Using a General Extended Technology Acceptance Model for E-Learning (GETAMEL). A Literature Review of Empirical Studies

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Abstract

This paper examines peer-reviewed empirical studies using the General Extended Technology Acceptance Model for E-learning (GETAMEL). We have created a framework for examining the effects of the set of external variables on e-learning acceptance. The study reviews the independent variables (Experience, Subjective Norms, Enjoyment, Computer Anxiety, and Self-efficacy), and dependent variables (Perceived Usefulness, Perceived Ease of Use, Attitudes Towards Using, Intention to Use, and Actual Use), path coefficients, theoretical backgrounds, and the type of studies performed on the e-learning systems in the literature review. The paper examines the state of current research on the topic and points out gaps in the existing literature. The objective of the paper is both to provide an overview of the literature and to investigate the reasons for e-learning acceptance. As a result of the study, we present the mean values of the relations between variables adequate for the GETAMEL model in all the reviewed works. The findings of the review provide insight for further studies and the use of the GETAMEL model.

Keywords: E-Learning, Distance Learning, GETAMEL, Technology Acceptance

1.   Introduction

During the last few years, e-learning adoption has been a trending topic and a subject of studies [17, 19]. It was speeded up by the COVID-19 pandemic that shifted teaching and learning into a distant form [5]. Almost all the countries in the world reacted to the ongoing pandemic by switching education on every level to online classes at schools and universities [12]. As noted by Sangrà et al. [18] e-learning "is part of the new dynamic that characterizes educational systems at the start of the 21st century, resulting from the merge of different disciplines, such as computer science, communication technology, and pedagogy". Understanding what can improve the implementation of e-learning, understanding the reasons why students and teachers reject this method of teaching, and discovering how to improve teaching techniques with the use of ICT - these issues are currently becoming one of the most significant challenges of higher education.

For several years e-learning has been often considered a complementary way to gain education [4]. In many countries, there was no infrastructure (internet connection and devices used to teach and learn) that could be used to develop e-learning competences both for students and teachers. A sudden change, such as the COVID-19 pandemic, forced both students and teachers to switch to different e-learning systems immediately due to the closure of physical facilities [24].

Understanding how students accepted this change is valuable practical knowledge for designing future e-learning systems. Different countries have introduced different solutions to continue the learning process at schools and universities [20]. However, due to these different circumstances, we noticed that each e-learning system can be evaluated by a general extended technology acceptance model for e-learning (GETAMEL) [1]. GETAMEL is a research model provided by Abdullah and Ward [1] after they examined 107 papers on the Technology Acceptance Model (TAM) in the context of e-learning adoption. They discovered that Self-efficacy (SE), Subjective Norms (SN), Enjoyment (ENJ), Computer Anxiety (CA), and Experience (EXP) are the most commonly used confirmed external factors for the TAM of 152 different external variables.

The main variables of the TAM model are used to explain to what extent the users' beliefs influence the use and/or behavioral intentions (in case of lack of the actual use measurement): Those variables are stated as follows:

- Perceived Ease of Use (PEOU) - the degree to which a person believes that using a particular system would be effortless,
- Perceived Usefulness (PU) - the degree to which a person believes that using a particular system would improve their work.

The Technology Acceptance Model, founded by Davies in 1986 [8], argues that perceived technology usefulness (PU) and perceived ease of use of technology (PEOU) influence Attitude to Use (ATT), which, in turn, influences Behavioral Intent to Use Technology (BI).

The main variables of TAM, PEOU and PU are influenced by external factors. That, as a whole, can affect the negative or positive attitude of an individual towards using technology. General Extended Technology Acceptance Model for e-learning (GETAMEL) is a TAM model extension with the most commonly used external variables in TAM research:

- Experience (EXP) - the amount and type of computer skills a person acquires over time,
- Subjective Norms (SN) - the person's perception that most people who are important to them believe that they should or should not perform certain behaviors. In the context of using e-learning, the Subjective Norm refers to "the extent to which the students perceive the pressure of members of their environment to use e-learning systems" [3],
- Enjoyment (ENJ) - the extent to which the activity of using a particular system is perceived as enjoyable in itself, ignoring any performance implications of using,
- Self-efficacy (SE) - an individual's judgment about their own ability to perform specific tasks,
- Computer Anxiety (CA) - the individual's tendency to anxiety or fear of the current or future use of computers in general.

