

Validation of a Theoretical Model to Control Actual Usage of E-learning in Organizations: Case of Lebanon

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Abstract—Actual e-learning use is an important outcome measure of organizational learning that remains understudied. The present study undertook the empirical validation of a TAM-3-based model of actual e-learning use among employees from Lebanese organizations in a mandatory setting. A previously developed model for the assessment of the factors affecting actual e-learning usage in Lebanon was validated through a survey of 331 employees from four different organizations. The questionnaire was pre-tested and modified for optimal psychometric properties, clarity, and applicability. Model variables were measured through a questionnaire with the exception of actual e-learning use, which was extracted from the learning management software as real data. All proposed model hypotheses were significant. The perceived usefulness of e-learning solutions among employees was influenced by image, social influences, and result demonstrability, while perceptions of external control predicted perceived ease of use. Actual e-learning use is significantly affected by perceived usefulness both directly and indirectly through attitude. Perceived ease of use is an antecedent of perceptions of e-learning usefulness as well as attitudes among employees. The different variables affecting actual e-learning usage were linked to practical implications along with best practice recommendations to enhance actual e-learning usage in organizations.

Keywords—organizational e-learning model, actual e-learning, TAM3, Lebanon

I. INTRODUCTION

The recent COVID-19 pandemic has forced a rapid global shift from traditional education towards online and distance learning alternatives. With most businesses barred from their premises, hands-on personnel training and workshops have become unattainable. However, social distancing has created the best opportunity for mobile and electronic educational platforms to rise in prominence as valuable tools for continued organizational learning. Offering easy and remote access to high-quality educational content, e-learning solutions provide employees and organizations with cost-effective

platforms to maintain workforce skills and competitive edge.

During the COVID-19 pandemic, e-learning tools constitute critical tools for the provision of continued education, as well as the management of organizational learning targets. Through e-learning solutions, businesses can offer their workforce with interactive, efficient, user-friendly, and timely courses customized for employees' personal and professional needs. This is an important initiative concerning the vital role of organizational learning in the development of innovations within enterprises [1].

However, the adoption and actual use of e-learning tools remain complicated by various factors that should be closely considered on a context-specific basis. Extant e-learning literature shows that individual, social, and technical variables play a prominent role in determining the sustainability of e-learning systems [2]. Regardless, studies examining e-learning adoption in the Middle East, particularly in Lebanon, remain very limited. This, along with the technological challenges, immature infrastructure, as well as cultural aspects of these countries, severely limits the benefit, penetration, and usability of e-learning platforms during the COVID-19 pandemic [3].

We have therefore examined the factors associated with organizational e-learning use in a previous exploratory qualitative study. In the present research, we aim to validate the model of organizational e-learning usage developed in the earlier research, with a special interest in the actual use of the platform. To that end, the applicability of the TAM3-based model, a widely used model in the field of e-learning [4], as well as an actual usage measure extracted from the learning management system is investigated in a population of 331 employees from four different establishments in Lebanon having access to an e-learning solution.

II. LITERATURE REVIEW

The evolution of information and communication technology led to the integration of e-learning as a means for the provision of improved education for students as well as employee training in the workplace. E-learning carries many benefits such as decreased cost, high availability of educational material as well as a reduced

need for traveling, which renders it a valuable resource in the workplace.

It is therefore important to elucidate the factors affecting technology adoption in order to better integrate e-learning and improve its adoption among employees. The examination of factors affecting technology adoption therefore emerges as a critical step in the potentiation of e-learning penetration and use. Naturally, it can be expected that e-learning is greatly dependent on the technologies that support it and enable it, as well as environmental factors and the capacities of its users. A wide variety of models are available for the study and elucidation of the acceptance and adoption of new technologies, such as e-learning, on an individual level. These include the Theory of Reasoned Action (TRA), the Triandis framework, the Diffusion of Innovation theory (DOI), the Motivational Model (MM), the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), the Model of PC Utilization (MPCU), the Decomposed Theory of Planned Behavior (DTPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT). TAM was found to be the most used model in the field of e-learning, far outpacing other models such as UTAUT, the DOI theory, and others [4].

While e-learning studies predominately included students [4], the organizational context was also explored in an effort to understand the drivers of employees' adoption of e-learning systems [5–9]. Moreover, the TAM3 model was found to be valid and applicable in the context of e-learning [4], further supporting its use as the theoretical underpinning of the present study.

Despite its extensive use in information systems technology studies, original TAM constructs are not sufficient for the explanation of individual intention as well as behavior towards a technology [10, 11]. As a result, the extension and modification of TAM was necessary in order to improve its explanatory power, even among employees using whom it was originally formulated [12]. Adapting the model to the specific context in which it is intended is important considering the cultural, technological, and individual intricacies exhibited by different countries and populations. As such, the factors affecting attitude and use of e-learning among employees in Lebanese organizations were previously established through an exploratory qualitative investigation.

Despite the availability of empirical evidence of adoption behavior and e-learning acceptance in an organizational context, the majority of it remains based on self-reported measurements of behavioral intentions [8, 9], continuance intentions [13, 14], or system use [15, 16]. It is also important to note that the majority of e-learning studies examined the antecedents of behavioral intentions. Very few undertook the investigation of actual system usage. Of those who did, time spent in the e-learning course or the frequency of was predominately reported,

often through self-reporting measurements [15, 17–19]. However, self-reported measures cannot be considered an objective indicator of actual system use, despite their necessity in certain implementation stages (pre-system implementation) [20].

The objective measurement of actual e-learning use was scarcely reported in studies, with notable examples [6, 21]. Measuring actual e-learning use is a complex and difficult endeavor which often precludes its implementation in e-learning studies who had mainly opted for self-reported measurements of system use. However, time remains an imperfect indicator of the learning process [6], which remains the subject of multiple factors affecting cognitive processes to different extents. Time could be used to indicate the possibility of occurrence of a learning activity, albeit with higher applicability in synchronous or live training environments. When users log into an e-learning platform, they do not necessarily engage in actual learning processes [6].

