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Measuring Distance Learning System Adoption in a Greek University during the Pandemic Using the UTAUT Model, Trust in Government, Perceived University Efficiency and Coronavirus Fear

Konstantinos Antoniadis, Kostas Zafiropoulos * and Dimitra Mitsiou

Department of International and European Studies, School of Social Sciences, Humanities and Arts, University of Macedonia, 54636 Thessaloniki, Greece
* Correspondence: kz@uom.edu.gr

Abstract: The COVID-19 pandemic has led most universities around the world using e-learning services as an alternative to their curricula. These distance learning tools can help universities expand and enhance their curricula with flexible learning techniques. In order to measure distance learning systems adoption in the University of Macedonia, a Greek university in the city of Thessaloniki, an extended version of the UTAUT model is introduced by using the constructs of Trust in Government regarding the management of the pandemic, Perceived University Efficiency on issues regarding distance learning provision and Corona Fear. To analyze the proposed model, an online survey of 471 university students was conducted. Data were analyzed using Partial Least Squares. The findings revealed that students' attitudes toward University Efficiency affect key variables of the proposed model, such as Performance Expectancy, Effort Expectancy, Social Influence, Facilitation Conditions and Use Behavior. Additionally, Trust in Government affects Perceived University Efficiency, and Use Behavior and Corona Fear affects University Efficiency and Trust in the Government in the management of pandemic issues. In contradiction with other research, Corona Fear has no moderating effects. University efficiency, Trust in Government and Corona Fear, because of the effects that they have on key variables, may have important managerial implications when considering the adoption of distance learning systems during the pandemic and in general.

Keywords: UTAUT; trust in government; perceived university efficiency; distance learning; distance learning systems; higher education; corona fear; Greece

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1. Introduction

In the past, humanity has been confronted with various diseases that led to pandemic outbreaks such as the Spanish influenza pandemic in 1918–1920 [1]. In December 2019, in Wuhan, the capital of Hubei province in China, several cases of pneumonia were reported without identification of their cause [2]. A study that was conducted detected a novel Coronavirus as the etiology of this new disease [3], while research indicated that this new virus is transmitted from human to human [4]. On 11 March 2020, the World Health Organization, due to the spread of the virus and the high numbers of severe cases, made the declaration that a Coronavirus named COVID-19 has evolved into a pandemic [5].

The COVID-19 pandemic has brought about significant changes in people's daily lives, affecting various areas of human activity and life [6]. Governments around the globe have responded by restricting people's mobility to slow the spread of the virus [7,8]. They took measures such as encouraging people to leave home only for reasons of necessity, closing cities, quarantining people and avoiding social contacts [9]. Some of the measures among other effects on human behavior can result in the cultivation of feelings of fear and anxiety [10].

One of the most important changes that was introduced by the proposed measures is the rapid adoption of new Information and Communication Technologies (ICT) as alternative means of helping individuals perform key functions of human activity remotely, thus contributing to the protection against the virus [11,12]. This development has attracted the interest of research worldwide, resulting in the publication of several studies on the use of ICT in several fields during the pandemic [13–16].

In the field of education, many countries decided to close their educational institutions from the pre-primary to the higher education level [17]. In order to minimize the impact of this educational disruption, an educational paradigm shift took place, since there was a transition from face-to-face to distance learning [18] to ensure the provision of education and that no student will be left behind academically [19]. Teaching staff all over the world adopted distance learning systems by using internet-based tools to facilitate the delivery of distance education [17,20–22].

The Greek Government announced the nationwide shutdown of all educational institutions, from nurseries to higher education establishments, on 10 of March 2020. Therefore, Greek universities such as the University of Macedonia, which is the university of this study and serves as the case study of this paper, followed the new norm and started to deliver their lessons via distance learning.

The purpose of the current paper is to propose a model that will extend the understanding of university students' acceptance and use of distance learning systems during the COVID-19 pandemic. The model is based on the Unified Theory of Acceptance and Use of Technology (UTAUT) [23]. Even though the UTAUT model was originally designed to be implemented by management staff in working environments [23–25], it has found its application in areas such as marketing and consumer behavior [26,27] and also in the field of education [28], since it has been used in research to assess the acceptance of technologies such as mobile learning [28–31], learning management systems [32], distance learning systems [33–39] and social learning platforms [40]. Additionally, the UTAUT model was selected for this study because it has been declared as the most updated and a widely recognized technology acceptance model [41]. The UTAUT model is already a key choice in several studies on distance learning during the pandemic [42–50].

2. Materials and Methods

The current study proposes an extended UTAUT model to investigate the acceptance and use of distance learning systems during the COVID-19 pandemic among the students at the University of Macedonia. It extends the UTAUT model using the concept of Corona Fear [32] and incorporates two more independent variables: Students' Trust in the Greek Government (STG) regarding the management of the COVID-19 pandemic, and Perceived University Efficiency (PUE) regarding the way they managed the transition from face-to-face to distance learning and the fear of getting infected by the Coronavirus (FC). It has three core hypotheses, as shown in Figure 1, and seeks to investigate their role in the relationship between the key factors of the extended UTAUT model, Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC) and the dependent variables of the UTAUT model, Behavioral Intention to use distance learning system (BI) and Use Behavior of distance learning systems (UB).

