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Acceptance of Technology in Online Learning Perspective at Educational Institutions : A Systematic Literature Review

Agus Pamuji
Islamic Counseling Guidance

State Islamic Institute of Sheikh Nurjati Cirebon

Cirebon, Indonesia
agus.pamuji@syekhnurjati.ac.id

Abstract— Today, many applications or technologies have been produced by every software developer. However, the success of all there is the decision of each user. Users have two possibilities to accept or reject a technology that is presented. The TAM model has been widely researched and undergone development and changes besides being quite reliable in predicting the level of technology acceptance in all countries in the world. In this study, we will recapitulate all studies on the acceptance of technology in the field of Education that handles online learning. The results showed that there was 51 article review publication were selected through some process of review. The period taken ranges from 2011 to 2020. The main findings show that there are differences in the models, methods, and applications identified. Since the TAM model has two basic variables, namely perceived ease of use and perceived usefulness as a framework for analyzing the make and influence technology acceptance. In this study also provides information about the results of the identification of some of the gaps in current research and also in the future. Therefore, the results of a systematic literature review were able to provide a better understanding of TAM especially in the perspective of education in online learning.

Keywords— Systematic Review, Technology Acceptance, Online Learning, Applications, Methods

I. INTRODUCTION

Today almost the life of society flooded with a variety of information [1]. This information is essentially generated from technological devices[2]. Unwittingly been many changes - changes in addition to the development of the technology itself[3], [4]. One of them is in learning which is carried out using the online method. Given the increasing number of users together also with the progress of the technology so encouraging to be studied in its acceptance[5]. Technology acceptance model has been widely studied with various patterns of implementation[6]. In this context the various applications or systems used by the user[7]. Thus, the technology acceptance model has undergone many changes with the modification [8] results of several studies that are considered relevant.

In this paper, a review will be carried out from a wide variety of literature. The literature relating to the assessment meant acceptance of the technology which was first proposed by the inventor Mr. TAM (Davis)[9]. In addition, this paper will classify and also summarize various types of technology acceptance models with the aim of providing a comprehensive overview of the technology acceptance models in addition to measuring the level of effectiveness[10]. But so far the systematic reviews that have been carried out by researchers are only as a guide and also a report as a reference for the study of technology acceptance models[11],[12],[13]. In line that, the first step in this literature review is to determine the scope of the topic to decide whether the study is relevant or not. In this paper we plan the structure of the article collection in an attempt to review what is produced and identify the core of current knowledge[14]. However, this paper may still be incomplete, without a systematic procedure, extracting insufficient knowledge.

There are various applications or systems used in higher education. Even though all of that is still the same in the concept of learning electronically and also online. Starting from the core applications as e-learning, zoom, video conferencing, social media and so on[15]. Almost all activities involve applications[16]. But so far, existing research has only discussed one item, for example e-learning, while this concept is not only one application but more[17]. On another occasion, in an effort to support the systematic review process, we determined data sources to be used as data collections[18]. All data is collected from various journal sources or websites as well as a database system that contains online journal information[19]. Furthermore, each article will be selected selectively and in detail related to the topic being studied[20],[21]. The aim is to assist researchers in determining and using a broader range of specific research data sets. Journals or articles as data will be selected relating to the development and change of technology acceptance models. The timeframe or period as a feature of search for published research is taken between 2011 - 2020. The use of a systematic review framework is aimed at systematically identifying journals that in each process follow established steps, procedures, mechanisms or protocols. A systematic review framework can reduce the risk of identification that is not objective or even biased. Furthermore, it is intended that the identification results can increase the amount of literature on the application of a systematic review framework when assessing technology acceptance models.

II. RESEARCH METHOD

Systematic Literature Review is considered by researchers as a term adopted to refer to a particular research or research methodology[22]. Its development is carried out in gathering and evaluating related research on a particular topic focus[23],[24]. This research is carried out for various purposes[25], including identifying, studying[26], evaluating, and interpreting almost all available research with the topic area of the phenomenon of interest, with certain relevant research questions[27]. Besides that, it is often needed as a research agenda determination, part of a dissertation or thesis, and is a part that complements the substantive requirements for research grant applications[28],[29].