Even scarcer than measuring time spent in e-learning systems was the measurement of percentage completion rate of e-learning modules (e.g., [7, 19, 22]). Completion rate is an important success metric reflecting the usability of a particular system [22]. However, determining completion rates remains complicated, with efforts including self-reported measurements of completed and initiated online programs [19], learning management software records [23], and a tracking script of user interactions with the platform [22].

Regardless of possible measurement methods, researchers shy away from tackling actual e-learning usage, particularly through completion rates. However, completion rates constitute arguably one of the most reflective measures of the effectiveness of e-learning, particularly in an organizational setting where significant investments are poured into this platform [17].

It is thus of the utmost importance to investigate the effect of the determinants of actual e-learning usage through completion rates in order to validate a model and rely on it to increase real e-learning usage rate. This would be done by providing practical insights into the possible avenues for the potentiation of organizational e-learning effectiveness.

The chosen theoretical model will be based on TAM3 as shared in a previous study (Fig. 1) [24].

To note that self-efficacy and cost were excluded from the original model seeing as cost was predominately a pre-implementation managerial concern and the e-learning solution in question has been previously implemented in the included companies. Moreover, users will be contacted through a survey distributed through the e-learning solution in the English language. As such, all participating employees are assumed to have adequate (English and computer literacy) self-efficacy to use the e-learning solution.

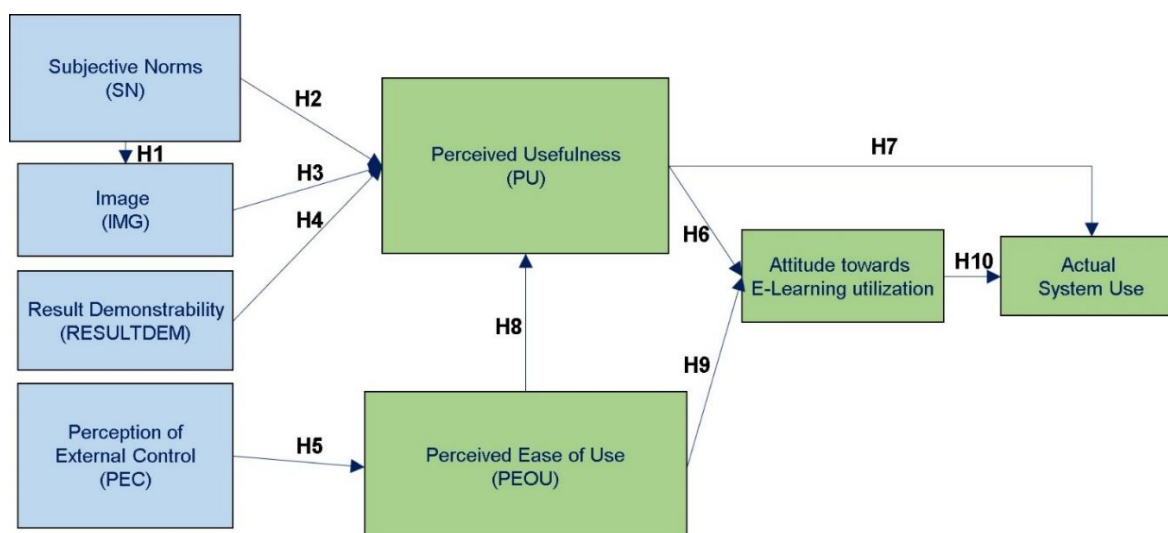


Fig. 1. TAM-3 Based model for the empirical investigation of actual e-learning usage in Lebanese organizations [24].

Subjective Norms: Subjective norms refer to an individual's perception of people's beliefs on whether he or she should perform a particular behavior [25]. In the TAM3 model, social influences were suggested to manifest through perceptions of management support, with a significant influence on perceived usefulness, behavioral intentions, and image [26]. E-learning studies have shown that the encouragement of system use on a managerial level indirectly affected behavioral intentions via its significant effect on subjective norms and perceived ease of use [11]. Management support promotes satisfaction in the e-learning system, thereby ensuring continued intention to use learning management softwares [27]. Employees' attitudes and intentions to use e-learning systems were also found to be indirectly affected by social factors through perceived usefulness [17]. This suggests that social pressure and referent opinions are internalized by learners in a gradual process through which other's opinions are integrated into the individual's belief structure [28, 29]. As a result, subjective norms become less salient with increased system usage, an assumption that is applicable to both mandatory and voluntary system adoption settings [28]. While the role of social influences could wane in voluntary settings [30], the prevailing influence of subjective norms could contribute to effectiveness and adoption of e-learning technology in the workplace, leading to higher completion rates of e-learning module use in mandatory settings [7]. Consistently with the above, the need for management support was expressed by respondents included in the previous qualitative study. As such, the following hypothesis is proposed:

H1: Subjective norms will positively influence the image of employees using organizational e-learning solutions.

H2: Subjective norms will positively influence the perceived usefulness of an organizational e-learning solution.

Image: Social influences induce a response on an individual level, which prompts users to create or upkeep a positive image with a particular referent or referent

group. The image was originally defined by Moore and Benbasat [31] as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system". In TAM3, image emerged as a significant predictor of perceived usefulness immediately after training as well as one to several months after implementation [26]. In the context of e-learning system adoption, students' acceptance of e-learning systems was shown to be significantly and positively affected by image [32]. In another study, users with no prior experience, but not experienced users, were found to be susceptible to the influence of image [16]. The role of experience could explain the insignificant influence of image reported in Calisir *et al.*'s study [33], in which the perceived usefulness of web-based e-learning systems was independent of the prestige and improvement in status that could result from the usage of this platform [33]. The findings of the previous qualitative research reflected the importance of recognition in the formulation of user attitudes towards e-learning. Deriving a positive external representation through championship and recognition of job performance were among the noted themes of the qualitative study. The following hypothesis is thus advanced:

H3: Image will positively influence the perceived usefulness of an organizational e-learning solution.