Taking into consideration several research works that use the GETAMEL model, we would like to find out how shifting from physical to distance learning was accepted by students and what are the results of the acceptance analysis in the reviewed studies. To meet this research problem, we have performed a literature review that provides an overview of the studies investigating how external variables have influenced e-learning acceptance. We have reviewed the results of the variables used in the GETAMEL model, sample sizes, and distribution of papers in the analyzed literature. Moreover, we report the coefficients between the external variables and the dependent variables in the covered literature.

Therefore, the research questions for this paper stand as follows:

RQ1: What variable relations in the GETAMEL research model are found to be consistent in the literature?

RQ2: How do the GETAMEL variables in the reviewed works affect each other?

RQ3: Which effects between variables are confirmed in all or most of the reviewed works?

These research questions led to achievement of the objective of our paper, which can be formulated as follows: (i) to reveal similarities and differences in the results of GETAMEL

application for distance learning acceptance analysis, presented in the literature of the last decade, and (ii) to define students' attitude towards distance learning based on the GETAMEL application results.

2. Procedure

This section reports the following stages of the analysis. We begin our research by conducting a literature search, starting with defining a comprehensive but accurate set of keywords, followed by a formal search for studies using keyword sets. We have formed explicit rejection criteria for omitting search hits that do not meet the objectives of this study. Next, we have encoded the relevant statistics, findings, and measures for the remaining papers. Finally, we have analyzed the papers by descriptive check of the sample size, research background, theory basis, and causal pathways of included studies.

Following the guidelines of Webster & Watson [23], the analysis process started with a literature search. We decided to use the Scopus and Web of Science databases as our primary data sources, which are the largest abstract and citation databases for academic literature. Scopus is the most relevant research repository in the related disciplines, publishing literature on why people adopt and use different technologies. In addition, Scopus includes libraries such as AIS, ACM, IEEE, and Science Direct, among others. The search procedure took place in January 2022.

The search term "getamel" was used in these two databases. This search term was used for all fields (including title, abstract, keywords, and full text). Web of Science contained eleven results, whereas Scopus returned ten results. Although more research with the use of this keyword can be found in Google Scholar, the quality of results is much worse. Google Scholar covers every document which contains the keyword "getamel", but not necessarily a scientific, peer-reviewed work.

After the initial database search to determine what results the databases provided, a focused search was performed on these databases. First, we removed ten duplicate research articles because they were included in both databases. The search was focused on complete, peer-reviewed papers published in international venues, not conference proceedings, books, or other general articles on technology acceptance and e-learning. The main inclusion criterion was the usage of the GETAMEL for assessment of the significance of external variables on e-learning acceptance. Using this criterion, we excluded the original published GETAMEL since our objective was to review not the research model itself, but the papers that study the application of this model. The inclusion process resulted in the selection of ten research articles for further analysis.

Prior to further analysis, the data was encoded according to Webster & Watson [23]. In addition to all the coded metadata, we used the methodology, theory, research context, independent variables, dependent variables, relationships between variables, coefficients, and effect sizes. Not all studies name and measure variables the same way, so we needed to identify and combine variables that measure the same factors but use different names. Since the body of literature was fairly uniform, and the studies used fairly standardized analysis methods, we did not have to make any other decisions during the coding process that might have affected the final results.

Table 1 presents the reviewed studies in alphabetical order, along with the names of the journals that published the papers and the year of publishing, ID for coding procedure, comment about the GETAMEL variables used, inner model, and context of the study.

Table 1. Included studies

Reference	Venue	Id	N	GETAMEL	Inner model	COVID context
Abdullah et al., 2016 [2]	Computers in Human Behavior	A1	242	all external variables	excluded attitude and actual use	No
Chang et al., 2017 [6]	Computers & Education	A2	714	all external variables	excluded attitude and actual use and intention to use	No

Cicha et al., 2021 [7]	Sustainability	A3	670	all external variables	original	Yes
Doleck et al., 2018 [9]	Knowledge Management & E-Learning: An International Journal	A4	132	all external variables	original	No
Humida et al., 2021 [10]	Education and Information Technologies	A5	262	all external variables	excluded attitude and actual use and intention to use	Yes
Jiang et al., 2021 [11]	Frontiers in Psychology	A6	678	all external variables	original	Yes
Liu et al., 2021 [13]	Interactive Learning Environments	A7	450	all external variables	excluded attitude and actual use	No
Matarirano et al., 2021 [14]	International Journal of Emerging Technologies in Learning	A8	101	all external variables	original	Yes
Matarirano et al., 2021 [15]	South African Journal of Higher Education	A9	125	all external variables	excluded attitude and actual use	No
Rizun & Strzelecki, 2020 [16]	International Journal of Environmental Research and Public Health	A10	1692	four external variables	original	Yes