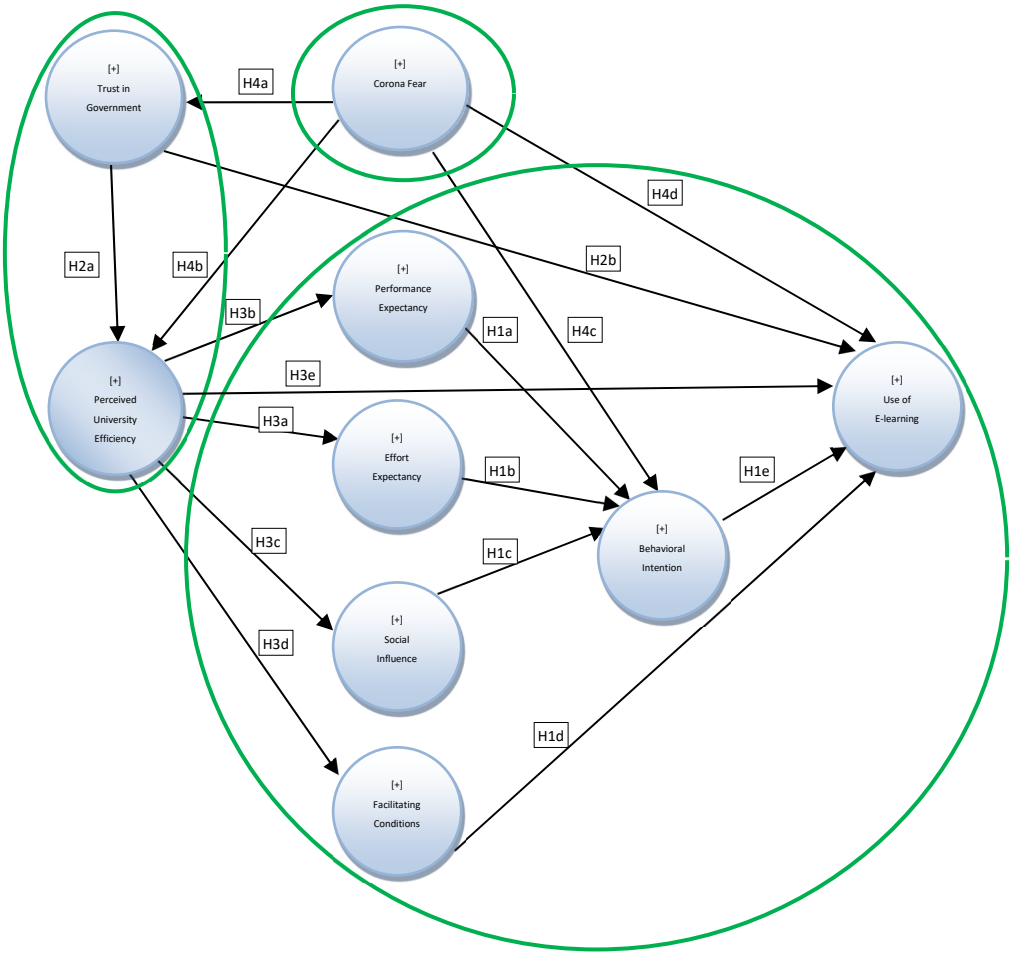

Figure 1. The proposed research model.

2.1. Hypotheses Formulation

2.1.1. UTAUT Extended Model Core Hypotheses

In this part, hypothesis H1 is formulated. This concerns the effects of the UTAUT exogenous variables to endogenous variables:

Hypothesis 1 (H1). *UTAUT exogenous variables (Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions) have positive direct effects on endogenous variables, Behavior Intention and Use Behavior.*

Performance Expectancy (PE)

Performance Expectancy is "*the degree to which an individual believes that using the system will help him or her to attain gains in job performance*" [23] p. 447, and for the purposes of this study is defined as the degree to which a student believes that using the distance learning system will facilitate the attainment of his/her academic goals. According to research, Performance Expectancy (PE) has been found to have a positive influence on students' Behavioral Intention (BI) to use the distance learning system [33,35,36,38,41,43,51–60].

Hypothesis 1a (H1a). *Performance Expectancy (PE) positively influences the students' Behavioral Intention (BI) to use distance learning systems.*

Effort Expectancy (EE)

Effort Expectancy (EE) is defined as "*the degree of ease associated with the use of the system*" [23] p. 450, and for the current study is the extent to which students find distance

learning systems easy to use for their studies. Research indicates that Effort Expectancy (EE) has been found to have a positive influence on students' Behavioral Intention (BI) to use distance learning systems [33,36,38,39,43,45,51–53,58,59,61,62]. Moreover, Users' Experience has positive effects on Perceived Attractiveness [63].

Hypothesis 1b (H1b). *Effort Expectancy (EE) positively influences students' Behavioral Intention (BI) to use distance learning systems.*

Social Influence (SI)

Social Influence (SI) is "*the degree to which an individual perceives that important others believe he or she should use the new system*" [23] p. 451. For this study, Social Influence (SI) is the extent to which students are influenced by the views of their fellow students, teachers and friends regarding the use of distance learning systems. According to findings, Social Influence (SI) has been found to have a positive influence on students' Behavioral Intention (BI) to use distance learning systems [33,38,41,43,52–56,60,62].

Hypothesis 1c (H1c). *Social Influence (SI) positively influences students' Behavioral Intention (BI) to use distance learning systems.*

Facilitating Conditions (FC)

Facilitating Conditions (FC) is "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" [23] p. 453. For this study, Facilitating Conditions (FC) are defined as the skills required, the availability of and accessibility to the necessary resources and human support to use distance learning systems and the compatibility of students' learning style with distance learning systems. According to research, Facilitating Conditions (FC) have a positive influence on students' Behavioral Intention (BI) to use distance learning systems [36,38,40,51,62,64,65].

Hypothesis 1d (H1d). *Facilitating Conditions (FC) influence the students' Use Behavior (UB) of distance learning systems positively*.

Behavioral Intention (BI)

Behavioral Intention is defined as *"a person's subjective probability that he will perform some behavior"* [66] p. 288, while in the context of acceptance and use of technology in the educational field. Behavioral Intention can be conceptualized as the "*willingness to use the learning system*" [40] p. 55. For the purposes of the current study, Behavioral Intention (BI) is defined as the students' subjective probability to use distance learning systems for their studies. Research supports that Behavioral Intention (BI) has a positive influence on students' Use Behavior (UB) of distance learning systems [36,38,43,51,53,54,57–59,62].