A. Research Object

The object of this research is the technology acceptance model. Making technology acceptance model as the research object has several considerations including: First, the change in technology acceptance model over the last decade. Second, changes, development, and modification of technology acceptance models, there are several construct variables, both endogenous and exogenous. Third, the diversity of cases that have been investigated through the technology acceptance model in previous studies.

B. Research Questions

In this context, there are research questions that are made based on the needs of the selected topic[30]. We conducted systematic reviews [31]of various approaches to evaluate that have been applied in the empirical literature on educational technology at the tertiary level[32]. Thus, it can support researchers to be more accurate so that the evaluation of the use of educational technology is more effective[33]. This paper focuses on how to evaluate the level of technology acceptance in education[34].

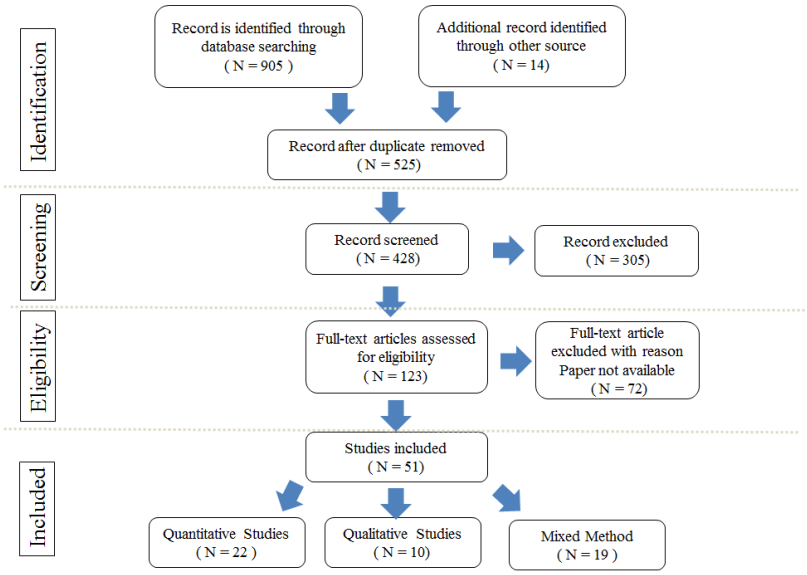

Figure 1. Systematic Review Process

RQ1 Does the technology acceptance analysis framework start from 2011 - 2020?
RQ2 What applications or technologies are often used in learning media?
RQ3 What methods are tested when evaluating technology acceptance in instructional media?

C. The process of search, Inclusion and Exclusion Criteria

The search process, as a support for systematic review, is used to obtain sources that are considered relevant in answering research questions and other related references. The search process is carried out using serach engine assistance tools such as direct science, springer link, google scholar, IEEE Explore and so on, marked as the primary data source (primary) and other search engines, namely www.google.com as supporting data (secondary)[35].

There are two stages, namely inclusion and exclusion criteria[36], where this stage is carried out to decide whether the data found in research uses a systematic literature review framework or not[37]. The rest, the study is feasible to choose if there are criteria including: source data used in this study is used in the time span between 2011 and 2020[38]. Second, the data obtained with the help of search engines such as science direct, Springer link, google scholar, IEEE Explore and www. google.com. Third, the source data used in this study only relates to the technology acceptance model.

D. Evaluation and Data Collection

The next stage, in evaluating the data that has been found through a search process based on the question of quality assessment criteria[39],[40],[41]. First, RQ1 was a journal paper or other similar published in 2011 - 2020? Second, RQ2 does the journal paper mention the application or system used in analyzing technology acceptance[42]. Finally, which methods are often used in analyzing technology acceptance[43],[44].

Data collection is a stage where data for research is collected. There are two types of data collected, namely primary data (primary) and supporting data (secondary). Primary data (primary) is intended as information collected through offline or online surveys, observations, and tailored to needs. In this study, the primary data obtained came from journals indexed or recorded in science direct, Springer Link, Google Scholar, and IEEE Explore. With this in mind, the serach engine facility provides complete, accurate and updated features. In addition, information is easy to find because it has a time range or period that can be adjusted based on the needs of the researcher[45]. The next data source is supporting data (secondary) which plays a role in completing the primary (primary) data. We use www.google.com to obtain supporting (secondary) data. Therefore, data collection in research is obtained through several stages, namely observation as a stage of data collection through direct observation to sources, namely direct science, Springer Link, Google Scholar, and IEEE Explore[46]. Next is a literature study which is a stage for conducting a data assessment study related to the systematic literature review method on journals that are retrieved through science direct, springer links, google scholar, and IEEE Explore.