3.   Reviewed Research Works

Various research with the use of the GETAMEL model has been conducted since 2016. Most publications with the GETAMEL were created in 2021. In all publications, the research subjects were universities, mainly students (only one study concerned teachers). Most studies were conducted in Asia and Europe (two of which were in Poland). Two studies were carried out in Poland and South Africa. The same researchers, Rizun & Strzelecki, participated twice in the research in Poland, but in the study from 2021, the team was extended [7]. The authors of both studies in South Africa were Matarirano et al. [14, 15]. In the case of 6/10 of the studies, the respondents used e-learning or selected tools voluntarily, and in the case of 4/10, using e-learning was institutionally forced. All studies concerned the technological acceptance of e-learning at higher education institutions (HEIs). Only one paper of ten examines the technological acceptance of e-learning by teachers.

The earliest study was conducted in 2016 by Abdullah et al. [2]. It uses the GETAMEL model to test the engagement and acceptance of ePortfolio by the UK university students participating in a computer course.

In 2017, Chang et al. [6] were looking for an answer to the question of whether the GETAMEL model can be used in the study of e-learning in Azerbaijan and whether, thanks to the obtained results, it is possible to prepare a comprehensive e-learning system.

In 2018, Doleck et al. [9], tried to empirically verify the correctness of the GETAMEL model on the sample of Collège d'enseignement général et professionnel (CEGEP) students. In this study, the authors question the stability of the GETAMEL model. Doleck et al. note that technology acceptance is context-dependent, and the hypothesis verification for GETAMEL is not always consistent across studies.

The study by Matarirano et al., 2021 [14] concerned the technological acceptance of the Learning Management System for a selected HEI (Higher Education Institution) in South Africa among teachers while pointing to the low use of purchased LMS licenses measured by the number of active students and teachers in the system. One of the conclusions of the study is that the GETAMEL model is not the best tool for studying technology adoption and

acceptance by faculty members, as the results indicated that many factors are irrelevant in this particular group. Moreover, the researchers pointed to the limitation of the study, which was the lack of voluntary use of tools. The use of tools during the study was forced by the COVID-19 pandemic.

The work by Rizun & Strzelecki, 2020 [16], analyzes students' attitudes to distance learning based on the example of a selected Polish university during the COVID-19 pandemic. The aim of the study was also to check whether students accept the IT communication tools used in distance learning selected by the university. As in the case of Matarirano et al., 2021 [14], the respondents did not participate in online learning voluntarily.

The aim of the study conducted by Cicha et al., 2021 [7] was to analyze the expectations of the first-year students about distance learning. The students had no previous experience and no opportunity to compare distance learning with full-time education at the tertiary level. It is difficult, however, to unequivocally assess their voluntary participation in online education in this case because when they started their studies, they knew that the education would take place in the form of distance learning and the only decision for them at that time was not to start studies in a given year. On the other hand, it cannot be ruled out that this decision was not entirely voluntary. If they wanted to maintain the continuity of education, they had no choice between online or stationary learning. However, the authors assumed that the decision to apply for studies was equivalent to the voluntary adoption of this form of education.

As part of the study by Liu et al., 2021 [13], the technological acceptance of learning the practical use of MLA (mobile library applications) solutions with the use of augmented reality (AR) and three-dimensional (3D) maps were analyzed among students. The authors assumed that the possibility of practicing the skills of using MLA in a virtual environment allows students to get to know MLA solutions better and use library resources.

Humida et al., 2021 [10] studied behavioral intentions in using e-learning systems at higher education institutions at a selected university in Bangladesh during the COVID-19 pandemic. As the authors point out, the pandemic forced the introduction of distance learning throughout the country. In Bangladesh, as in most developing countries, the e-learning system was not fully adopted before the pandemic.

Jiang et al., 2021 [11] used the GETAMEL model to test the technological acceptance of foreign language online learning at a university in China.

The study by Matarirano et al., 2021 [15] concerned the technological acceptance of the Learning Management System among students. Based on the results obtained through a study conducted at the selected HEIs in South Africa, the authors concluded that it is necessary to find ways to make the use of technology more enjoyable and to teach how to use technology for learning from the beginning of the education process. This could have a positive impact on the students' experience of using technology and result in an improvement in their self-efficacy. The main standardized information about every reviewed research is presented in Table 2.

