiness of e-Learning adoption in secondary education level from developed and developing countries perspective. The classification of deveoped and developing countries according to latest annual report of United Nation Development Programme (UNDP) Human Development Index which classified countries with index above 0,80 classified as developed country, while the rest are developing countries [26]. The objectives of this article will be answered by addressing four main research questions:

1. What factors need to be considered for the readiness of e-Learning adoption in secondary education during COVID-19 pandemic in developed and developing countries?

2. What issues arise in e-Learning adoption for secondary education level during COVID-19 pandemic in developed and developing countries?

3. Which learning and communication technologies are being used in developed and developing countries?

4. How did the adoption of e-learning in developed countries' high schools differ from developing countries' secondary educations?

The research objective of this review is to identify the implementation and differences of e-Learning adoption between developed and developing countries during pandemic to compare and analyze the implication in the context of e-Learning adoption readiness. This research aims to explore a new perspective related to e-Learning adoption readiness, create an insight for practitioners regarding important factors, technology, and communication technology needed for e-Learning adoption in secondary education.

Conducting Research

This step begin from searching thoroughly from several databases, mainly Scopus in initial

search. Articles from initial search will be selected further with inclusion criteria, exclusion criteria and quality assesment as shown on Figure 1.
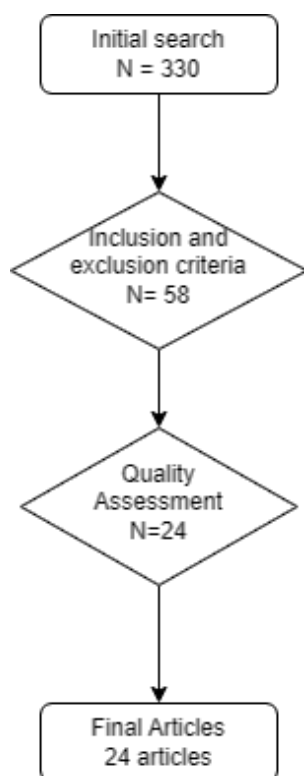

Fig 1. Selecting research articles

As stated before, different from prior studies, this paper will focus not only on e-Learning adoption readiness, but also explore learning technologies, communication channels or technologies used in supporting e-Learning, and the differences between developed and developing countries. Analysis will be done by extracting related information to the research question, summarize and elaborate to find a conclusion.

Search Strategy and Criteria

We search articles from Scopus and several database such as Science Direct, Taylor and Francis Online, Emerald, ProQuest, and Google Scholar. The keywords of the search were (E-OR online OR home-based OR remote OR distance) AND learn* AND (tech* OR tool*) AND (adopt* OR implement*) AND ((high OR secondary) W/1 school) AND NOT higher education* AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) . After initial result, we found 330 articles that would be filtered further by inclusion and exclusion criteria set by the authors, which described in the next sub-sub-chapter.

Inclusion and Exclusion Criteria

In order to find relevant articles for this research, we set inclusion and exclusion criteria.

The inclusion criteria are:
- The article published in pandemic era.
- The research object include education in general or high and/or secondary school whether as standalone or K-12 context.
- The article is published in English or Indonesian.
- The paper stated which country the research was conducted.
- The article is peer reviewed.

The exclusion criteria are:
- The article is a literature review.
- Article did not conduct experiment or implementation of the research.
- The article did not clearly mentioned the country.

Based on selection from the criteria, we found 58 articles. These articles are evaluated more, explained in the next sub-sub-chapter.

Quality Assesment

After selecting articles based on criteria, we filter the articles further with checklist to measure the most suitable articles. The checklist consists of seven questions:
1. Does the article has clear objective?
2. Does the conclusion relevant to the objective described?
3. Does the article state which country the study was conducted in?
4. Does the research experimental or not theoritical only?
5. Does the research has secondary education respondents?
6. Does the research explicitly or implicitly discuss factors or issues regarding the adoption of e-Learning?
7. Does the research mentioned technologies used in the adoption of e-Learning?