Hypothesis 1e (H1e). *Behavioral Intention (BI) to use distance learning systems influencesthe students' Use Behavior (UB) of distance learning systems positively.*

2.1.2. Trust in Government Regarding the Management of the COVID-19 Crisis and Perceived University Efficiency

In the context of this study, hypotheses were formulated for analyzing the role of two variables that measure trust and Perceived Efficiency: Students' Trust in the Greek Government (STG) regarding the management of the COVID-19 crisis, and Perceived University Efficiency (PUE) regarding the way the University managed the transition from face-to-face to distance learning. These two variables were incorporated in the UTAUT model to explore their relationship with key factors of the UTAUT model, Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and the dependent variables of the UTAUT model, Behavioral Intention (BI) to use distance learning system and Use Behavior (UB) of distance learning system.

Students' Trust in the Greek Government (STG)

In [67] p. 103, trust is defined as "an expectancy held by an individual that the behavior of another person or a group would be altruistic and personally beneficial". For this study, Students' Trust in the Greek Government refers to the students' belief that the government measures to control the spread of COVID-19 are in line with wider public interests, that the Greek Government's response to the COVID-19 crisis is satisfactory and that the Government fulfills its obligations with regard to the management of the COVID-19 pandemic. Trust in Government was found to have a positive influence on citizens' intention to adopt e-government services [68] even in emergency situations such as during the COVID-19 pandemic. [69]. It can be argued that the Student's Trust in the Greek Government regarding the management of the COVID-19 outbreak can affect their compliance with the measures taken against the spread of COVID-19, such as the transition from face-to-face to distance learning systems, which is supported by the findings of [70]. The relative literature proposes scales to measure Trust in Government, incorporates them in research and has proven that trust has significant effects on other parameters or technology adoption [71–74]. In [74], a scale is proposed. The four-item scale aims to measure Trust in Government, and besides being characterized by reliability and validity, it had statistically significant effects on Intention to Use.

Consequently, Students' Trust in Government (STG) was included as a variable in the proposed extended UTAUT model, and the following hypothesis emerged:

Hypothesis 2 (H2). *Student's Trust in the Greek Government regarding the management of the COVID-19 outbreak (STG) affects Perceived University Efficiency (PUE) and the final UTAUT parameters, BI and UB.*

In particular:

Hypothesis 2a (H2a). *STG has a positive direct effect on STU.*

Hypothesis 2b (H2b). *STG has a positive direct effect on use of distance learning systems (UB).*

Hypothesis 2c (H2c). *STG has positive indirect effects on all the parameters of the UTAUT model through its effect on STU, which serves as a mediator.*

Perceived University Efficiency (PUE)

Perceived University Efficiency (PUE) refers to the students' confidence that their university has responded positively to this educational transition, promoted distance learning and provided immediate and consistent information on issues related to distance learning as well as support to their students regarding the use of distance learning software. According to [75], Perceived Service Quality positively affects attitudes toward service adoption. Additionally, [76] found that Service Quality has a positive effect on the use of a service. Hence, Perceived University Efficiency (PUE) was integrated as a variable in the proposed model and the following hypotheses were formulated:

Hypothesis 3 (H3). *Perceived University Efficiency (PUE) affects UTAUT parameters.*

In particular:

Hypothesis 3a (H3a). *Perceived University Efficiency (PUE) has a positive direct effect on Effort Expectancy (EE).*

Hypothesis 3b (H3b). *Perceived University Efficiency (PUE) has a positive direct effect on Performance Expectancy (PE).*

Hypothesis 3c (H3c). *Perceived University Efficiency (PUE) has a positive direct effect on Social Influence (SI).*

Hypothesis 3d (H3d). *Perceived University Efficiency (PUE) has a positive direct effect on Facilitating Conditions (FC).*

Hypothesis 3e (H3e). *Perceived University Efficiency (PUE) has a positive direct effect on Use Behavior (UB).*

2.1.3. Fear of COVID-19 (FC)

Fear is "an adaptive animal defense mechanism that is fundamental for survival and involves several biological processes of preparation for a response to potentially threatening events" [77] p. 232. It can also be defined as "an adaptive response in the presence of danger" [78] p. 1. Uncommon circumstances such as the COVID-19 pandemic can cultivate the feeling of fear among numerous individuals [79,80]. Research indicates that the feeling of COVID-19 fear (CF) is experienced by university students, since Alkhazaleh et al. (2021) [81] reported a moderate degree of COVID-19 fear, which is also supported by the findings of the study conducted by Martínez-Lorca et al. (2020) [82]. Moreover, [48] found a mediated effect of COVID-19 fear on the relationship between the external factors in their proposed UTAUT model and the Behavior Intention of e-learning users after the pandemic. The current research seeks to investigate how the Fear of COVID-19 affects attitudes and use parameters within the UTAUT model. Previous research concluded that COVID-19 fear (CF) is a moderator to the relationship between Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Behavioral Intention (BI) to use [53]. Additionally, the study of Raza et al. (2021) [32] indicated that the Fear of COVID-19 has a positive moderating role on the relationship between Performance Expectancy (PE) and Behavioral Intention (BI) and Social Influence (SI) and Behavioral Intention (BI) [80].

Thus, the following hypotheses were formulated:

Hypothesis 4 (H4). *Corona Fear (CF) affects Trust in Government (STG), Perceived University Efficiency (PUE), Behavioral Intention (BI) and use of distance learning systems (UB).*

In particular:

Hypothesis 4a (H4a). *CF has a positive direct effect on STG.*

Hypothesis 4b (H4b). *CF has a positive direct effect on PUE.*

Hypothesis 4c (H4c). *CF has a positive direct effect on BI.*

Hypothesis 4d (H4d). *CF has a positive direct effect on UB.*

Hypothesis 4e (H4e). *CF has positive indirect effects on all the valuables of the UTAUT model through its direct effects on STG and PUE, which serve as mediators.*

2.2. Methodology

2.2.1. Questionnaire

The questionnaire was developed using scales for the UTAUT model [23,32,83,84] and the Fear of Coronavirus scale [32]. For STG, a scale [74] was adopted by including the specification "concerning the pandemic". For STU, a scale self-developed by the authors was used. The items of the questionnaire are reported in the Appendix A (Table A1.).

