The Use of Communication Technologies in Higher Education During the Pandemic: A Systematic Literature Review

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ABSTRACT
The use of Information and Communication Technology or transformation to digitalization has become a must due to the pandemic , universities. During the crisis due to Covid-19, learning activities and services at universities are carried out remotely, increasing the use of Information and Communication Technology. The use of Information and Communication Technology is an evolution of the presentation of performance data in universities to achieve external accountability by stakeholders, internal accountability in the organizational hierarchy, and improvement and development of services following organizational goals. This study aims to determine the use of Information and Communication Technology in universities during the crisis due to the Covid-19 pandemic. This research method is a Systematic Literature Review used to identify, review and evaluate all research relevant to the research question. A systematic review and identifying articles can be done in each process following the steps or protocols set using the systematic literature review method. Articles were collected from the electronic data-based Scopus, Science Direct, and Google Scholar for English-language articles published from 2020 until 2022. The results show various kinds of use of Information and Communication Technology in universities during the pandemic. The development and evolution of e-learning help to increase internationalization, help university management, help to increase the skill of Information and Communication Technology use, and increase gender and disability access.

Keywords: *higher education, information system, pandemic, communication technology, systematic literature review*

1. INTRODUCTION

Education, as one of the tools for global change, was disrupted because of the COVID-19 pandemic. During this period, every higher educational institution worldwide applied distance learning. Distance learning is a learning system that enables the learning process not to happen in one place, and there is no direct interaction between teacher and student. In distance learning, higher education institutions do consider not only the process of learning but also prepare to learn management. Learning Management is the concept of managing the learning activities based on concepts and learning principles to achieve learning goals so that they can be achieved more effectively, efficiently, and productively with the process of strategy making and planning and ends with an examination [1]. Learning Management is related to Management, administration, and human resources readiness and supporting facilities.

In preparing the management, adaptive culture is one of the primary fundamental changes. Three dimensions and indicators are changing-making, customer-oriented, and organizational learning. Change-making can be seen through (1) how the universities do everything in a way that is flexible and adaptable to changes and (2) the ability of the universities to give responses to other changes in the environment. Customer (student)-oriented can be seen through (1) input and advice from students that can cause changes, (2) every element of higher educational institutions have a deep understanding regarding students' needs and wants [2].

The use of information and communication technologies becomes a critical factor in making innovation as next step of adaptive culture in responding to the COVID-19 pandemic. To UNESCO (2011), there are five benefits of the application of Information and Communication Technologies in the education system, which are: 1) to ease and widen access to education, 2) to increase equality in education, 3) to increase the learning quality, 4) to increase teachers' professionalism and 5) to increase

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affectivity and efficiency of management and education administration [3]

Every higher educational institution worldwide has competed to optimize the use of Information and Communication Technologies in management. Studies about the use of information and communication technologies in distance learning have been widely discussed; however, there have yet to be ones discussing the use of information and communication technologies in universities. Therefore, this study includes several questions, such as RQ1: what are the uses of information and communication technologies in universities during the pandemic? RQ2: what are the prospects of these studies regarding information and communication technologies? This article tries to review the use of information and communication technologies based on the global perspective. Study results can be references for universities to plan strategies for using information and communication technologies in universities' organizational management.

2. LITERATURE REVIEW

The study of utilization is the most popular concept to be used in studies of human interaction [4]. The primary purpose of being achieved in the utilization is its benefits to create effective and efficient outcomes. The use of information and communication technologies, mainly in the learning process, must consider these principles: 1) Able to create a social situation between teacher and student; 2) Able to increase collaborative skills between students; 3) Able to increase students' participation in class; 4) Able to be evaluated; 5) Flexible; 6) Communicative; 7) Able to accommodate diversity [5]. Abdulraheem & Abdulrahim (2019) stated that introducing information and communication technologies has become an effective tool for increasing accessibility and delivery quality in the learning process [6].

The use of the digital platform is not novel in how this platform increased policy integration in public services, including education services. Technological innovation is needed to give students the most efficient services [7]. The purpose of digital transformation is mainly caused by the needed ability to distribute new fast systems and prospective business processes. In managing services administration, it must be supported by system-based facilities. The information management system is a system created to manage an administration system. The philosophical aspect of IT-based system utilization is to minimize paper (paperless) and digitalization of documents[8]. The system's benefits are to increase productivity and efficiency and decrease environmental impacts.