Results Demonstrability: Result demonstrability was originally defined as the "tangibility of the results of using the innovation" [31] and was integrated into the TAM model by Venkatesh and Davis [29]. Both the original TAM and TAM3 validated the direct relationship between result demonstrability and the perceived usefulness of a particular technology, proving that the tangibility of usage outcomes induces positive attitudes towards the usefulness of this technology consistently over time [26, 29]. Result demonstrability later emerged as a significant antecedent of the intentions to use e-learning websites, albeit in an experience-dependent manner [16]. Students with no prior e-learning experience were not subject to the influence of result demonstrability, which suggests the modification of user perceptions and expectations with

system usage [16]. Regardless, the results demonstrability remained applicable in a cross-cultural context, significantly predicting the perceived usefulness of web-based e-learning systems in different settings [15]. It can therefore be suggested that by indirectly promoting positive intentions towards e-learning use, actual usage of this platform can be enhanced through result demonstrability [15]. The previous qualitative analysis revealed that reportable results following e-learning use affected employees' attitudes and perceptions of the e-learning platform. It is thus hypothesized that:

H4: Result demonstrability will positively influence the perceived usefulness of an organizational e-learning solution.

Perception of External Control: Originally defined by Triandis in 1977 and redefined by Venkatesh *et al.* in 2003 [12], the TAM3 framework adopted facilitating conditions as perceptions of external control, which were also defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system". The application of the TAM3 model showed that perceptions of external control was a significant antecedent of perceived ease of use [26], consistent with the original proposition of its role as one of the anchors affecting a technology's ease of use [34]. In an application of the TAM model among students using e-learning platforms, perceived control over the system was a positive and strong predictor of the intentions to adopt it through perceived ease of use [35]. This is consistent with other studies demonstrating the cross-cultural validity and significance of perceptions of external control as a predictor of various e-learning systems' perceived ease of use in different countries such as Chile [15], Spain [15, 36], and Saudi Arabia [37]. It is thus advanced that:

H5: Perception of external control will positively influence the perceived ease of use of an organizational e-learning solution.

Perceived Usefulness: Perceived usefulness was proposed in the original TAM model as the extent to which a user believes that system usage would result in enhanced job performance [38]. In other words, perceived usefulness reflects a user's capacity of using a technology or particular system to their advantage. While perceived usefulness was predominately reported as one of the most significant factors in the TAM model, its impact could be overshadowed by that of perceived ease of use in the initial stages of technology adoption where user experience is limited [39, 40]. Empirical e-learning evidence supports the relationships proposed in the original TAM model [9, 35, 41, 42]. The perceived usefulness of e-learning systems was found to be directly and significantly correlated to employees' behavioral intentions to use this technology [8], which could be due to an increase in user satisfaction [7]. Consistently, one of the most prominent barriers facing e-learning usage remains the lack of understanding of the benefits of this technology on an organizational level [43]. It is important to recognize that perceived usefulness is intimately related to the characteristics of e-learning systems (e.g.,

functionality, interactivity, information quality), which predict both perceived usefulness and actual platform use [13, 18]. The previous qualitative study similarly indicated the perceived necessity of interventions to improve the skills and knowledge of e-learning users through the provision of accurate and cutting-edge information while guaranteeing job relevance. It is thus proposed that:

H6: Perceived usefulness will positively influence attitude towards an organizational e-learning solution.

H7: Perceived usefulness will directly and positively influence actual use of an organizational e-learning solution.

Perceived Ease of Use: In his formulation of TAM, Davis [38] proposed that the ease of use of a technology, or the effort necessary for its use, would affect user attitudes towards it. This assumption was maintained throughout the extension of the TAM model into TAM2 and TAM3 [26, 29]. Through its influence on user attitudes towards a technology, be it directly or indirectly by way of its role in the modulation of perceived usefulness, perceived ease of use can significantly impact actual usage [38], particularly in the initial stages of adoption [39, 40]. This is consistent with e-learning literature, with empirical evidence demonstrating the correlation between the intention to adopt e-learning systems among employees and the perceived ease of use of this technology [8]. As complications in e-learning use would significantly decrease user satisfaction in the system [7], reducing technical difficulties faced while using e-learning systems would greatly enhance the technology's usability as well as user attitudes. System-related characteristics were actually suggested to be important predictors of perceived ease of use [26], an association that was demonstrated in e-learning platforms [44]. Consistently, the previous qualitative analysis revealed that user-friendliness, easy access as well as simple and short content were highly desirable by employees in an organizational e-learning setting. The following hypotheses are thus proposed:

H8: Perceived ease of use will positively influence perceived usefulness of an organizational e-learning solution.

H9: Perceived ease of use will positively influence attitudes towards an organizational e-learning solution.

Attitude: In their theory of reasoned action, Ajzen and Fishbein [25] advanced personal attitude as an important determinant of behavioral intention and defined it as "the person's belief that the behavior leads to certain outcomes and his/her evaluations of these outcomes". Regardless, the TAM study showed that the role of perceived usefulness and perceived ease of use in the determination of actual behavior could not be fully explained by user attitudes [38]. While TAM2 and TAM3 do not include attitude as a construct mediating the relationships between different factors and behavioral intentions to use a technology [26, 29], e-learning studies have still investigated the antecedents of this construct. It was found that user attitude towards the system remains intimately related to perceptions of its ease of use. Attitude's role in

mediating the relationship between perceived ease of use and behavioral intentions was evident among e-learning users [9, 17]. Usage promotion through positive user attitudes was evidenced on the level of actual system usage, where it seems that employees will voluntarily dedicate a longer period of time for learning through available e-learning platforms should they exhibit higher motivation to learn [6]. The motivation and happiness with which a system is being used by employees is thus a critical consideration, which paints user attitude as a more adequate measure of technology adoption in mandatory settings [45]. The importance of attitude as a dependent variable thus emerges in mandatory use environments [40, 45] where employees use the system simply because they are mandated to and do not have the choice to abstain from using it without sabotaging their current professional standing. Based on the work of Brown [45] and the findings of the qualitative analysis, it is proposed that:

H10: Attitude will positively influence the actual usage of an organizational e-learning solution.