The Senate of the University of Macedonia approved the implementation of the study titled: "Research of students of the University for the distance education during the period: spring semester 2019–2020 to spring semester 2020–2021". The authors promptly applied

for permission to the Ethics Committee of the University of Macedonia (45/10.05.21) for approval with respect to methodological and ethical issues, and permission was granted (24/19.05.2021). An online questionnaire was administered to students of the University during May and June 2021. Likert scales were used for all items. After contacting the administration of the eight departments of the University, a link leading to the questionnaire was posted on "Students' Web", which is the platform that the administration uses to inform students. Through an announcement on the Students' Web platform, students were informed about the survey and were asked to participate voluntarily. The announcement included details of the purpose and objectives of the research, as well as information on student participation. Although students responded voluntarily, a quota sampling with regard to school and semester was achieved. A total of 471 completed questionnaires were recorded. Table 1 presents the sample description according to Faculty and School.

Table 1. Sample description.

School	%	Semester	%
School of Economics and Regional Studies	12.1	2nd semester	29.9
School of Social Sciences, Humanities and Arts	32.7	4th semester	17.6
School of Information Sciences	27.4	6th semester	18.0
School of Business Administration	27.8	8th semester	18.3
		semester greater than 8th	16.1

2.2.2. Statistical Analysis

SmartPLS v.3.3.6 was used for the statistical analysis [85–87]. PLS modelling uses partial regression models that allow smaller and larger samples to be used, complex models to be tested and, in most cases, they converge. Additionally, discriminant validity can be validated through a range of methods: Fornell and Larcker criterion, cross-loadings criterion and the heterotrait–monotrait ratio of correlations criterion (HTMT).

3. Results

3.1. Reliability and Validity

Reliability was measured with Cronbach's alpha, rho_A and Composite Reliability. The threshold in order for a scale to be considered reliable was 0.70. AVE was used for the measurement of validity. It should have had a value of at least 0.50. Table 2 presents Construct reliability and validity. According to Table 3, all values produced with SmartPLS were above the thresholds.

Table 2. Construct reliability and validity.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
EE	0.892	0.896	0.925	0.755
FC	0.729	0.789	0.822	0.539
PE	0.919	0.921	0.943	0.805
SI	0.782	0.875	0.857	0.616
BI	0.949	0.950	0.963	0.868
UB	0.775	0.834	0.843	0.525
STG	0.914	0.918	0.939	0.794
STU	0.817	0.824	0.880	0.648
CF	0.872	0.933	0.899	0.597

Table 3. Discriminant validity coefficients (Fornell–Larcker criterion) (AVE on the diagonal).

	BI	CF	EE	FC	PE	SI	STG	STU	UB
BI	0.932								
CF	0.267	0.773							
EE	0.646	0.233	0.869						
FC	0.642	0.171	0.650	0.734					
PE	0.864	0.251	0.700	0.695	0.897				
SI	0.665	0.198	0.488	0.468	0.681	0.785			
STG	0.231	0.251	0.219	0.169	0.264	0.257	0.891		
STU	0.459	0.187	0.476	0.487	0.498	0.440	0.299	0.805	
UB	0.825	0.283	0.702	0.692	0.858	0.684	0.295	0.547	0.725

Discriminant validity can also be checked using three criteria: the Fornell–Larcker criterion [88], the cross-loadings criterion and the heterotrait–monotrait ratio of correlations (HTMT) criterion [89,90]. According to the Fornell–Larcker criterion, the correlation matrix of all the constructs is calculated, and in order to have discriminant validity for each construct, the correlations should be smaller than the square root of AVE. For the cross-loadings criterion, the loadings of the indicators that reflect a construct are examined. For each construct, they should be higher than the loadings that these indicators have with any other construct. For the heterotrait–monotrait ratio of correlations (HTMT) criterion, the average correlations of indicators measuring the same construct relative to the average correlations of indicators across constructs measuring different phenomena is calculated. Values should be lower than 0.85 or 0.95, since the latest are considered to be the thresholds (the premier being more conservative). When the HTMT is under 0.85 or at least under 0.95, discriminant validity is established. In the case that HTMT is over 0.95, then Bootstrap confidence intervals are used. If the intervals do not include the value one, then discriminant validity is considered to be achieved. In Table 3, the findings of the Fornell–Larcker criterion are presented. The criterion was achieved since all the correlations were smaller than the square roots of the AVEs of the relative constructs. Cross-loading are presented in Table 4. Discriminant and convergent validity were also demonstrated here, since each construct loaded highly only to the items that it was supposed to represent. Table 5 presents the HTMT. All values were lower than 0.95 and no confidence interval (using Bootstrap sampling 5000 rep.) included the value one. Validity was also achieved according to this criterion.

Table 4. Cross-loadings for discriminant validity.