A study discussing information system development made as a promotive media in private universities has become a solution to marketing challenges in a way that lessens the burden of promotional unit staff workers [9]. One study regarding information system development of web-based mathematics graduates data in Universitas Negeri Semarang could store information and provide accurate data to support the administration and management of the university [10]. A study was also done in The Netherlands discussing information system development to support performance data presentation in universities to achieve external accountability by stakeholders, internal accountability in an organizational hierarchy, input for evaluations, and input for developing targeted services [11].

3. METHODS

The research methodology used in this paper is the Systematic Review method. A systematic review can be explained as a research method and process for identifying and critically appraising relevant research and collecting and analyzing data from said research [12]. A literature review with systematic steps to identify, evaluate, and translate relevant studies in this research.

3.1 Search strategy

Data searching was done from April 2022 to May 2022. The database used in this study is Scopus because it covers almost every internationally published journal worldwide. The academic database Scopus provides access to information used in studies, including titles, abstracts, and keywords [13]. After choosing the database, keywords were set, and a search format was made. Keywords used in this study include TITLE-ABS-KEY (communication AND technology AND higher AND education AND pandemic), and there were 395 articles found. After the publication year was set to (2020-2022) with a searching format as TITLE-ABS-KEY (communication AND technology AND higher AND education AND pandemic) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020)), there were 226 articles founds.

3.2 Eligibility Criteria

Selected articles have to fit these criteria: 1) articles written in English; 2) articles discussing information and communication technologies in universities; 3) articles published in 2020-2022; 4)

empirical studies; 5) articles include complete IMRAD format; 6) focusing on ICT in universities. Exclusion criteria include: 1) Article in which mixed language was excluded; 2) Article focusing on other unstructured data forms such as video, audio, and email were excluded; 3) Grey papers which comprise missing bibliographic information data like type and date of publication, volume, issue number, were excluded; 4) Literature review article was excluded; 5) Unstructured article were excluded; 6) The papers without any information related to the topic were excluded.

3.3 Study Selection

Study selection was made by finding potentially relevant articles with the study aims. After reading the abstract, the authors read the articles' body parts to determine their compatibility with the inclusion criteria. The evaluation was done in the next phase by selecting relevant articles that fulfilled the inclusion criteria.

3.4 Data Extraction and classification

Extraction is applied to every article found. An early step was to check the duplication of articles. Articles that were not published in 2020-2022 were 169 and excluded. Articles that were written not in English were 7 and excluded. Articles that discussed education but not specifically discussing universities were 74 and excluded. Articles that were not empirical studies were 32. Articles written in an incomplete format (Introduction, Method, Result, Analysis, and Discussion (IMRAD)) were 12. Finally, the number of articles discussing the use of information and communication technologies in universities during the COVID-19 pandemic was 28 articles.

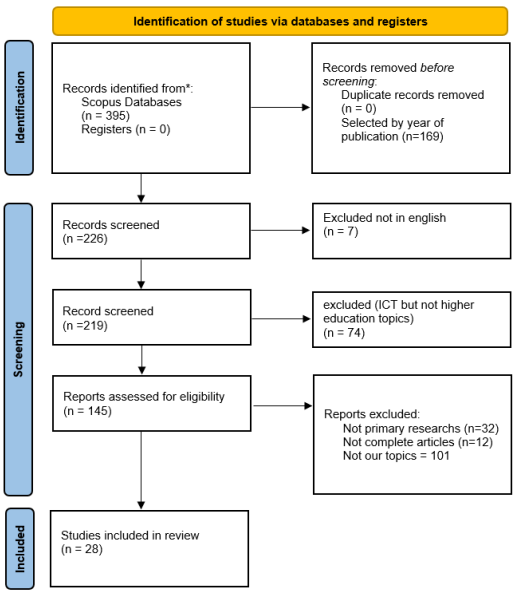

Figure 1. PRISMA Flow Diagram 2022

4. RESULTS AND DISCUSSIONS

RQ 1. What are the uses of information and communication technologies in universities during the pandemic? Below are several uses of information and communication technologies in universities during the pandemic based on selected articles analysis:

4.1. Based on the type of use

Based on the use of ICT, the authors conclude 5 (five) main uses of ICT in universities during the COVID-19 pandemic are Increasing internationalization, gender and disability access, and management.