Table 2. Main information about the selected studies

Id	Reference	Who	Where	N	Voluntary of use	Field of research
A1	Abdullah et al., 2016 [2]	students	The United Kingdom (Europe)	242	yes	ePortfolio
A2	Chang et al., 2017 [6]	students	Azerbaijan (Asia)	714	yes	e-learning acceptance
A3	Cicha et al., 2021 [7]	students	Poland (Europe)	670	yes	e-learning acceptance
A4	Doleck et al., 2018 [9]	students	Canada (North America)	132	yes	e-learning acceptance
A5	Humida et al., 2021 [10]	students	Bangladesh (Asia)	262	no	e-learning acceptance
A6	Jiang et al., 2021 [11]	students	China (Asia)	678	no	language learning
A7	Liu et al., 2021 [13]	students	Taiwan (Azja)	450	yes	Mobile Library Applications
A8	Matarirano et al., 2021 [14]	lecturers	South Africa (Africa)	101	no	Learning Management System

| A9 | Matarirano et al., 2021 [15] | students | South Africa (Africa) | 125 | yes | Learning Management System |
| A1 0 | Rizun & Strzelecki, 2020 [16] | students | Poland (Europe) | 169 2 | no | information and communication technologies |

4. Findings

This section reports our review findings. First, we report studies included in the review and their characteristics. Then, we report the context of the presented studies and their theoretical foundations. Finally, we report causal relationships used in the reviewed literature.

The studies were published between 2016 and 2021 but most frequently and uniformly in 2021 (6 times). All of the published studies are journal articles. Sample sizes (column "N" in Table 2) range from 101 to 1692, with a mean of 356.

Structural equation modeling was the most popular methodology. These ten studies employed either the covariance-based SEM (four papers) or Partial Least Squares SEM (six papers). The used software was SmartPLS3, SPSS, Amos, WarpPLS, and Mplus. See table 3.

Table 3. Analysis methods used in the reviewed papers

Method	Study	N
PLS-SEM	A3, A4, A5, A8, A9, A10	6
CB-SEM	A1, A2, A6, A7	4
Software	**Study**	**N**
SmartPLS	A3, A5, A8, A9, A10	5
SPSS	A1, A6	2
Amos	A2	1
WarpPLS	A4	1
Mplus	A7	1

All studies were conducted according to the principles of GETAMEL research model. Although some of them have a slightly different set of external variables and inner models, all the studies were aimed at finding the acceptance level of e-learning education. Five of these studies were conducted after the COVID-19 pandemic occurred. All the studies, except one, used all the external variables, whereas one study (A10) used only four out of five external variables (Subjective Norms were omitted). Five studies used the original inner TAM model. The other five used different variations of the inner model, e.g., excluding one or two dependent variables or replacing them with another. The original inner model contains the following dependent variables: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Intention to Use (ITU), Attitude Towards Using (ATU), and Actual Use (AU).

Figure 1 illustrates the GETAMEL research model, in which five variables were added to the TAM model: Self-efficacy (SE), Subjective Norms (SA), Experience (EXP), Enjoyment (ENJ), and Computer Anxiety (CA).
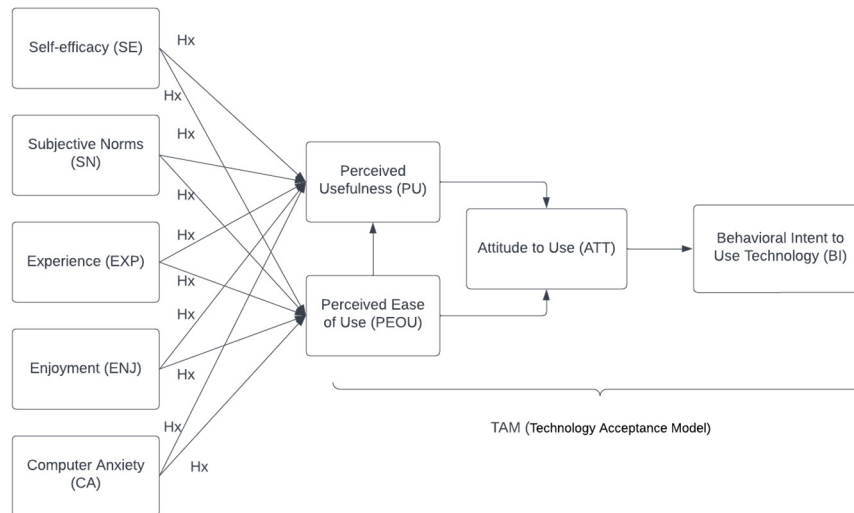
Fig. 1. General Extended Technology Acceptance Model for E-learning diagram

Source: own, based on [1]

We have examined the outer model of each study since it was nearly identical in each paper (except A10, where SN were omitted). Table 4 contains hypothesis results confirmation for each path in each study.