Table 1. Summary of Search Result Based on Database

Database Name	Search results	Duplicate Papers	Relevant Paper
Science Direct	68	30	5
IEEE Explorer	182	167	3
Springer	534	236	26
Google Scholar	135	92	17
Total	919	525	51

E. Analysis of Data Sources

The data analysis stage is needed to show the technology acceptance analysis starting from 2011 - 2020 which refers to RQ1. What applications are often used in instructional media refers to RQ2, and what methods are tested when evaluating technology acceptance in education refers to RQ3. The final stage is the identification of the existence of report deviations (Deviation from Protocol) as a result of the study by showing the changes, namely:

1. This study identifies the analysis of technology acceptance, applications used in learning, and construct variables and answers the research questions that have been asked.
2. Collecting journal manuscripts or the like in answering and ensuring quality and providing information deemed mandatory.
3. Increase and expand the scope of the description of the systematic literature review framework in this study.

III. RESULT

A. Overall Review of Selected Studies

The first discussion, considering that all paper data have been selected, there are 51 articles that are considered original. The main choice is in the educational context when adopting technology as a learning tool[47],[48]. For the rest, we will concentrate on the publication history by researchers relating to the acceptance of technology as a defined topic[49],[50],[51],[52]. The picture below, illustrates that during the last 10 years, there have been several published research articles that were selected according to the criteria. Information about real trending starts from 2011 to 2020. There are a number of articles that were selected the highest in 2018 with 11 articles, while in 2012 the lowest was with an average of 5 to 6 published articles[53].

A further problem associated with the prevalence of author and researcher scattered around the world that focus on research on technology acceptance. This is particularly so on the perspective of learning, teaching, addressing various domains of learning and technology[54]. The image below can actually provide a visualization of a location or area that is different from the others.

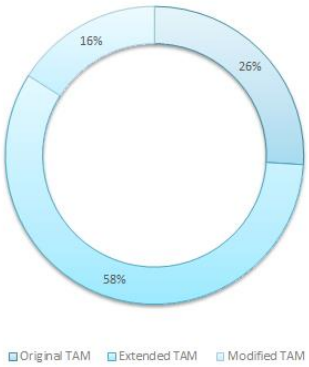

Figure 2. Summary of TAM Modeling and versions

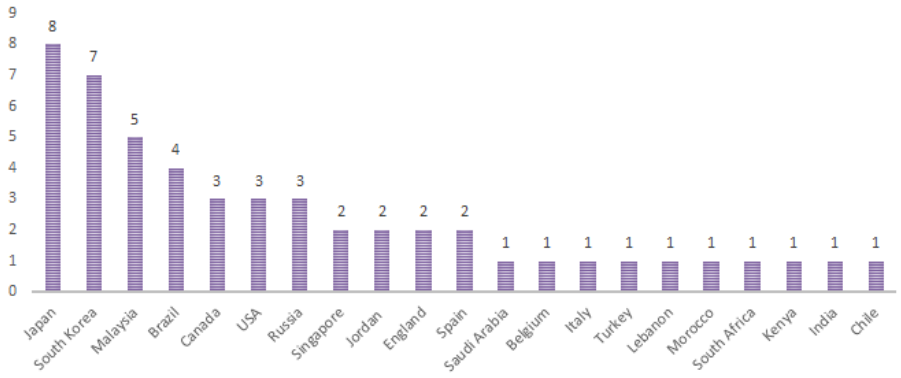

Figure 3. Contributions Paper From every country studies TAM

This topic was raised with the aim of studying the user's acceptance of technology when learning and to understand their behavior. Understand behavior when using all kinds of new information technologies and related technologies that can be used to support learning, teaching and assessment processes. Almost the majority of research on the concept of TAM in the context of education comes from Asia, especially developing countries in the Southeast and East Asian regions such as Malaysia, Thailand, Singapore, South Korea and Japan. However, followed by the second rank of countries in the western hemisphere such as Germany, Finland, France and Austria. Furthermore, there are in the Middle East, Africa, North America, and South America. Even though the numbers differ from each country, they have the same mission on how to improve the quality and experience in the learning process with the help of technology.