III. MATERIALS AND METHODS

The present study consists of an empirical validation of a previously developed model for the assessment of the factors affecting actual e-learning usage in Lebanese organizations. The study population consisted of employees from the four participating companies with headquarters in Lebanon who had participated in the development of the model, namely a retail company A, a bank B, a telecommunication company C and an aviation company D. All companies provide employees with access to an e-learning solution, which was implemented prior to the initiation of the survey.

The questionnaire was mainly composed of two parts: a section gathering demographic data followed by items measuring the different constructs of the research model. As shown in Table A1 in the appendix, the variables perceived usefulness, perceived ease of use, subjective norms, image, results demonstrability, perceived external control, and attitude towards e-learning adoption were adopted and operationalized according to the TAM3 model [26]. The attitude was adapted from Davis [38], and Taylor and Todd [46] for the purposes of the present e-learning study. The construct items were measured using a 5-point Likert scale ranging from "1" (strongly disagree) to "5" (strongly agree). On the other hand, actual e-learning usage was measured based on the percentage of learning target completion extracted from the LMS (Learning Management System) itself.

First, a pilot study was done to eliminate uncertainty and ambiguity, aligning the items to the existing context. Then convenience sampling was used with online data collection, followed by an internal reliability check and statistical hypothesis testing, leading to analysis and results discussion.

1) Pilot study

Seeing as the original construct measurement items were developed in a context dissimilar to the one targeted in the present study, a pilot test of the questionnaire was necessary to eliminate all possible ambiguities [47]. A

survey pre-test was thus conducted among several employees in order to determine the understandability, clarity, fluidity, and applicability of the survey instrument items. The questionnaire was administered to 25 employees and the feedback and suggestions regarding the survey questions were gathered in face-to-face interviews. Face-to-face data collection was suggested to provide more detailed and better information [48], allowing the researcher to dispel any complexities or misunderstandings arising in the questionnaire [49]. Survey items were then modified based on interviewees' suggestions highlighted as shown in the supplementary Table A1 in the appendix.

2) Sampling

Seeing as only four organizations agreed to participate in this study, the number of e-learning users eligible for entry was limited. Convenience sampling thus served for the generation of the research sample. Study participants were predominately employees of company A (88.52%) seeing as it had the highest number of employees with access to the E-learning platform.

Over the course of 3 months, data collection was undertaken through the dissemination of the developed survey among employees from the four participating companies. Digital data collection offers several advantages such as quick diffusion and cost effectiveness, albeit with a risk of respondent self-selection of respondents, and consequently, poor control over sample structure [48]. Data collection was thus completed through the LMS, through which 1385 contacted e-learning users. Of the 356 obtained responses, 331 complete and valid survey entries were included in the final analysis. Study participation was strictly voluntary, with a financial reward used to encourage survey responses. Employees completing the questionnaire within 1 month of receipt were eligible to win a financial prize.

3) Statistical analysis

All data were analyzed using Statistical Package for Social Science (SPSS) software version 26. The psychometric quality of the measurement instrument was determined through internal reliability, as reflected by Cronbach's alpha. The real use of the E-learning system was measured as a ratio variable, while Likert-type measurement scales were assumed to have interval properties, thus allowing the use of parametric statistical methods [50]. As per the non-purist approach [50], all variables included in the present study can thus be considered metric variables and were subjected to Pearson's correlation coefficient in order to establish inter-variable associations [48].

4) Sample demographics

As shown in Table I, the majority of respondents were male (63.44%), while females accounted for 36.56% of the study population. Moreover, very few participants were of older age, with approximately 58% of employees between 30 and 40 years of age. Almost three-quarters of the study population consisted of employees holding university degrees, be it a bachelor's (73.41%) or Master's (10.27%) degree. Interestingly, around 21% of employees reported having no prior e-learning experience despite the

fact that the e-learning solution was previously implemented in their respective organizations.

TABLE I. DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS ACROSS 4 DIFFERENT INCLUDED ORGANIZATIONS

Variable		%
Gender	Male	62.44%
	Female	36.56%
Age (years)	20–30	34.14%
	30–40	57.70%
	40–50	6.95%
	50–60	1.21%
	> 60	0.00%
Education	High school degree	14.80%
	Bachelor’s degree	73.41%
	Master’s degree	10.27%
	MBA	1.51%
	PHD	0.00%
Prior e-learning experience	Yes	78.85%
	No	21.15%

5) Internal reliability

TABLE II. CRONBACH ALPHA MODEL’S VARIABLES RESULTS

Variable	Initial Cronbach’s Alpha	Item deleted	Final Alpha
SN	0.749	SN1	0.698
		SN2	0.636
		SN3	0.696
		SN4	0.724
IMG	0.846	IMG1	0.778
		IMG2	0.741
		IMG3	0.833
RsltDem	0.393	RsltDem1	0.01
		RsltDem2	0.06
		RsltDem3	0.146
		RsltDem4	0.845
PEC	0.332	PEC1	0.074
		PEC2	-0.011
		PEC3	0.11
		PEC4	0.735
PU	0.905	PU1	0.861
		PU2	0.872
		PU3	0.884
		PU4	0.892
PEOU	0.849	PEOU1	0.799
		PEOU2	0.792
		PEOU3	0.859
		PEOU4	0.78
ATT	0.922	ATT1	0.908
		ATT2	0.912
		ATT3	0.879
		ATT4	0.891