Table 4. Type of effect between external and dependent variables.

ID	ENJ -> PU	ENJ -> PEOU	EXP -> PU	EXP -> PEOU	SE -> PU	SE -> PEOU	CA -> PU	CA -> PEOU	SN -> PU	SN -> PEOU
A1	P	P	NS	P	N	P	NT	NS	NS	P
A2	P	P	P	P	NS	P	N	N	P	NS
A3	P	P	N	P	P	P	NS	NS	P	NS
A4	P	P	NS	P	NS	P	NT	NS	NS	NS
A5	P	P	NS	NS	NS	P	NS	P	NS	P
A6	NS	NS	NS	NS	NS	NS	NT	N	P	P
A7	P	P	P	NS	NS	P	NT	NS	P	NS
A8	NS	P	NS	NS	NS	P	NS	N	NS	NS
A9	P	P	NS	NS	NS	P	NS	N	P	NS
A10	P	P	N	P	P	P	N	NS	NT	NT

P - positive effect, N - negative effect, NS - hypothesis not supported, NT - hypothesis not tested

Positive effect (P) means that the external variable positively affects the dependent variable. The negative effect (N) means that the external variable negatively affects the dependent variable. When a hypothesis is not supported (NS), it means that the external variable has no effect on the dependent variable, and when the hypothesis is not tested (NT) - the relationship was not examined.

The least tested relationship was the Computer Anxiety effect on Perceived Usefulness. In the original GETAMEL, the authors concluded that this relationship is often insignificant [1]. That is why some of the reviewed studies did not test this relationship at all, assuming that it is not relevant to the model. It can be concluded that nowadays computer and digital literacy is improved in each group of age, especially in the group of students who are very familiar with computers. It means they do not have anxiety about using a computer during online learning. In the reviewed studies which tested this relationship, two times the significant negative effect is reported, and three times the effect is not supported by the data. Table 5 presents a summary of reported effects in the reviewed studies.

Table 5. Summary of the types of effects between external and dependent variables

	ENJ -> PU	ENJ -> PEOU	EXP -> PU	EXP -> PEOU	SE -> PU	SE -> PEOU	CA -> PU	CA -> PEOU	SN -> PU	SN -> PEOU
Positive	8	9	2	5	2	9	0	1	5	3
Negative	0	0	2	0	1	0	2	4	0	0
Not supported	2	1	6	5	7	1	3	5	4	6
Not tested	0	0	0	0	0	0	5	0	1	1

From the presented summary, it is visible that the results differ across all studies. The most-reported positive effect is of Enjoyment on the Perceived Usefulness and on the Perceived Ease of Use. The Experience has an almost equally distributed effect on PU and PEOU. Experience is an external variable with the biggest number of not supported effects. The Subjective norms variable either has a positive effect on PU and PEOU, or the effect is not supported. Self-efficacy has mostly a positive effect on PEOU, while its effect on PU is mostly not supported. When Computer Anxiety is tested, it has a mostly negative effect on both dependent variables.

Almost all the reviewed studies used the same external variables as the GETAMEL model. Study A8 has three additional external variables: job relevance (JR), system accessibility (ACC), and technical assistance (TS). Study A8 motivated such additional variables as job relevance (JR) to be identified in the Technology Acceptance Model 2 [22], and system accessibility (ACC) and technical support (TS) - to be identified in Technology Acceptance Model 3 [21]. Study A10 resigned from the subjective norms (SN) variable due to the mandatory character of distance courses during the COVID-19 pandemic.

The relationships between the independent variables (Enjoyment, Experience, Self-efficacy, Computer Anxiety, and Subjective Norms) and dependent variables (Perceived Usefulness and Perceived Ease of Use) are reported in Table 6. From the most commonly measured independent variables, based on the results, Enjoyment (0.37) and Subjective Norms (0.15) were the strongest predictors for Perceived Usefulness (based on weighted means of the coefficients). Self-efficacy (0.33), Enjoyment (0.27), Experience (0.19), and Subjective Norms (0.15) were the strongest predictors for the Perceived Ease of Use.