RQ1 Does the technology acceptance analysis framework start from 2011 - 2020?
Based on the search results using strings as keywords, there are 905 published articles along with 14 additional articles. As for almost all documents or articles related to technology acceptance. Furthermore, we identified that there were 525 articles declared duplicates which provided the next step in screening, in fact there were 305 that

succeeded in accordance with the criteria. If you look at the eligibility, there are 123 and so on until you get 51 data.

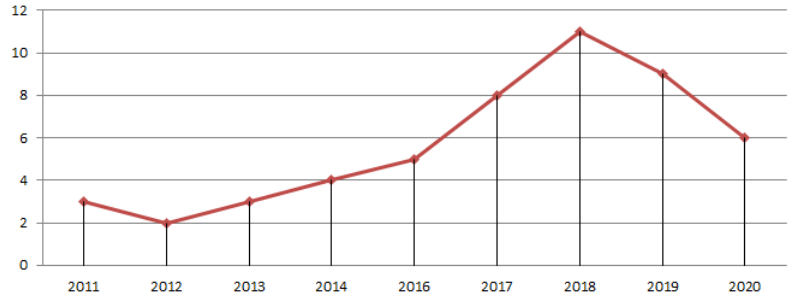

Figure 4. A collection of published articles after being selected by year

We found and identified it based on the year of publication taken from 2011 - 2020. The highest number of figures was in 2018, namely 10 - 12. This condition is considering that TAM has reliability and is increasingly trendy among researchers when assessing technology acceptance.

RQ2 What applications or technologies are often used in learning media?
It is unique in the study of objects in the form of TAM is the application or technology other than the user who adopt it. Many technologies have been used in learning with the aim of improving the quality of the learning process. The online-book media is the number that dominates the various literatures in addition to the perceived ease of using and studying the content contained therein. In second place, namely e-learning applications which are considered as the main needs when interacting with technology in connecting everyone.

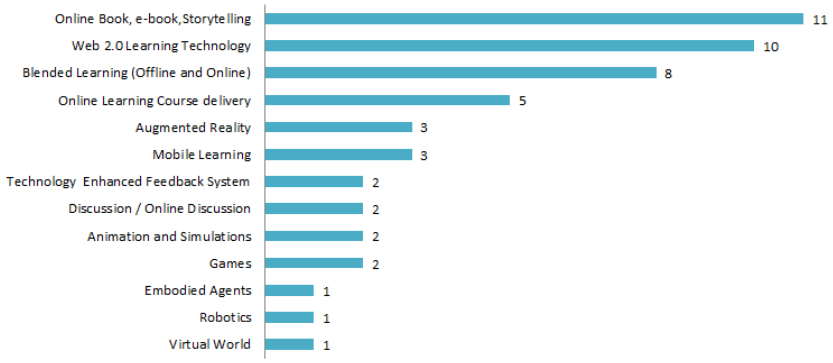

Figure 5. Learning technology used in educational institutions.

RQ3 What methods are tested when evaluating technology acceptance in instructional media?

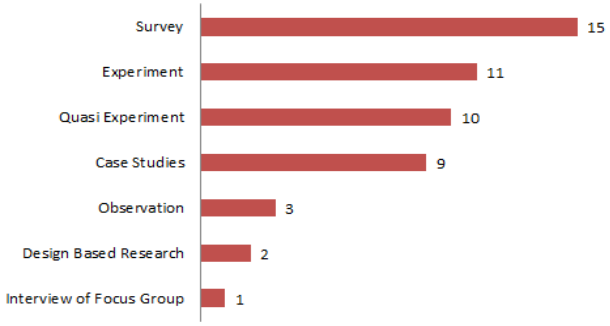

Figure 6. Summary of analysis methods for the study of technology acceptance models

Initially, we suspected that almost all of the research that had been carried out used experimental methods, but it turned out to be a survey. Thus, the survey is not only considered a way of collecting data but also as a method of analysis in statistical tests using a survey. Each user is given a Likert scale form when filling out the questionnaire.