Prior to the examination of study hypotheses, the internal reliability, or fidelity, of the measurement instrument should be established. Through this, researchers establish the degree of reproducibility of the results obtained from the repeated application of a particular instrument in the same context [48]. A frequent indicator of internal reliability is Cronbach’s alpha [51], which reflects acceptable reliability of the measurement tool at values of 0.7 or higher [52–54]. Cronbach alpha values obtained from reliability assessment are shown in Table II. Satisfactory reliability was observed for the Subjective norm, image, perceived usefulness, and attitude constructs. On the other hand, the internal

coherence of the result demonstrability, perceived external conditions, and perceived ease of use scales were improved following the elimination of the RsltDem4, PEC4, and PEOU3 items, respectively. The final survey instrument was modified accordingly in order to ensure both satisfactory and best internal consistency of the used scales in the ensuing data analysis. The internal correlation between the items of each construct was therefore validated, with Cronbach α values ranging between 0.735 and 0.922 (> 0.7).

IV. RESULTS AND DISCUSSION

A. Hypothesis Testing

Following Person’s coefficient correlation analysis, it was demonstrated that all proposed hypotheses (H1 through H10) can be confirmed in the context of the present study (Fig. 2). Following the guide suggested by [55], nul Pearson’s coefficient correlation (r) values denotes the absence of A linear correlation, while values ranging between 0 and 1 or -1 reflect the strength of a particular correlation [55]. Based on the absolute value of r , the strength of a correlation can be suggested ranging from very weak ($r \leq 0.20$) to very strong ($r \geq 0.8$).

1) Subjective norms

As hypothesized in our conceptual model, subjective norms were a positively strong predictor of both image and perceived usefulness ($r = 0.569$, $p = 0.00$; $r = 0.516$, $p = 0.00$, respectively). This is consistent with the original conception of Venkatesh and Davis [29], as well as Venkatesh and Bala [26] in their TAM2 and TAM3 models.

While reported in IS studies [56–59], e-learning literature provides scant evidence of the interplay between image and social influences. Regardless, studies conducted in an academic context support the positive association between subjective norms and image [32], particularly in high power distance settings such as Saudi Arabia [37]. In fact, any improvement in one’s status of standing in a particular group or society could be expected concomitantly with the performance of a behavior perceived to be necessary by influential individuals [26, 29]. This effect was suggested to be compounded in high power distance cultural settings, such as Lebanon and Saudi Arabia, where compliance to social influenced and subsequent technology usage would be perceived to enhance an employee’s image in an organizational environment [60]. On the other hand, the correlation between subjective norms and perceived usefulness of e-learning is well documented [11, 61]. Research in e-learning has indicated that managerial encouragement of system use indirectly influences behavioral intentions by significantly affecting subjective norms and perceived ease of use [11]. Moreover, managerial support fosters satisfaction with e-learning systems, thereby sustaining users’ intentions to utilize learning management software [27].

Both internal and external social factors seem to play an important role [17], suggesting that social pressure positively affects a user’s perception of e-learning usefulness in the workplace, which in turn promotes

positive attitudes towards it as well as continuance intentions towards its use [11, 44]. The influence of subjective norms is reportedly persistent across both voluntary and mandatory settings [62], further supporting its importance in an organizational setting. The number of users using a particular system leads to a bandwagon effect to which the effect of social norms on user attitudes and intentions to use e-learning systems in the workplace could be attributable [17, 62].

2) *Image*

In the present study, image was also demonstrated as a direct and positive determinant of perceived usefulness (H3+; $r = 0.556$, $p = 0.00$). This was consistent with the work of Venkatesh and Bala [26], who had shown that the role of image as an antecedent of perceived usefulness was consistent over time. Information technology literature

support this association, which was evident when examining PDA usefulness [63], behavioral intentions to use internet-based technologies [64], and perceptions of social media usefulness [65]. In the context of e-learning, evidence on the role of image remains scarce. In one study, potential users were not found to be significantly affected by image when voluntarily considering the usefulness of e-learning. This suggests that the prestige and improved social standing following the use of e-learning systems did not play an important role in the perceptions of potential users when formulating their intentions towards this platform [33]. Other factors, such as experience and voluntariness, should thus be considered when examining the influence of image on e-learning usage intentions to better explain this relationship [16].

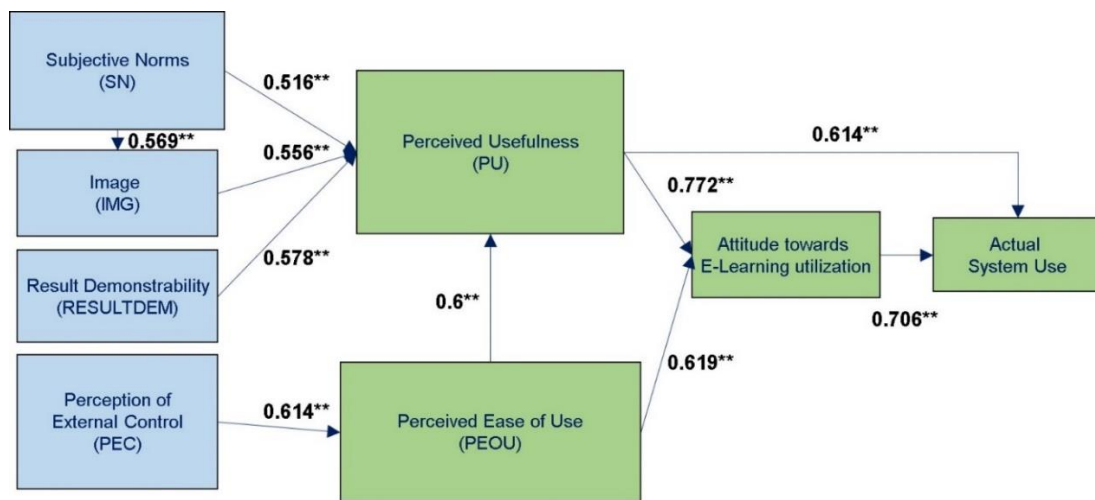


Fig. 2. Hypothesis testing results. **: p -value < 0.001.