	BI	CF	EE	FC	PE	SI	STG	STU	UB
bi1	**0.948** *	0.264	0.623	0.620	0.813	0.635	0.218	0.429	0.766
bi2	**0.935**	0.257	0.569	0.558	0.807	0.626	0.210	0.400	0.762
bi3	**0.951**	0.261	0.595	0.601	0.814	0.646	0.200	0.447	0.785
bi4	**0.892**	0.210	0.622	0.613	0.787	0.570	0.235	0.436	0.761
ee1	0.576	0.191	**0.868**	0.587	0.616	0.434	0.227	0.450	0.614
ee2	0.482	0.158	**0.872**	0.552	0.548	0.344	0.190	0.387	0.548
ee3	0.608	0.258	**0.878**	0.555	0.663	0.470	0.199	0.443	0.667
ee4	0.567	0.194	**0.857**	0.562	0.593	0.435	0.141	0.367	0.599
fc1	0.321	0.117	0.432	**0.788**	0.352	0.220	0.144	0.348	0.392
fc2	0.294	0.065	0.475	**0.766**	0.340	0.179	0.059	0.314	0.356
fc3	0.223	0.030	0.218	**0.583**	0.263	0.201	0.107	0.290	0.295
fc4	0.786	0.211	0.641	**0.780**	0.827	0.582	0.160	0.430	0.774
cf1	0.333	**0.775**	0.257	0.218	0.348	0.282	0.265	0.198	0.360
cf2	0.199	**0.808**	0.137	0.116	0.176	0.142	0.137	0.106	0.190
cf3	0.155	**0.791**	0.177	0.112	0.139	0.113	0.223	0.199	0.190
cf4	0.125	**0.727**	0.155	0.079	0.111	0.070	0.099	0.059	0.095

Table 4. *Cont.*

	BI	CF	EE	FC	PE	SI	STG	STU	UB
cf5	0.140	**0.830**	0.139	0.078	0.121	0.091	0.190	0.148	0.162
cf6	0.152	**0.696**	0.140	0.096	0.107	0.079	0.148	0.058	0.143
pe1	0.778	0.248	0.698	0.650	**0.900**	0.606	0.214	0.450	0.800
pe2	0.707	0.210	0.587	0.610	**0.873**	0.574	0.240	0.443	0.718
pe3	0.794	0.224	0.606	0.633	**0.908**	0.648	0.246	0.446	0.781
pe4	0.816	0.217	0.617	0.602	**0.908**	0.613	0.246	0.449	0.776
si1	0.559	0.180	0.423	0.388	0.563	**0.879**	0.260	0.381	0.563
si2	0.659	0.167	0.498	0.494	0.660	**0.903**	0.188	0.432	0.655
si3	0.554	0.164	0.387	0.370	0.587	**0.843**	0.227	0.349	0.596
si4	0.140	0.122	0.064	0.052	0.166	**0.407**	0.129	0.128	0.186
stg4	0.166	0.225	0.178	0.117	0.210	0.205	**0.879**	0.243	0.211
stg2	0.233	0.205	0.215	0.170	0.256	0.241	**0.908**	0.265	0.288
stg3	0.204	0.236	0.196	0.151	0.241	0.223	**0.892**	0.288	0.268
stg1	0.218	0.231	0.190	0.162	0.230	0.244	**0.885**	0.267	0.278
stu1	0.415	0.162	0.472	0.479	0.455	0.342	0.235	**0.829**	0.502
stu2	0.344	0.115	0.360	0.375	0.389	0.357	0.257	**0.846**	0.388
stu3	0.364	0.155	0.380	0.391	0.391	0.327	0.235	**0.839**	0.444
stu4	0.346	0.170	0.301	0.303	0.358	0.396	0.238	**0.696**	0.415
ub1	0.466	0.224	0.479	0.478	0.486	0.397	0.208	0.450	**0.712**
ub2	0.369	0.167	0.381	0.403	0.410	0.311	0.128	0.323	**0.589**
ub3	0.373	0.136	0.385	0.336	0.334	0.334	0.171	0.249	**0.578**
ub4	0.803	0.251	0.663	0.633	0.833	0.627	0.264	0.474	**0.860**
ub5	0.789	0.225	0.567	0.583	0.837	0.672	0.261	0.445	**0.834**

(*: numbers in bold show high factor loadings).

Table 5. The heterotrait–monotrait ratio of correlations (HTMT).

	HTMT	HTMT 95% CI (Bootstrap 5000 rep.)	
CF -> BI	0.259	0.159	0.357
EE -> BI	0.698	0.635	0.756
EE -> CF	0.240	0.140	0.350
FC -> BI	0.657	0.589	0.719
FC -> CF	0.158	0.106	0.273
FC -> EE	0.737	0.648	0.819
PE -> BI	0.924	0.895	0.949
PE -> CF	0.239	0.141	0.346
PE -> EE	0.769	0.711	0.819
PE -> FC	0.734	0.672	0.789
SI -> BI	0.713	0.650	0.774
SI -> CF	0.208	0.123	0.327
SI -> EE	0.524	0.451	0.608
SI -> FC	0.485	0.411	0.578
SI -> PE	0.749	0.684	0.810
STG -> BI	0.247	0.151	0.342
STG -> CF	0.254	0.151	0.355
STG -> EE	0.241	0.142	0.333
STG -> FC	0.192	0.105	0.302
STG -> PE	0.287	0.193	0.378
STG -> SI	0.305	0.196	0.415
STU -> BI	0.520	0.428	0.602
STU -> CF	0.198	0.125	0.301
STU -> EE	0.549	0.453	0.634
STU -> FC	0.596	0.484	0.698
STU -> PE	0.573	0.482	0.653
STU -> SI	0.523	0.426	0.611
STU -> STG	0.347	0.249	0.439

Table 5. *Cont.*

	HTMT	HTMT 95% CI (Bootstrap 5000 rep.)	
UB -> BI	0.900	0.866	0.932
UB -> CF	0.293	0.196	0.405
UB -> EE	0.816	0.756	0.873
UB -> FC	0.798	0.717	0.871
UB -> PE	0.946	0.917	0.974
UB -> SI	0.783	0.713	0.850
UB -> STG	0.336	0.228	0.437
UB -> STU	0.669	0.576	0.754

3.2. Model Evaluation

Estimations of the effects and all indices were performed using the PLS algorithm. Additionally, Bootstrapping using 5000 samples (5000 rep.) was used the estimate statistical significance of the effects and fit indices. Three types of effects, direct, indirect and total effects, were considered in the analysis.