Table 6. Coefficients of variables' relationships

Path	N	Min	Max	Mean	W-mean	SD
ENJ - PU	10	0.02	0.65	0.35	0.37	0.20
ENJ - PEOU	10	0.08	0.36	0.30	0.27	0.09
EXP - PU	10	-0.19	0.18	0.05	0.02	0.14
EXP - PEOU	10	-0.02	0.50	0.16	0.19	0.18
SE - PU	10	-0.14	0.19	0.03	0.03	0.10
SE - PEOU	10	0.02	0.57	0.31	0.33	0.17
CA - PU	5	-0.19	0.05	-0.02	-0.05	0.10
CA - PEOU	10	-0.26	0.19	-0.08	-0.07	0.14
SN - PU	9	0.02	0.34	0.15	0.15	0.11
SN - PEOU	9	-0.04	0.59	0.09	0.15	0.19

5. Discussion

This paper reviewed ten research works dedicated to the application of the General Extended Technology Acceptance Model for E-learning (GETAMEL) before and during the COVID-19 pandemic. The objective of the paper was to compare the results of the analysis of the independent and dependent variables of GETAMEL and to reveal students' attitude toward e-learning. We searched such research databases as Scopus and Web of Science, finding papers

in which GETAMEL was applied (within the last decade), excluding the paper that presented the original model to the world. The review allows concluding about how students used to perceive e-learning, paying particular attention to e-learning which was forced on by the pandemic. The research questions set in the Introduction of the paper were answered with the review.

Firstly, we can state that three relations (positive) are proved by most studies (eight and nine out of ten): Enjoyment and Perceived Usefulness, Enjoyment and Perceived Ease of Use, Self-efficacy, and Perceived Ease of Use. Furthermore, the relation between Self-efficacy and Perceived Usefulness is not supported by seven out of ten studies.

Secondly, we observe that Enjoyment has the strongest positive effect on the variables (PU and PEOU); students are more eager to use something (in this case - e-learning) when they enjoy it than when they are just forced to do that. A high positive effect of Self-efficacy on PEOU also shows us that the feeling of working effectively makes students believe that e-learning is an easy option for them to use. At the same time, we see that the same feeling (SE) does not influence whether students will actually use (PU) e-learning or not. This relation is not supported, probably because in five of the ten works we reviewed, the respondents (students) had to switch to e-learning because of COVID-19. Therefore, the second and third research questions are answered by the data in Table 5 of the paper.

5.1. Methodological Limitations in the Reviewed Studies

Apart from achieving the objective set in the paper, in the review process, we have revealed several limitations in the studies conducted on GETAMEL. First, the groups of respondents who took part in the studies presented in the papers could be more homogeneous. For instance, some samples included 80% of women, while the other had 75% of the first-year students. Obtaining data from both genders equally or from all the years of study in the same amount might have given slightly or even significantly different results. Second, in the reviewed studies, such factor as students' major was ignored. And it seems reasonable to differentiate students of, for example, Philology, from the students of Computer Science - the latter might feel much less anxious about working with computers. Third, we consider that surveys on students' attitudes towards e-learning should be repeated on the same sample of respondents (students). It might happen that one day the students feel good about e-learning because it allows them to stay at home, working with a laptop under a warm blanket, but a few months later they may get tired of working at home, or they might feel that systematic learning online is too complicated for them. Therefore, studying students' attitudes in dynamics could provide researchers with much more valuable results on how students change their attitude and behavior.

Fourth, the reviewed research works mostly neglect the fact that students' attitude toward e-learning is formed not only by how they perceive work with a computer at home but also by the way a particular course is taught, what methods the teacher uses, what software is applied, etc. For instance, Abdullah et al. [2], in their work, studied e-learning acceptance not in general but in the case of the ePortfolio learning tool. Such a narrowed research subject allowed them to draw conclusions about required improvements in a particular e-learning methodology. Fifth, the studies that applied GETAMEL did not consider such a variable as the willingness of students to study online. COVID-19 has forced students, as well as teachers, to switch to e-learning. In this case, such variables as Intention to Use could be ignored since the students have to study online regardless of their personal intentions. As stated by Doleck et al. [9], technology acceptance is highly context-specific, and any model would need to account for the situativity of technology acceptance decisions.

And sixth - we revealed very little research that analyzed the acceptance of e-learning by teachers. While studying teachers' attitudes towards using technology is particularly important since these teachers can have a real impact on students' attitudes and the way they perceive any suggested e-learning technology. If a teacher does not encourage students to study online and, for example, does not help them adapt to this new learning format, it may significantly decrease students' enjoyment of using new technologies in the learning process.