3) *Results demonstrability*

As hypothesized, the perceived usefulness of e-learning systems was also positively influenced by results demonstrability (H4+; $r = 0.578$, $p = 0.00$). Obtaining tangible and demonstrable results following technology use affects perceptions of its advantageousness consistently over time, as shown in the original TAM3 model [26]. This was reflected in e-learning literature, where students using e-learning platforms were more likely to recognize their usefulness and by extension, intend and actually use the system when e-learning outcomes were clear [35]. The significance of results demonstrability was reported in a cross-cultural context and thus seems to be applicable in different e-learning populations [15]. The tangibility of usage outcomes was demonstrated to foster positive attitudes toward the technology's usefulness consistently over time [29, 26]. Regardless, certain factors could confound the role of results demonstrability. In fact, behavioral intention to use e-learning websites was independent of its result demonstrability among non-experienced users, as opposed to experienced users [16].

4) *Perception of external control*

Consistently with Venkatesh and Bala's TAM3 model [26], perception of external control was a significant positive antecedent of perceived ease of use of e-learning

solutions among employees (H5; $r = 0.614$, $p = 0.00$). For academic populations, studies suggest that individuals capable of exerting control and easily navigating the e-learning system are more likely to perceive the system to be easy to use [35]. This effect was consistent across different cultures, including an academic Saudi Arabian setting [37], where the correlation between perceptions of external control and perceived ease of use was actually the strongest in the proposed conceptual model of e-learning use [15, 37]. It thus seems that affording users a certain degree of control over the e-learning system in question, such as the ability to modify it, guidance for its use, adequate resources for a smooth e-learning experience, 24/7 access to the learning solution as well as other external facilitating conditions (e.g., time, remote access options, target feasibility) would significantly enhance its perceived simplicity and ease of use and promote usage intentions [26, 36]. However, the influence of employee perceptions of external control in organizational e-learning has not been reported, which constitutes an important gap considering its effect on technology use both directly [66] and indirectly through perceived ease of use.

5) *Perceived ease of use*

Perceived ease of use was also demonstrated to be among the antecedents of perceptions of e-learning system

usefulness (H6+; $r = 0.6$; $p = 0.00$), consistently with the original TAM3 model as well as previous research [26, 29, 38, 67]; This extends to e-learning literature, where both employees [9, 11, 17], and students [41, 35] recognized the usefulness of e-learning when it was easy to use. However, the perceived usefulness of web-based e-learning systems is not always dependent upon its ease of use seeing as other factors, such as experience [33, 68] and gender [35, 69] can modify its effect. Prior experience or training with the use of web-based systems was actually suggested to potentially alleviate the burden of technology complexity and thereby abolish the role of perceived ease of use [33]. Regardless, perceived ease of use has been reported to be the most important determinant of behavioral intention to adopt e-learning [9]. This could be attributed to its influence on user attitudes both directly, and indirectly through perceived usefulness [17].

The direct correlation between perceived ease of use and attitude towards e-learning among employees was supported in the present study (H8+; $r = 0.619$, $p = 0.00$). literature suggests that e-learning users were more likely to have positive attitudes and intend to adopt the technology when they perceived it to be easy to use [9, 17, 33, 44]. perceived ease of use could actually be a stronger predictor of attitude than the perceived usefulness of e-learning systems [41] and maintain its effect even in the insignificance of behavioral intentions to use the platform [61]. Moreover, perceived ease of use can promote continuance intentions towards the use of e-learning systems through its effect on user attitudes [44] as well as promote user satisfaction with the technology [7, 70]. Careful consideration should thus be exercised when designing and implementing e-learning systems in order to ensure positive attitudes and satisfaction, and by extension, actual system usage.

6) *Perceived usefulness*

Perceived usefulness was another strong and direct correlate of employee attitude towards e-learning in Lebanese organizations (H7+; $r = 0.772$, $p = 0.00$), in addition to actual system use ($r = 0.614$, $p = 0.00$). Evidence from extant literature supports the complexity of perceived usefulness's role in determining e-learning adoption, promoting e-learning usage through various constructs. That being said, perceived usefulness could predict continuance intention towards e-learning systems both directly and indirectly through the promotion of user satisfaction [71], perceived ease of use [9], and positive user attitudes [17, 44]. In organizations, evidence suggests that the perceived usefulness of e-learning systems induced positive attitudes towards its use, but did not translate in immediate behavioral intention to use it among blue-collar workers [33]. That being said, the intention to use e-learning systems among employees is clearly influenced by the extent of benefit they stand to draw from this technology, or in other words, its usefulness [8]. Consistently, perceived usefulness was a significant direct predictor of e-learning platform usage [18] as well as e-retention [70] among students using an e-learning platform. While a limited understanding of actual e-learning use is available in the literature, it was shown that

poor understanding of e-learning usefulness remains one of the main barriers facing the actual usage of this platform in an organizational setting [43]. The provision of useful content and features relevant to their workplace is therefore important to significantly boost the perceived usefulness of e-learning and consequently, user acceptance of it. This would result in the promotion of user satisfaction, which would in turn increase the effectiveness of organizational learning through e-learning systems [7, 72].