3.3. Effects

Direct, indirect and total effects are presented in Table 6. Direct effects are presented in Figure 2. Only two direct effects were not statistically significant: CF -> BI and CF -> UB. Corona Fear had no direct effect on the intention to use and on the actual use of distance learning systems. However, it did have indirect effects on these two dependent variables through a series of direct effects on every other variable that it was considered to affect in the proposed model. Corona Fear had significant and positive direct effects on Trust in Government (0.251) and Perceived University Efficiency (0.119). Students' attitudes toward the institutions were probably affected by the fear about Coronavirus. On the other hand, Trust in both the Government and the University affected other parameters. Trust in Government had positive and statistically significant effects on Perceived University Efficiency and Use behavior. The more students trust the Government, the more they trust the University and the more they use distance learning systems. Perceived University Efficiency had positive and statistically significant effects on EE, PE, SI, FC and Use Behavior. So, Perceived University Efficiency could be considered a key variable, a factor that determines the attitudes and the use of distance learning systems. Additionally, since it is affected by CF and Trust in Government, it could also be regarded as a mediating parameter for the adoption and use of distance learning systems, not only in statistical terms but also in real-life context.

Table 6. Effects and significance.

Path	Direct Effect	Indirect Effect (Total)	Total Effect
EE -> BI	0.073 *		0.073 *
EE -> UB		0.043 *	0.043 *
FC -> UB	0.229 **		0.229 **
PE -> BI	0.707 **		0.707 **
PE -> UB		0.415 **	0.415 **
SI -> BI	0.139 **		0.139 **
SI -> UB		0.082 **	0.082 **
BI -> UB	0.587 **		0.587 **
STU -> EE	0.476 **		0.476 **
STU -> FC	0.487 **		0.487 **
STU -> PE	0.498 **		0.498 **
STU -> SI	0.440 **		0.440 **
STU -> BI		0.448 **	0.448 **

Table 6. *Cont.*

Path	Direct Effect	Indirect Effect (Total)	Total Effect
STU -> UB	0.137 **	0.375 **	0.512 **
STG -> STU	0.269 **		0.269 **
STG -> EE		0.128 **	0.128 **
STG -> FC		0.131 **	0.131 **
STG -> PE		0.134 **	0.134 **
STG -> SI		0.118 **	0.118 **
STG -> BI		0.121 **	0.121 **
STG -> UB	0.068 **	0.138 **	0.206 **
CF -> STG	0.251 **		0.251 **
CF -> STU	0.119 *	0.068 **	0.187 **
CF -> EE		0.089 **	0.089 **
CF -> FC		0.091 **	0.091 **
CF -> PE		0.093 **	0.093 **
CF -> SI		0.082 **	0.082 **
CF -> BI	0.044	0.084 **	0.128 **
CF -> UB	0.044	0.139 **	0.183 **

(*: $p < 0.05$, **: $p < 0.01$).

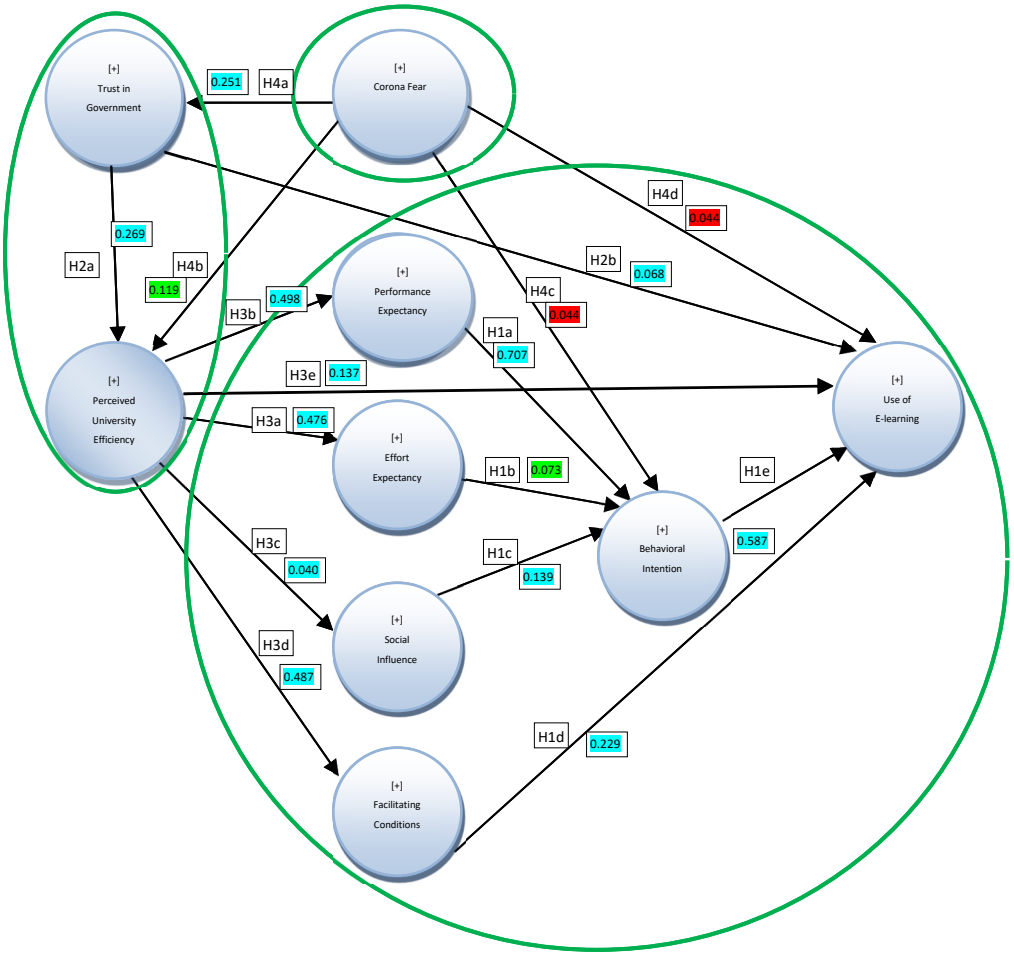

Figure 2. The proposed research model. Statistically significant direct effects ($p < 0.01$) are shown in blue. Statistically significant direct effects ($p < 0.05$) are shown in green. Non-statistically significant direct effects are shown in red.