B. Gaps in Current Work and Implications for Future Research

We are aware of the fact that in general, empirical research, although carefully designed and carried out, has opportunities for weaknesses that open new avenues for future work [55],[56]. Most of the studies presented in this systematic have pointed out some research gaps and hence have suggested there are areas or areas for further investigation. For example, most studies have cited generalization as a major drawback[57],[58]. Generalization for populations other than those in the study sample presented is discouraged due to specific demographic or cultural contexts. The data analyzed often comes from one or only a few educational institutions on the one hand and / or the sample of participants is too small [59]for any valid statistical analysis[60].

In addition, another general limitation applies to the short time period during which the research is conducted as well as with some new research variables based on TAM[61]. In line with the limitations presented, future research perspectives include new studies that include a wider sample of participants in particular other countries or other constructs, subjects and participants of different ages, circumstances or other e-learning infrastructure or broader technological tools[62]. In order to ensure the generalizability of the study findings, [x] has discussed that in subsequent studies, the findings should be validated in other settings beyond specific conditions such as subject characteristics and type[63].

In an effort to shorten, future studies could be extended to a large number of respondents to also include instructors because, apart from students, various teaching staff are also involved in the teaching and learning process[64]. In addition, future research needs to collaborate with the proposed method with a computational approach, for example using fuzzy logic or creating a decision support system. This alternative approach may be considered difficult but in the future all research results can be measured with certainty with the help and improvisation of computational theory in addition to using statistical analysis. Finally, several authors as well as researchers suggest training and socialization on how to use effective resources such as digital games as a learning tool and social media in the context of education.

C. Limitations of The Conducted Review and Directions of Our Future Work

In essence, the systematic study undertaken seeks to convey an important recapitulation of technology acceptance, especially concerning the field of education. In addition, it provides a critical picture of the state of the search effort. There are several considerations of limitations that must be considered. First, some concerns about the search keywords being specified can be raised[65]. Thus, it can be argued that a particular search term in a publication title does not completely cover all potentially contributing research studies.

This is because there are several peer-reviewed publications where these keywords may not appear in the title but still appear in the content. However, due to the considerable effort by researchers in the field of technology acceptance, the review cannot be considered complete but only includes representative academic literature.

Second, the potential specification of another criterion, namely the search term, together with other database options, may have resulted in more publications. Third, we start with the assumption that all extensions or modifications to the original TAM model will be adhered to under the generic term "TAM ++". However, during the final literature

selection analysis, we realized that "TAM ++" was not a concrete term in the literature and continued to define the publication with a delivered research model based on the original TAM or modified or extended TAM. As there are gaps in current research as well as the limitations of the review itself, future research will follow new research directions:

- In order to search wider academic literature that will adopt several different keyword searches also included a special learning technologies as explicit search terms,
- Searches oriented discover and analyze the extension / modification new TAM, for example MTAM - cellular technology or STAM - social networking platform, GTAM GPS Technology.
- Implementation of studies to address some of the gaps identified in the current situation as a basis for seeking TAM in an educational context.

IV. CONCLUSION

Without realizing it, currently living in an era of sophisticated technology that has the potential to have an impact on life in various ways. The existence of a configuration in the field of education has been recognized and is considered a domain with good potential. Thus it is able to adapt to new technology. It involves a wide range of learning technologies supporting the transfer process, transfer and acquisition of specific knowledge. Therefore, research examining the acceptance of technology in the field of teaching and learning has become an interesting and unique trend. TAM and its many versions are recognized in many countries around the world as a robust framework when planning and implementing empirical research in education. The work presented in a systematic review of the academic literature analyzing with TAM in the context of education brings a number of 51 basic studies published between 2011 and 2020 period. The studies that have been identified, assessed and analyzed offer various kinds of trials of studying technology with different research methods using TAM so that they seek to dig more and more about this important topic. The main findings are discussed and a summary of the gaps identified.

In the present study along with future research perspectives are presented. In general, the authors try to prove TAM as a reliable model for predicting the acceptance and use of various types of technology, especially learning. A new expansion / modification of the Model is proposed to cover various factors that influence the decision to adopt and accept or reject certain technologies in the teaching and learning process.

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