We measure the quality and only choose articles that checked minimum 5 items. Based on this phase, we have 24 articles that are used in this study, as shown on Figure 1. The next step is reporting research based on 24 articles chosen in this step.

Reporting Research

This review investigates research papers published during COVID-19 pandemic, from 2020 to 2021. The paper is presented into four sections: (1) Introduction, (2) Material and Methods, (3) Result and Discussion, and (4) Conclusion. Introduction explains a short background and problem of this research. The material and methods chapter describes the process and material used in this research. The result and discussion sub chapter will report and discuss the result of analysis from selected articles. The conclusion, implication and recommendation of the result will be further addressed on the conclusion chapter. Result and discussion of the study explained further in the next sub-chapter.

RESULT AND DISCUSSION

According to the research questions and criteria, we discover total of 24 articles that are useful to give some insight. These 24 articles later extracted based on developed and developing countries and categorized according to questions stated in the previous section. The summary of countries from chosen articles we used in this paper is shown on Table 1.

Table 1. Countries of relevant research

Classification	Country	Reference
Developing	Indonesia, South Africa, India, Nigeria, Kazakhstan, Haiti	[22, 27, 28, 29, 20, 31, 32, 33, 34, 35, 36]
Developed	Singapore, Turkey, Saudi Arabia, United States of America, Germany, Poland, Spain, Slovakia, Ireland	[37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49]

Authors found 24 suitable articles that would answer four main research questions as described on Table 1. We separated them into 13 articles from developed countries and 11 countries, which will be discussed in the later section. We found 13 articles from various developed countries based on the latest HDI classification of UNDP, such as Singapore, United States, Turkey, Saudi Arabia, Germany,

Spain, Slovakia, Ireland and Poland. We also found 11 articles from various developing countries including Indonesia, India, Kazakhstan, Nigeria, South Africa, and Haiti.

All prior studies include an implicit or explicit definition of factors that influenced readiness of e-Learning adoption, which clearly stated that secondary education is the focused or included as research subjects. Selected studies also explained at least one technology used in learning, that would be discussed further to analyze its implication in developed and developing countries. The first and second questions will be discussed further in the next sub-section.

RQ1 and RQ2: Influencing Factors and Issues in Developed and Developing Countries

In order to answer the first and second question, we extract and categorized influencing factors and issues into five main categories: internal, learning institutions and environment, demography, technologies and social environment. Tables of influencing factors and issues classified from the developing countries articles are shown on Table 2.

Table 2. Factors and issue of E-Learning adoption readiness in developing countries

Category	Influencing Factors	Issues	References
Internal	TPCK skill, experience, IT literacy, commitment, preferences, usefulness perception, ease of use perception, self-efficacy	Lack of IT literacy, lack of understanding of e-Learning benefit, low self-regulated learning skill, worsen physical and mental health, lack of motivation caused by lack of	[27, 30, 32, 33 34, 35, 36]

Category	Influencing Factors	Issues	References
Learning Institutions and Environment	Interaction in learning, teaching methods, importance of e-Learning, autonomy	interaction, fear to use technology, stress Lack of students' monitoring and control, limited time to learn, high workload, distraction in learning with online setting	[30, 31, 34, 35]
Demography	Age, gender, geographical location	Gap between schools in urban and rural area, gap between genders caused by culture, gap of familiarity with technology in older age group	[30, 32, 36]
Technologies	Equipment availability, internet access, platform interface, infrastructure	Lack of infrastructure, bad connection of internet, lack of knowledge about learning technology, lack of electricity, low of device ownership, limited	[22, 29, 30, 31, 33, 35, 36]
Social Environment	Economical condition, parents support, government support	technology that could be used Economy instability, lack of government response and support, lack of resource because of economy condition, lack of parents knowledge and support	[22, 29, 30, 32, 33, 35, 36]