Further, all the variables of the UTAUT model were associated with positive and statistically significant effects, as it is supposed to be in the original UTAUT model. The findings offer once more support to the already-established UTAUT model. The novelty is that the parameters of the model served as mediating variables for Corona Fear, Trust in Government and Perceived University Efficiency to affect attitudes toward use and actual Use Behavior. The indirect effect of STG on BI was 0.121 ($p < 0.01$) and on UB was 0.082 (0.01). The indirect, and consequently the total effects, were medium but statically significant. Additionally, PUE had a statistically significant indirect effect on BI (0.448) and on UB (0.375). The total effect of PUE on UB was 0.512 ($p < 0.01$). Perceived University Efficiency was a strong factor affecting UTAUT variables, which was also affected by Trust in Government (0.269, $p < 0.01$) and Corona Fear (total effect 0.187, $p < 0.01$).

4. Discussion

The analysis provided evidence and support that the UTAUT model can be used to describe users' attitudes and behavior regarding distance learning systems during the COVID-19 pandemic. Further, factors of trust, Trust in Government and Trust in University serve as exogenous variables that affect the UTAUT variable. Perceived University Efficiency had higher effects than Trust in Government.

In detail, Effort Expectancy had a direct and significant effect, yet not so big, on Behavior Intention (0.073) and a small indirect effect on Use Behavior (0.043, $p < 0.01$).

Facilitating Conditions had a positive and statistically significant effect on Behavior intention (0.229, $p < 0.01$).

Performance Expectancy had a high positive and statistically significant effect on Behavior intention (0.707, $p < 0.01$) and a positive indirect effect on Use behavior (0.415, $p < 0.01$).

Social Influence had a smaller yet positive and statistically significant effect on Behavior Intention (0.139, $p < 0.01$). SI also had a positive indirect effect on Use Behavior (0.082, $p < 0.01$).

Finally, Behavior Intention had a large, positive and statistically significant effect on Use Behavior (0.587, $p < 0.01$). So, overall, the UTAUT model is fully supported and all the hypotheses under the general Hypothesis 1 (H1a to H1e) are supported. The effects of the adopted UTAUT model parameters are compatible with the findings of previous studies.

Trust in Government regarding managing the pandemic and COVID-19 issues had a direct effect on PUE (0.269, $p < 0.01$). H2a was supported. Through this direct effect, it also had statistically significant effects on EE, FC, PE, SI, BI and UB, with values over 0.100. H2c was supported. In particular, STG had a positive and statistically significant direct effect on UB (0.068, $p < 0.01$) and an indirect effect (0.138, $p < 0.01$). H2b was supported. These two sum up to a total effect of 0.206, which is statistically significant ($p < 0.01$). Hence, STG indeed affects Use Behavior but mainly indirectly through the initial direct effect on STU.

Perceived University Efficiency regarding distance learning systems during the pandemic had direct and significant effects on EE, PE, FC and SI with values well above 0.400. So, hypotheses H3a to H3d were supported. It also had a positive indirect effect on BI (0.448, $p < 0.01$) and a direct (0.137, $p < 0.01$) and an indirect (0.375, $p < 0.01$) effect on Use Behavior, so hypothesis H3e was supported. It had a positive and statistically significant effect on Use Behavior (0.512, $p < 0.01$), which is attributed mostly to the indirect effect of PUE through its effects on EE, PE, FC and SI. Overall, Students' Trust in the University was proved to be a significant and important factor affecting the adoption and use of distance learning systems.

Regarding Corona Fear, the effects can be separated in three sections: CF effects on Trust, CF effects on EE, PE, SI and FC and CF effects on BI and UB. CF had a direct effect on STG (0.251, $p < 0.01$) so H4a was supported. Corona Fear seemed to affect Trust in Government. On the other hand, CF had a direct effect of PUE (0.119, $p < 0.01$) and an indirect and statistically significant effect of almost half this value (0.068, $p < 0.01$). H4b was supported. CF also had positive indirect and statistically significant effects on EE,

PE, SI and FC with values ranging from 0.082 to 0.093. These lead to the conclusion that hypothesis H4e was supported. Finally, CF did not have significant effects on BI and UB, so H4c and H4d were not supported. However, it did have statistically significant effects on them through the paths passing through STG, STU, EE, PE, SI and FC (indirect effect on BI 0.084, $p < 0.01$ and on UB 0.139, $p < 0.01$). It was also investigated whether CF could serve as a moderator, since in relative research the literature suggests that fear serves as a moderator. However, besides direct and indirect effects, when the authors attempted to test moderation effects, no interaction was statistically significant. In this sense, CF should be considered not to moderate the effect of other variables on Behavior Intention and Use Behavior.

Overall, the findings about the factors included in the UTAUT model were in accordance with the relative literature. EE and PE and SI had positive and significant effects on BI in accordance with the relative literature [33,35,36,38,39,41,43,45,51–53,58,61–63].

Facilitating conditions also had a positive direct effect on Use Behavior. This finding is also in accordance with the literature [36,38,40,51,62,64,65].

Coronavirus Fear plays an important role in the proposed framework, by having direct positive effects on Trust in Government and Trust in University. However, an analysis showed that it did not have any moderating role and that is effects on other parameters did not change significantly for different levels of fear, as was the case in [32,48,80].