7) *Attitude*

As hypothesized, Employee attitude towards e-learning use was significantly, positively, and strongly ($r = 0.706$, $p = 0.00$) associated with actual system use in our study. This was in accordance with existing e-learning literature, where behavioral intention to use an e-learning system was shown to significantly predict its use among students using this technology [35]. This relationship could be mediated through the effect of attitudes on the intentions to use e-learning platforms [61] as well as behavioral intentions themselves [17]. While empirical examinations of actual e-learning use remain scarce, studies have shown that satisfied employees show positive inclinations towards the use of e-learning technologies, and are more likely to exhibit the intention to use such platforms again [7]. Negative past user experiences were among the major deterrents of e-learning usage among Turkish employees [43]. Motivation to learn was the strongest predictor of actual e-learning participation by employees in a voluntary setting [73]. Promoting positive attitudes towards e-learning is therefore critical towards enhancing actual system usage, and could be undertaken by providing useful, need-matching, and satisfactory e-learning platforms along with adequate incentives.

B. *Theoretical Implications*

The present research was the first to examine the actual usage of the e-learning system in an organizational setting in Lebanon. Based on our results, a number of improvements and considerations could be suggested when looking to improve the e-learning usage model's applicability to the Lebanese context. Firstly, the interplay between a technology's perceived benefit and actual usage behavior remains poorly characterized, particularly in the field of e-learning where system usage measurement faces many difficulties. The role of perceived usefulness in determining actual e-learning usage should be characterized at different time points following the integration of any intervention pertaining to e-learning usefulness. Secondly, our study demonstrated the applicability of measuring actual e-learning system use in an organizational context, represented by the percentage of completion rate. Future studies should incorporate this measure into their conceptual model, thus complementing subjective self-reported measures and qualitative data to provide a deeper understanding of user behavior in any given context. Thirdly, the study only examined the efficiency of online training in Kirkpatrick's second level but not the third level [74], behavior, due to feasibility constraints. Future studies should thus consider

investigating the effect of e-learning on job performance, thereby assessing employee skills and competencies, as well as detecting gaps in their knowledge and work-related performance, before and after initiating the e-learning program. Finally, the present research examined the adoption behavior of employees in a mandatory post-implementation setting. This provides valuable insights into potential avenues of improvement in existing e-learning systems and consequently, increased actual usage in organizations.

C. Practical Implications

Managers should capitalize on the demonstrated importance of management support as a critical determinant of complex system success [75–77] by indirectly supporting system usage through sponsoring, directing, or mandating specific behavior, or could act directly through their personal usage of the system in question [78]. Promoting the platform as well as completion culture in the workplace could be done through marketing campaigns, launching sessions, and the implementation of organizational policies and mandates, thus positively influencing completion rates of e-learning programs among employees [19]. Effective communication of e-learning benefits, and managerial commitment to the e-learning solution should be exercised along with frequent and consistent follow-up through e-mails and personalized reminders. This would further emphasize management support, interest, and commitment towards e-learning use, thereby positively influencing it within the workplace.

Boosting employee visibility could serve to improve learning outcomes and encourage system use [79] and could be achieved by integrating elements from online social network environments, such as Twitter and Facebook, into e-learning platforms, sharing e-learning results, and organizing frequent championship campaigns to make system usage and championship results visible to all employees [80]. Management support and commitment towards the e-learning system can be communicated through the organization's internal social networks, website [28], as well as the corporation premises.

Capitalizing on peer support is another way to enhance the usability and perceptions of a particular system [29, 78] and could be achieved by incorporating chat and peer feedback functionalities in the e-learning system. This is especially important considering that system benefits in terms of enhanced perceptions of technology usefulness will persist over time as long as peer support and reference groups regard its usage favorably [26, 29]. By promoting and choosing e-learning platforms integrating features of peer support, social exchange, related peer input sessions, and coalition formation are encouraged, thereby ensuring a sense of group membership which positively contributes to goal achievement and productivity [81–83], and by extension, the usefulness of e-learning systems.

Broadcasting satisfactory employee performance and boosting moral recognition of their achievements can also be achieved through the organization of inter-department or inter-country rallies, as well as the integration of training results into employees' yearly performance

appraisals or regular assessments. Learners are more likely to participate in e-learning training should they perceive a positive outcome to their use that would be compatible to the time, effort, and costs incurred by it [84]. The communication of the outcomes and benefits of e-learning platforms enhances its value among peers, which indicates that enhancing the tangibility and visibility of the system will reflect positively on its use [35]. Managers could capitalize on this by using e-learning resources that include testing & scoring such as e-learning courses and using an E-learning platform that easily allows to share the learners' results. This would also allow the assessment of employee skills and assimilation of the provided educational and training material will allow management to identify gaps and address them accordingly by modifying or expanding the organization's e-learning offerings.

Accounting for facilitating conditions, such as organizational, technological, and peer support, seems to be a critical consideration intimately related to the potentiation e-learning use through subjective norms and perceptions of external control [26]. There is a need for improved support in order to provide employees with a nurturing environment favorable towards e-learning [85]. This includes ensuring and promoting access to workstations and adequate internet connections, along with facilitating documents and training for the system utilization, as well as declaring the safety and security of e-learning websites would serve along with the official allotment of time for the use of e-learning platforms within the workplace to promote the adoption and acceptance of this system [12, 34, 46]. The workload of employees should also be carefully considered and managed in such a way as to allow on-the-job learning, especially that decreased work load is actually positively correlated with actual e-learning system [6]. On an organizational level, managers could organize training sessions, practice seminars, develop user manuals, or invite a panel of experts in the e-learning field in order to provide employees with skillful and targeted training and enhance basic technology-related skills among employees [85]. This would serve to alleviate the burden of limited technological savviness, which would in turn enhance the accessibility of e-learning to its potential users. Managers should try to address computer anxiety by providing constant learner support, and encouraging user participation in e-learning through the provision of feedback on their performance. More importantly, managers should recognize the effort and improved performance of employees using the e-learning platform, which would serve to further boost their confidence and by extension, their use of the system [73].