We identified five major categories of influencing factors and issues into internal, learning institutions and environment, demography, technologies and social environment. Internal factors or issues are related to individual beliefs, perspective, skill or knowledge regarding the matter. Learning institution and environment include internal policies, facilities, curriculum or subjects related to the school condition. Meanwhile, demography related to diversity of human in the environment. Technologies related to various subjects from the availability to the accessibility of technologies and social environment related to external forces such as government and parents. We also identified influencing factors and issues from the developed countries, that were shown on Table 3. Based on Table 2 and Table 3, it is clear that influencing factors in developing countries were not as much as influencing factors in developed countries. In contrast, developing countries has more issues compared to developed countries. This implies that developing countries has similar driving factors and issues when it comes to adopting e-Learning, while developed countries has more variation due to differences of social, economy and education conditions.

Table 3. Factors and issue of E-Learning adoption readiness in developed countries

Category	Influencing Factors	Issues	References
Internal	Motivation, technology skill, self-efficacy, self-directedness, self-management, attitude, usefulness perception, ease of use perception, prior experience, IT literacy, feelings, needs, belief	Behavioral engagement, familiarity with e-Learning environment, fear and anxiety, frustration, needs of physical and mental health	[37, 38, 39, 40, 41, 44, 45, 46, 47, 48]
Learning Institutions and Environment	Institution support, major, teaching strategy, learning environment, difficulties of learning, objective evaluation, academic level, type of school, heterogeneity of teachers and students, availabilit	Limited time, lack of collaboration, lack of interaction, teaching methods not suitable for e-Learning, lack of students participation, class management issue, monitoring issue, lack of learning resources, lack of work-life balance	[39, 40, 41, 45, 47, 48, 49]
	y of training		
Demography	Age, gender, geographical location	Differences of male and female in learning	[37, 39, 40, 48]
Technologies	Technology access, E-Learning characteristic, daily internet use, technology infrastructure, digitalization, gap between students with and without internet access, technological equipment	Limited platform that create real-life situation, infrastructure and technology support problem	[37, 39, 40, 41, 42, 44, 45, 48]
Social Environment	Support and program of government, family support, social support, education needs, relationship between parents and students, students motivation from teachers	Students with disabilities needs for assistance, culture, social environment, lack of direction and policy from government, lack of parents' support and communication	[37, 38, 40, 41, 42, 44, 49]

Category	Influencing Factors	Issues	References
	perspective, peer teachers' experiences		

The most interesting fact is internal factor is the highest frequent for both developed and developing countries. This related to the fact that preferences, commitment, belief, feelings, self-regulated and self-efficacy, personal skill and knowledge, especially physical and mental health in pandemic influenced e-Learning adoption the most [33, 35, 38, 39, 40, 45]. This finding is supported by statement that it is related to e-Learning characteristics, especially during pandemic, where teachers' presence is low compared to face-to-face class, causing self-regulated learning related skills to influence readiness and adaptation in e-Learning adoption [50].

Meanwhile, factors and issues of demography are similar between developed and developing countries, as some countries has different geographical layout and culture. Demographic factors and issues linked with another categories such as technologies and internal. for example, in some countries, the problem of geographical layout leads to issues in technologies, such as gap in technological infrastructure such as electricity and connection necessary for learning, even some area still has frequent blackout, which hinder the learning process [28, 29, 32, 36]. The difference age group or gender found to have different state of internal issue or driver such as confidence and fear in using technology in learning [27, 34, 39, 48].

On another hand, factors and issues in social environment are even more linked to another categories such as learning institutions and environment, internal and technologies. for both learning institution and technology category, government readiness, support and policies affect the institution policy, availability of training, equality in infrastructure or facility needed to support online learning and other related factors or issues as there are differences of dependence to government between public and private schools or different needs of

vocational and academic institution [21, 36, 37, 40].

In addition, social environment of students at home such as parents readiness and support to guide and monitor students, also the ability to assist students with disabilities in distance learning, affects their internal motivation, psychological stress, confidence and other internal factors in learning [21, 31, 32, 45].