5. Implications

Distance e-learning can play an important role in enhancing students' overall experience, not only in times of crisis but also as a result of its integration as part of the educational process in conjunction with lifelong learning methods. As the demands of everyday life change rapidly and because there is a shortage of time for parallel activities for the majority of people, there is a growing number of students in need of more flexible forms of teaching. These students will choose to study in institutes that provide the facilities to meet their needs. Universities and institutes should find ways to develop flexible study programs that meet new expectations in order to maintain a competitive advantage based on the greater value of service they provide to students.

The proposed model serves as a methodological tool for the research of the key factors that can motivate and shape students' attitudes toward distance learning. Policy makers and university administrators should consider these factors in order to develop an up-to-date model of education that utilizes the potential of modern technology and distance learning.

6. Conclusions

What can be learned from the above analysis is that models of electronic services adoption still hold and are validated even in the pandemic period. Distance learning system environments are considered by students within the framework proposed by [23]. It is important to consider the role played by the University regarding the management of distance learning system issues. Perceived University Efficiency can raise the level of EE, PE, SI and FC. Through their influence on BI and UB, Perceived University Efficiency can raise the levels of distance learning system adoption and positive attitudes toward the use of distance learning systems. To some degree, Trust in Government regarding how it handles pandemic issues can also raise the level of the attitudes and the use of distance learning systems, probably because the adoption of distance learning systems is regarded as a well an applied strategy to cope with learning during the pandemic and it is credited to the Government's ability to efficiently manage the situation.

Fear of Coronavirus probably makes students more dependent on the choices and decisions that established institutions make. So, for students, the levels of trust and use behavior raise according to the levels of fear.

Without forgetting, the findings come from just one university in Greece, which could allow for some generalizations. The administration of universities should understand the important role of trust. By enhancing and delivering procedures that raise the trust of their students and by providing efficient distance learning system environments, universities could probably support distance learning system use, raise the levels of students' satisfaction, produce better educational and pedagogical results and alter the negative climate of Coronavirus Fear and isolation by offering well-accepted and pedagogically suitable procedures.

The main limitation of the study is the use of a limited sample that includes only the students of the undergraduate departments of the University of Macedonia, which raises issues of generalization. The proposed model is based on the hypothesis that constructs such as Trust in Government, Perceived University Efficiency and Coronavirus Fear not only correlate with UTAUT model parameters, but they also have effects on them. This causality could be questioned. Common sense and previous research on the role of fear and trust support these causal relationships. Findings should be regarded within this framework of accepting such effects to exist. This research did not use additional explanatory variables but was limited to the use of the UTAUT model and some key variables. Variables such as demographics of the students, whether the university is a state university or not, whether there exist some other local administration unit intermediating between the central government and the university or other potentially important moderating variables, such as the study semester of the students, the social support that students had during the pandemic and the stress level of the students were not taken into consideration. In the occasion that this research could be repeated within another framework, parameters such as these could be also considered.

Future research may include more educational institutions, both in Greece and abroad. In addition, future studies may include additional variables [91] or a combination of the UTAUT model and other models, such as the Expectation–Confirmation Model [91,92] and Task Technology Fit Model [91,93]. The framework used in this study could be easily validated using data from the current time, during which physical participation in classes is allowed but still the pandemic has not ended. The results that could be obtained from the two implementations of the model at different times could then be compared in order to discern possible changes in students' habits and perceptions. Qualitative methods could also be used—for example, focus groups—with groups of students to explore in detail the reasons and details of certain students 'attitudes.

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Appendix A

Table A1. Items used in the questionnaire.

BI1: I intend to continue using distance learning systems
BI2: For my studies, I would use distance learning systems
BI3: I will continue to use distance learning systems on a regular basis
BI4: Because of the possibilities that distance learning systems offer, I plan to approach my next course more effectively
EE: My interaction with the system would be clear and understandable
EE: It would be easy for me to become skillful at using the system.
EE: I would find the system easy to use
EE: Learning to operate the system is easy for me
FC1: I have resources to use distance learning systems
FC2: I have the knowledge to use distance learning systems
FC3: A specific person (or group) is available to assist when difficulties arise with distance learning systems
FC4: Using the system fits into my study styles
PE1: I find distance learning systems useful for studies
PE2: Distance learning systems allow me to accomplish class activities more quickly
PE3: Distance learning systems increase learning productivity
PE4: Using the system would make it easier to do my studies
SI1: My peers who influence my behavior think that I should use distance learning systems
SI2: My friends who are important to me think that I should use distance learning systems
SI3: Instructors whose opinions that I value prefer that I use distance learning systems
SI4: I use the system because of the proportion of classmates who use the system
UB1: I use distance learning systems frequently during my academic period
UB2: I use many functions of distance learning systems (e.g., discussion forums, chat sessions, messaging, downloading course content, uploading assignments, etc.
UB3: I depend on distance learning systems
UB4: The use of distance learning systems by our university is a good idea
UB5: Distance learning systems make learning more interesting for the students
CF1: I do not want to leave the house because of the risk of getting infected by COVID-19
CF2: I am concerned that I may get sick from COVID-19 during the next six months
CF3: I am feeling anxious about the COVID-19 pandemic
CF4: I am concerned that someone in my immediate family may get sick from COVID-19 during the next six months
CF5: I am scared about getting infected by COVID-19
CF6: I see the possibility that the COVID-19 pandemic will break out in the area where I live and work
STG1: I feel that the government acts in the citizen's best interest concerning the pandemic
STG2: I feel fine interacting with the government since the government generally fulfills its duties efficiently concerning the pandemic
STG3: I always feel confident that I can rely on the government to do their part when I interact with them, concerning the pandemic
STG4 I am comfortable relying on the government to meet their obligations concerning the pandemic
PUE1: The university responded satisfactorily in providing distance learning systems
PUE2: The university informs us immediately and consistently on issues of distance learning systems
PUE3: The university promotes distance education using various distance learning system media such as zoom platform, etc.
PUE4: The university provides training on the use of distance learning systems

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