5.2.   Limitations of this Literature Review

We see the first limitation of our research in the fact that five of ten reviewed research papers present studies conducted during the COVID-19 pandemic. It was not our particular objective to review works with coronavirus context, however, since we have searched for the papers published within the last decade, it was obvious that those published in 2020 and later will present studies conducted when the education all over the world had to be transformed to e-learning or, at least, blended learning. Therefore, five of ten works with the GETAMEL applied, analyze how students accept e-learning which they did not choose because they wanted to - but because they had to switch to learning from home due to the pandemic. We consider that students' opinions about voluntary e-learning in 100% of the reviewed papers could have provided us with different results.

The second limitation of our review is caused by the small number of research papers dedicated to the GETAMEL application. With more papers reviewed, we could have obtained a different picture of GETAMEL usage - with more or less consistent review results. Third, the study samples of the reviewed works are not unified, which makes it rather difficult to compare the results of the studies. The respondents' groups differ significantly by geography, gender, age, and profile (students and teachers), which does not allow concluding accurately about any particular type of respondents. In addition to that, as the fourth limitation, we would like to mention the fact that the works reviewed do not have a unified structure of the studies presentation, i.e., some of them present detailed tables with all the data obtained, while the others only describe the results in textual form, more or less in detail. Thus, we can assume that in our review, we might be lacking some essential insights that the authors of the reviewed works may have neglected in their papers.

5.3.   Contribution of the Research

The major contribution of this work is the review of the ten papers in which GETAMEL has been applied to analyze students' acceptance of e-learning. In the process of SLR, the authors have (i) synthetically described the research conducted in each of the papers, (ii) compared the results of GETAMEL application in these papers, revealing the similarities and differences in the findings obtained in each of the works and (iii) indicated limitations in research methodology of the papers. As the result of the Systematic Literature Review, we have not only examined the works taken for this review but have also discovered new knowledge that may be used for future, more profound research on e-learning.

5.4.   Avenues for Future Research

Directions for further research on applying the General Extended Technology Acceptance Model for E-learning arise, first of all, from the limitations discussed above. All together, they lead to a suggestion for the authors to conduct another study of e-learning acceptance with the application of GETAMEL. We see a possibility of research that will, first of all, fill one of the gaps revealed in our review - the lack of studies on teachers' acceptance of e-learning. As already mentioned above - teachers play a crucial role in forming students' acceptance of a particular course, topics within this course, technology and teaching methods applied in the learning process, and also in the format of learning. The same group of students might prefer working online with one teacher and be totally against e-learning with another teacher. That is why a study of teachers' acceptance of e-learning, in connection with how their students accept e-learning, would be a valuable contribution both to GETAMEL application theory and to the understanding of how e-learning is perceived at HEIs.

In addition, following the mentioned limitations, we consider it reasonable to conduct a study that will cover a larger time scale. We plan to analyze students' acceptance of e-learning at different moments of time - for instance, in the first year of studies and after one year. In this case, of course, it would be the same group of students taken as respondents in both periods.

References

1. Abdullah, F., Ward, R.: Developing a general extended technology acceptance model for e-learning (GETAMEL) by analysing commonly used external factors. Comput. Human Behav. 56 238–256 (2016)

2. Abdullah, F., Ward, R., Ahmed, E.: Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. Comput. Human Behav. 63 75–90 (2016)

3. Agudo-Peregrina, Á.F., Hernández-García, Á., Pascual-Miguel, F.J.: Behavioral intention, use behavior and the acceptance of electronic learning systems: Differences between higher education and lifelong learning. Comput. Human Behav. 34 301–314 (2014)

4. Akour, M., Alenezi, M., Sghaier, H. Al, Shboul, Y. Al: The COVID-19 pandemic: when e-learning becomes mandatory not complementary. Int. J. Technol. Enhanc. Learn. 13 (4), 429 (2021)

5. Almaiah, M.A., Al-Khasawneh, A., Althunibat, A.: Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. Educ. Inf. Technol. 25 (6), 5261–5280 (2020)

6. Chang, C.-T., Hajiyev, J., Su, C.-R.: Examining the students' behavioral intention to use e-learning in Azerbaijan? The General Extended Technology Acceptance Model for E-learning approach. Comput. Educ. 111 128–143 (2017)