RQ3: Learning and Communication Technology Used

In order to answer the third research question, we summarized learning and communication technologies used that were mentioned in the articles. Frequency of learning technologies used in developing countries is shown in Figure 2, while frequency of communication technologies used in developing countries is show in Figure 3.
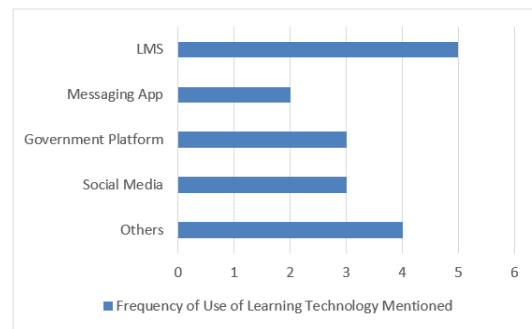

Fig 2. Frequency of use of learning technology in developing countries
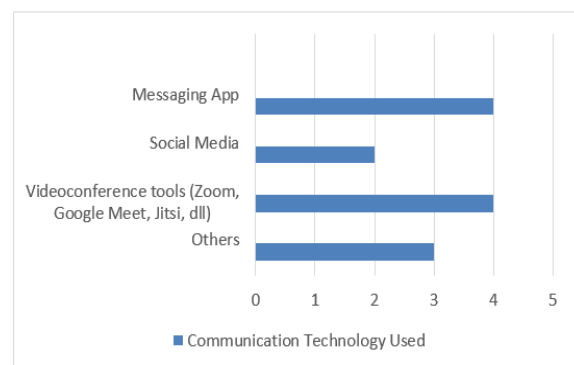

Fig 3. Frequency of use of communication technology in developing countries

According to graphic shown by Figure 2, Learning Management System (LMS) such as Google Classroom, Schoology, and Moodle is the common technology used with frequency five out of eleven research mentioned this

technology [27, 30, 31, 32, 33]. In addition, the data shows that social media and messaging app are used as the main learning technology, even though it is more suitable as communication or informal learning technology [11, 27, 32, 33].

The low IT and digital literacy issue in developing countries caused the lack of technology variation used in learning environment, as there are not much differences between technologies used in Figure 2 and Figure 3. The percentage of messaging app and social media usage for learning technology, which around 30%, almost similar with percentage of messaging app and social media usage for communication technology, which around 40%. The lack of functional separation in learning and communication technology in e-Learning adoption might affect learning experiences that will be discussed further in addition of comparison between developing and developed country, including how digital literacy results in similarity between learning and communication technology.

According to prior studies, the lack of digital literacy can be caused by the lack of internal motivation or knowledge [27, 28, 29] or the support of government in providing infrastructure equality and training for developing related skills [21, 34, 36]. Teachers and students in developing countries still need more training to fix the lack of tech savviness and familiarity with technology to support the frequent evaluation of their skill's capacity [27, 28, 31, 32].

In order to compare the result, we also show the frequency of learning technologies used in developed countries is shown in Figure 4, while frequency of communication technologies used in developed countries is shown in Figure 5. These figures will be used to compare between variation of technologies used in developing and developed countries.

Similar to developing countries, LMS is the most frequent used learning technologies in developed countries, as shown on Figure 4 [37, 39, 41, 43, 44, 45, 47, 48, 49]. Moreover, the application of LMS supported by other learning technologies such as Google Apps for Education [37, 44, 45], mobile-based technologies such as iReady [44] or high-end technologies such as virtual reality and games also used [45]. Some also used government-supported platforms such as Eğitim Bilişim Ağı (EBA) and Singapore Student Learning Space [37, 38, 40].
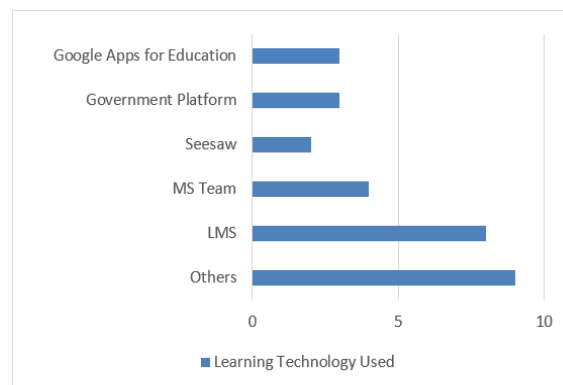