4.1.1 Internationalization

The COVID-19 pandemic has made new variants for ICT that could increase universities' internalization. Universities' internalization is when universities' activities to achieve purpose, function, or educational delivery system are integrated into international components [14]. Market demand for global working professionals with international qualifications to make education service users look for high-quality institutions and provide global access. During the COVID-19 pandemic, the opportunity of using ICT as a media that provides educational information accessible to the global community has risen. Through online collaboration, students, researchers, and institutions from various countries and contexts could connect and look for solutions to the same problem. Increasing international collaboration networks, promoting universities' potential to international networks [15]; [16] ; [17];

4.1.2 E-learning

During the COVID-19 pandemic, distance learning was applied in universities. Distance learning is a learning system that enables the learning process not to happen in one place, and there is no direct interaction between teacher and student [18]. In a pandemic era, ICT development grows fast. This platform can be used in distance learning through a learning management system and video conference. Learning management systems commonly used include Google Classroom and university-owned distance learning portals. Commonly used video conference applications include Google Meet, Zoom, and Visco Webex. Alternatively, WhatsApp can also be used in distance learning. Although many teachers and students found difficulties using such applications

due to facility limitations supporting distance learning, such as technical support and the internet.

4.1.3 Gender and disability Access

In Saudi Arabia patriarchal society still happens to this date, in which men acquire higher authority than women [19]. As an effect, equality in Arab countries is not achieved. It does not mean that men misuse these rights and discriminate against men, but several Arab countries are now working to ensure women's rights, especially privacy rights. Many factors influence gender inequality in Arab countries, one of which is the long-standing patriarchal culture in society. Patriarchal is a social system that puts men as the dominant power controller in political leadership, moral authority, social rights, and property control. In family matters, fathers have rights to women, children, properties, and the family's prosperity. This system gives men more rights than women. Regarding education, supporting gender equality is highly needed as female participation in this field is still relatively low compared to other countries. Not only in the education field but public opinion regarding gender equality also exists in the working environment, where women do not have complete access to participate. However, it is surprising that Arab countries and Spain use ICT in distance learning, which increases women's participation in learning. There is also a finding that female students are more active than their male counterparts [17] [20].

Students with disability are those who experience different abilities than the general population (average). Therefore they need specific tailored-education services to optimize their potential. Some of them experience differences in physical-motoric aspect, intellectual aspect, social, and emotional aspects. The Learning process involves students being active with concepts and principals and requires teachers to motivate students to do their research and have their own experiences to enable them to find their principals [21].

4.1.4 Skill to use Information and Communication Technologies

The use of ICT forces students and teachers to upgrade their skills in using ICT. This is a positive influence, and although some of the baby-boomers generations found some challenges in adapting, they eventually learned to work well. In the end, the skill level is increased.

4.1.5 Management

The practical implication is given to teachers and policymakers to invest in IT and apply learning practices equal to increasing digital inclusivity [22];. Guideline administration [23]; Significantly affecting institutions' quality control [24]; Having significant implications in designing effective organizational policy to optimize faculty staff's research performance [25]; program evaluation [26]; Increasing Accounting System [27].

4.2 Based on the year of publication

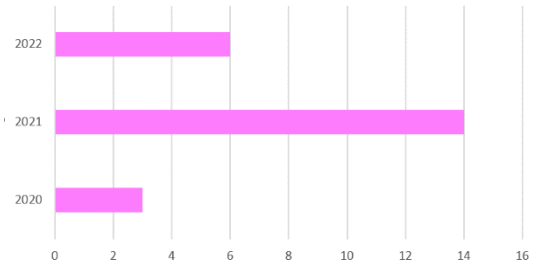

Figure 2. Distribution of the article's year of publication

Based on the year of publication, there are 28 selected articles, with 2 published in 2020, 14 published in 2021, and 6 published in 2022.