Managers should integrate employees into the decision to use e-learning by considering their individual needs and opinions on the matter [86]. Adopting a course-on demand system catering to employees' actual and immediate needs [26, 85] is another important consideration, in addition to ensuring content relevance [26, 86], service delivery quality, e-learning information quality and e-learning system quality [87] as well as emphasizing the advantages of e-learning. Positive attitudes towards e-learning

experience could be promoted through adequate e-learning content and platform design. Offering interactive content greatly contributes to the satisfaction of users, which would induce employees to access and use e-learning courses [88]. Moreover, management should ensure that the organization’s available e-learning portfolio aligns with the job perception of employees [26, 85]. Also, the organization can link positions or new projects to needed skills, allowing the contextual changes to be expressed with leveled skills needed which in their turn, are linked to the appropriate learning assets. This mapping process once standardized, will motivate the employee to complete the affected e-learning program by management to be eligible for a new position or a project requirement.

D. Limitations

While providing valuable insights, the present study was not without its limitations. Firstly, the research was conducted in a controlled environment, which limits its findings’ applicability to dissimilar settings such as blended learning or traditional learning [89]. The applicability of any model should also be examined in different cultural settings (other countries, e-learning platforms of different types or from different providers, and dissimilar populations (e.g., students) [12]. The e-learning system in question offered business-related content that might not have been directly linked to work-related needs. This could have affected research findings by decreasing actual system usage due to weak job relevance. Moreover, the moderating role of variables known to influence use beliefs and behavior, such as experience and voluntariness, should be considered in future studies in order to better explain e-learning adoption. This study examined the influence of various TAM3 factors on user attitudes and actual usage of e-learning systems in the post-implementation stage. This precludes the consideration of experience as a moderating

variable in our conceptual model seeing as the This entails the necessary administration of the survey in the English language in an online format, which could limit the study sample to computer-proficient individuals. Therefore, our findings do not provide insights into the adoption behavior of employees with a lower level of computer literacy. As previously mentioned, affording learners a certain degree of autonomy and control over e-learning content and platforms is essential to a satisfactory learning process. However, integrating the learning approach into the framework of the current research was not possible seeing as the e-learning solution was already implemented in the included organizations. As such, e-learning content was pre-determined and unmodifiable, which is also applicable to the platform through which it was delivered.

V. CONCLUSION

In conclusion, our study provided an empirical validation of an adapted TAM3 model for the examination of e-learning attitudes and actual use in an organizational context in Lebanon. Our findings provided valuable insights into the antecedents of perceived usefulness and perceived ease of use, which in turn predict employee attitudes and use of e-learning systems. Moreover, the study provided an important contribution to the use of completion rates as a reliable measurement method for the reflection of actual e-learning usage within an organization. Finally, our research contributes to bridging the notable gap in e-learning literature, particularly in Lebanon where such studies remain rare. Nevertheless, further investigation is necessary in order to provide a clear in-depth comprehensive understanding of the usage outcome of organizational e-learning platforms in Lebanese organizations when the suggested practical implications are applied.

APPENDIX

TABLE A1. SURVEY FINAL VERSION WITH CHANGES HIGHLIGHTED IN BOLD

Variables	Items	Identifying code	Item origin
Perceived Usefulness	1- Using the E-learning improves my learning performance	PU1	TAM3 [26]
	2- Using the E-learning in my job increases my productivity	PU2	
	3- Using the E-learning enhances my learning effectiveness.	PU3	
	4- I find the E-learning to be useful in my learning development .	PU4	
Perceived Ease of Use	5- I find the E-learning system to be easy to use.	PEOU1	TAM3 [26]
	6- My interaction with the E-learning system is clear and understandable.	PEOU2	
	7- Interacting with the E-learning system does not require a lot of my mental effort.	PEOU3	
	8- I find it easy to get the E-learning system to do what I want it to do.	PEOU4	
Result demonstrability	9- I have no difficulty telling others about my E-learning results .	RsltDem1	TAM3 [26]
	10- I believe I could communicate to others the report of my E-learning utilization .	RsltDem2	
	11- My E-learning results are apparent to me.	RsltDem3	
	12- I would have difficulty explaining why using the E-learning may or may not be beneficial.	RsltDem4	
Image	13- People in my organization who use the E-learning have more prestige than those who do not.	IMG1	TAM3 [26]
	14- People in my organization who use the E-learning have a high profile.	IMG2	
	15- Having the E-learning system is a status symbol in my organization.	IMG3	

Subjective Norms	16- People who influence my behaviour at work think that I should use the E-learning.	SubNrm1	TAM3 [26]
	17- People who are important at work to me think that I should use the E-learning.	SubNrm2	
	18- The senior management of our organization has been helpful in the use of the E-learning. (Frequent communication, reminders, reports, training target, deadline, technical assistance)	SubNrm3	
	19- In general, the organization has supported the use of the E-learning. (Commitment, support, recognition)	SubNrm4	
Perception of External Control	20- I have control over using the E-learning.	PEC1	TAM3 [26]
	21- I have the resources (internet, laptop, time, documents) necessary to use the E-learning.	PEC2	
	22- Given the resources and knowledge it takes to use the system, it would be easy for me to use the E-learning.	PEC3	
	23- The E-learning is not compatible with other systems I use	PEC4	
Attitude	24- Using E-learning is a good/bad idea.	Att1	[38, 46]
	25- Using E-learning is a wise/foolish idea.	Att2	
	26- I like/dislike the idea of using the E-learning system.	Att3	
	27- Using E-learning is pleasant/unpleasant.	Att4	

CONFLICT OF INTEREST

The author declares no conflict of interest.

ACKNOWLEDGMENT

The author expresses their heartfelt thanks to the participants of this study for their participation, time, and valuable insights. We extend our appreciation to the organizations that provided access to their employees and facilities, without which this research would not have been feasible.

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