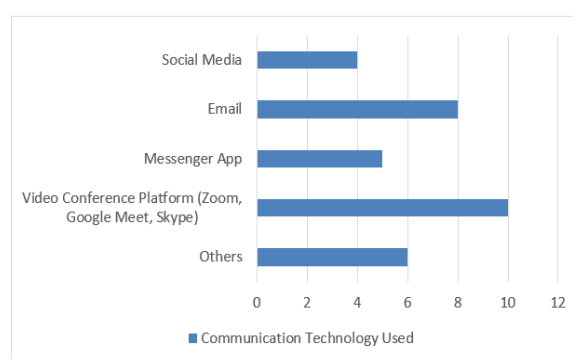Fig 4. Frequency of use of learning technology in developed countries

Fig 5. Frequency of use of communication technology in developed countries

In contrast with developing countries, Figure 5 shown that developed countries has more variation and functional separation between learning and communication technologies. This also related to IT and digital literacy in developed countries that enables more access to various type of learning technology and communication technologies for learning. Numerous research and digital literacy framework for educators include the ability for educators to guide other educators in the same learning environment on how to use technologies for learning, creativity in using technology and creating learning contents, while at the same time understand how to communicate efficiently and effectively [51, 52, 53, 54]. As mentioned before, the adoption of e-Learning is more than using technology for learning. The assessment of digital literacy supported this statement, hence the level of digital literacy could be predicted at least by the separation and variation of technology for learning and communication in learning. Therefore, the lack of digital literacy in developing countries results in similarity

between communication and learning technology.

RQ4: Notable Difference Between Developed and Developing Countries

Based on discussion of previous section, the most notable differences were the level of IT and digital literacy, as teachers, students and parents in developed countries has higher literacy than those in developing countries. This differences reflected on how learning and communication technologies have separation of functionality in developed countries, while this practice is lack in developing countries. This difference influenced by differences of inequality in developing countries, as availability of proper technology infrastructure and electricity still become one of fundamental issue as mentioned.

This difference also related to economy condition. Developing countries, as classified by UNDP and IMF, has different economy situation and stability compared to developed countries. Differences economy situation and stability might cause differences of financial priority in a country, including those related to education and infrastructure. This problem alone could affect the adoption of e-Learning in general.

CONCLUSION

Based on the analysis, it could be concluded that factors and issues in e-Learning adoption readiness classified into five categories, where internal factors and issues are the most notable ones. This related to pandemic situation that caused more health and mental issue. Second, there are distinct and clear differences in e-Learning adoption between developed and developing countries, especially in context of variation and separation of learning and communication technologies. Third, while internal factors and issues mentioned the most, demography and social environment factors or issues are the ones heavily linked to other categories, whether internal, learning institutions or technology. Last, we concluded that readiness of e-Learning adoption in developed and developing countries are different in digital literacy and economical aspect. As the development of digital literacy is important in digital learning environment, there is a need of strong support not only from individuals but also government for it to work. In order to develop digital literacy better, the issue of inequality access to important facility, education and socialization of digital literacy program should be prioritized. We recommend future research in similar field to assess the condition of the case study's country, especially for demography and social environment related factors or issues before assessing or evaluating the readiness of e-Learning adoption. We also recommend to measure the degree of relation between demography and social environment to internal factors or issues that could be the base of comparison between prior, during and post pandemic.

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