4.3 Based on regions

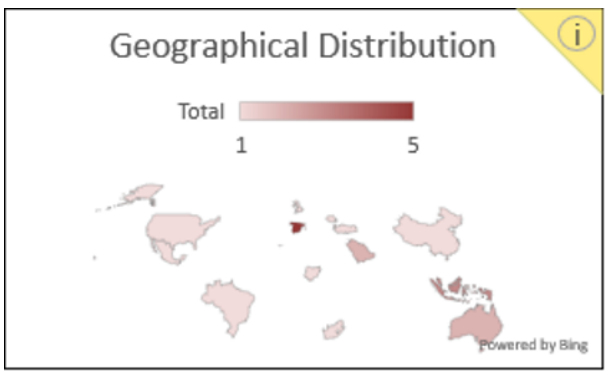

Figure 3. Distribution of articles based on regions

Based on geographical distribution, a total of 28 articles were from various countries, which are Hongkong 1, Indonesia 3, Nigeria 1, Spain 1, UAE 1, The United Kingdom 1, Malaysia 3, Latin America 1, Mexico 1, South Africa 1, Turkey 1, Greece 1, Saudi Arabia 2, Australia 2, China 1, and The United States 1.

RQ2. What are the prospects of these studies in the future?

To understand the future opportunities to do these studies, the authors utilize the software Vos Viewer. It is free software to gather bibliometric data to analyze and visualize using several bibliometric indicators,

such as bibliometric coupling, quotation, co-author, and co-occurrence as keywords [28]. Vos Viewer software forms network visualization based on network relationships' significance and power [29]. A network relationship is used to determine variable that still needs to be studied.

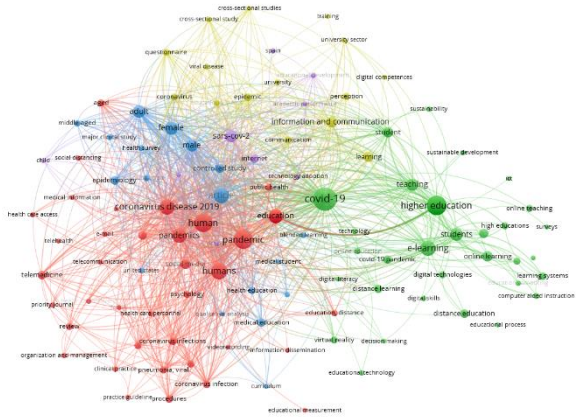

Figure 4. Visualization using the software Vos Viewer using keywords

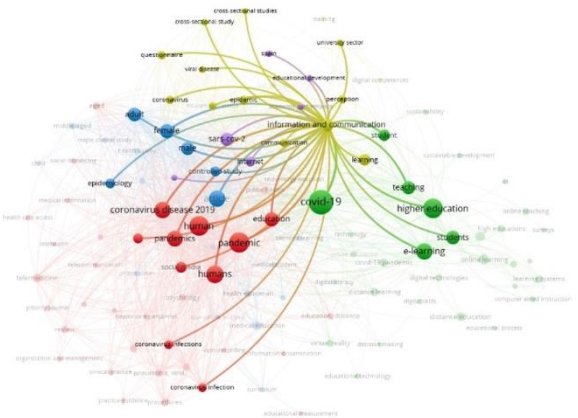

Figure 5. Power of commonly-found word analysis connection

Further studies with variables of information and communication and universities are still very probable to be linked with variables in the visualization graphed above. Those variables include the university sector, cross-sectional studies, controlled studies, academic performance, and perception.

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5. CONCLUSION

Based on studies results, the use of information and communication technologies in universities during COVID-19 varies. Based on studies across countries, the most extensive study was done in Asia, followed by Europe. Study regarding using information and communication technologies in universities during the COVID-19 pandemic exposes opportunities to optimize in America and Australia continents. Both continents put more effort into studies regarding the use of information and communication technologies in the health field (based on exclusion criteria set by authors in the screening phase).

Further study analysis of the use of information and communication technologies in universities during the COVID-19 pandemic can be used as a standard in creating future strategies for facing uncertain situations. Although the pandemic waves have stabilized in several countries, universities still must be ready and create strategies to face uncertain situations.

Further studies are expected to discuss the relationship between university internalization variables with the use of information and communication technologies. It will be exciting to see and contribute a significant impact to the scientific field by discussing the relationship between information and communication technologies and the university sector, cross-sectional studies, controlled studies, academic performance, and perception. Countries that still have a lot to explore regarding this topic are countries in Africa and the Australian continents.

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