7. Cicha, K., Rizun, M., Rutecka, P., Strzelecki, A.: COVID-19 and Higher Education: First-Year Students' Expectations toward Distance Learning. Sustainability. 13 (4), 1889 (2021)

8. Davis, F.D.: A technology acceptance model for empirically testing new end-user information systems: Theory and results. Massachusetts Institute of Technology (1986)

9. Doleck, T., Bazelais, P., Lemay, D.J.: Is a general extended technology acceptance model for e-learning generalizable? Knowl. Manag. E-Learning An Int. J. 10 (2), 133–147 (2018)

10. Humida, T., Al Mamun, M.H., Keikhosrokiani, P.: Predicting behavioral intention to use e-learning system: A case-study in Begum Rokeya University, Rangpur, Bangladesh. Educ. Inf. Technol. (2021)

11. Jiang, M.Y., Jong, M.S., Lau, W.W., Meng, Y., Chai, C., Chen, M.: Validating the General Extended Technology Acceptance Model for E-Learning: Evidence From an Online English as a Foreign Language Course Amid COVID-19. Front. Psychol. 12 (2021)

12. Keržič, D., Alex, J.K., Pamela Balbontín Alvarado, R., Bezerra, D. da S., Cheraghi, M., Dobrowolska, B., Fagbamigbe, A.F., Faris, M.E., França, T., González-Fernández, B., Gonzalez-Robledo, L.M., Inasius, F., Kar, S.K., Lazányi, K., Lazăr, F., Machin-Mastromatteo, J.D., Marôco, J., Marques, B.P., Mejía-Rodríguez, O., Méndez Prado, S.M., Mishra, A., Mollica, C., Navarro Jiménez, S.G., Obadić, A., Raccanello, D., Rashid, M.M.U., Ravšelj, D., Tomaževič, N., Uleanya, C., Umek, L., Vicentini, G., Yorulmaz, Ö., Zamfir, A.-M., Aristovnik, A.: Academic student satisfaction and perceived performance in the e-learning environment during the COVID-19 pandemic: Evidence across ten countries. PLoS One. 16 (10), e0258807 (2021)

13. Liu, Y., Sun, J.C.-Y., Chen, S.-K.: Comparing technology acceptance of AR-based and 3D map-based mobile library applications: a multigroup SEM analysis. Interact. Learn. Environ. 1–15 (2021)

14. Matarirano, O., Jere, N.R., Sibanda, H.S., Panicker, M.: Antecedents of Blackboard Adoption by Lecturers at a South African Higher Education Institution – Extending GETAMEL. Int. J. Emerg. Technol. Learn. 16 (01), 60 (2021)

15. Matarirano, O., Panicker, M., Jere, N.R., Maliwa, A.: External factors affecting blackboard learning management system adoption by students: Evidence from a historically disadvantaged higher education institution in South Africa. South African J. High. Educ. 35 (2), 188–206 (2021)

16. Rizun, M., Strzelecki, A.: Students' acceptance of the COVID-19 impact on shifting higher education to distance learning in Poland. Int. J. Environ. Res. Public Health. 17 (18), 6468 (2020)

17. Roca, J.C., Chiu, C.-M., Martínez, F.J.: Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. Int. J. Hum. Comput. Stud. 64 (8), 683–696

(2006)

18. Sangrà, A., Vlachopoulos, D., Cabrera, N.: Building an inclusive definition of e-learning: An approach to the conceptual framework. Int. Rev. Res. Open Distrib. Learn. 13 (2), 145 (2012)

19. Selim, H.M.: Critical success factors for e-learning acceptance: Confirmatory factor models. Comput. Educ. 49 (2), 396–413 (2007)

20. Shahzad, A., Hassan, R., Aremu, A.Y., Hussain, A., Lodhi, R.N.: Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. Qual. Quant. 55 (3), 805–826 (2021)

21. Venkatesh, V., Bala, H.: Technology Acceptance Model 3 and a Research Agenda on Interventions. Decis. Sci. 39 (2), 273–315 (2008)

22. Venkatesh, V., Davis, F.D.: A theoretical extension of the technology acceptance model: Four longitudinal field studies. Manage. Sci. 46 (2), 186–204 (2000)

23. Webster, J., Watson, R.T.: Analyzing the past to prepare for the future: Writing a literature review, https://www.jstor.org/stable/4132319, (2002)

24. Ziemba, E.W., Eisenbardt, M.: The Effect of the Covid-19 Pandemic on ICT Usage by Academics. J. Comput. Inf. Syst. 1–15 (2021)