Towards a Model of Situated Acceptance of Tablets in Teaching Practice in Moroccan Primary Schools

https://doi.org/10.3991/ijim.v16i14.29685

El Ayachi Rahali[1(✉)], Khalid El Khattabi[1], Ahmida Chikhaoui[1], Fatima Ouzennou[2]
[1]Sidi Mohamed Ben Abdellah University, Fez, Morocco
[2]Regional Centre for Education and Training. Fez, Morocco
elayachi.rahali@usmba.ac.ma

Abstract—This article aims to contribute to the establishment of a model of tablets' situated acceptance in teaching practice in Moroccan primary schools. To do this, Davis' TAM has been adopted in the testing of this technology in its context of use. This research is conducted through a questionnaire administered in six primary schools in the region of Béni Mellal-Khénifra, one of the twelve regions of Morocco. An exploratory factorial analysis and another confirmatory one using structural equation modelling revealed that the appropriation of tablets is positively and directly influenced by the perception of its usefulness in teaching practice; and indirectly by teacher training and conditions that facilitate teachers' work.

Keywords—acceptance situated, tablet, TAM, primary education

1 Introduction

Mobile technology has characteristics of interest to educational researchers. The tools used are portable, light, connected and support a variety of applications, giving rise to a variety of states of use (or affordances) [1], which can renovate educational practice. Several studies have highlighted the positive impact of this technology on pedagogical and didactic choices for the teacher, and on the learning capacity of the learner [2] [3] [4] [5] [6] [7] [8]. Thus, a new learning modality is born: Mobile Learning (or M-learning). According to UNESCO, this kind of learning can "expand and enrich educational opportunities for learners in a variety of settings" [5]. As a result, Mobile technology is considered one of the new paradigms of nowadays quality education [9].

Several studies have confirmed that the digital tablet is the most suitable instrument for this mode of school practice. This tool combines the capacity of a computer with the lightness, connectivity and smartphone ease of use. Research has shown a positive effect of this artefact on learning [9] [10] [11] [12] [13] [14] [15] [16]. Therefore, most Organisation for Economic Co-operation and Development countries have integrated it into their teaching practices [17].

The adoption and integration of mobile technology in general, and the tablet in particular, into school practice is a process that depends on several factors [18] [14]. But the human factor remains the most important in the acceptance or rejection of this kind of practice [9] [19] [20] [21]. A technology that does not attract THE user's interest cannot be adopted and used. Several models have tried to predict technology adoption by describing the factors that can influence it. Davis' TAM (Technology Acceptance Model) [22] remains the most widely used. This model accounts for the intention to use a technology by two variables: perceived usefulness (PU), and perceived ease of use (PEU) [22] [23]. Other contextual factors influence these two variables. The most important of these are the technical and pedagogical training (T) of teachers, and the facilitating conditions (FC) of integration in the classroom context [3] [5]. But to ensure the appropriation of a technology, several researches suggest to confront the intentions of use with real situations of use [24]. This is to measure the impact of feedback through actual use on the adoption of a technology and the intention to maintain its use. Thus, calling it a situated acceptance.

It is in this perspective that this research has the ambition to establish a model of appropriation of tablets in formal education school practice, while studying the impact of the two factors (training and facilitating condition) on the TAM variables. The study was conducted in a primary education context where the tablet was used on an experimental basis for four consecutive years (from 2017 to 2021).

This article is structured as follows: after an introduction that contextualises the objectives of the research, a theoretical background is developed. Then, we propose the hypotheses and the research model. Next, we present the methodology used, and the results obtained. Afterwards, the hypotheses are evaluated and the proposed model is empirically tested. The paper ends with a discussion of the results, identification of the limitations of the study and a conclusion.

2 Theoretical background

Since the 1970s, and especially with the advent of computers, research has focused on studying and modelling technology adoption. Based on the psychosocial theory of reasoned action [25], Davis designed a technology acceptance model known by the abbreviation: TAM (Technology Acceptance Model). According to the researchers, this model predicts the intention to use technology better than other theories; namely, the Theory of Reasoned Action model [25], and the Planned Behaviour model [26]. It has become the most dominant model of decision prediction of information and communication technology (ICT) use [4] [12] [24] [27].

2.1 Technology acceptance model (TAM)

This model predicts ICT adoption behaviour by two variables: perceived ease of use (PEU), and perceived usefulness (PU). The former is defined by Davis as "The degree to which the prospective user expects the target system to be free of effort". And the second is defined as "The prospective user's subjective probability that using a specific

application system will increase his or her job performance within an organizational context" [22]. These two variables predict the attitude towards a particular technology, which in turn predicts the intention to use or not to use that technology.

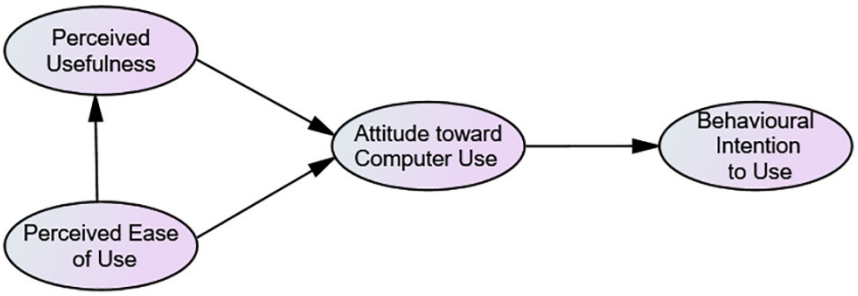

Fig. 1. Technology acceptance model (Davis et al., 1989)

The correlation between PU and technology use was confirmed in several research [4] [23] [28], But the one between PEU and acceptability of use was subject to several controversies [12] [27] [29]. And despite the contradictory results presented by some studies, the TAM model "has proven its usefulness in contributing to the understanding and explanation of the intention to use in technology implementations" [12].

The TAM model was developed by taking into consideration the contextual variables that could influence the two predictor variables PEU and PU. In this version, the researchers tried to make explicit the multiple external and moderating factors acting indirectly on the intention to use. "The most common ones are computer self-efficacy, subjective norms and facilitating conditions" [5]. (Yousafzai et al.) [30] classified them into 4 categories, which relate to organisational, ICT, personal, and other characteristics.

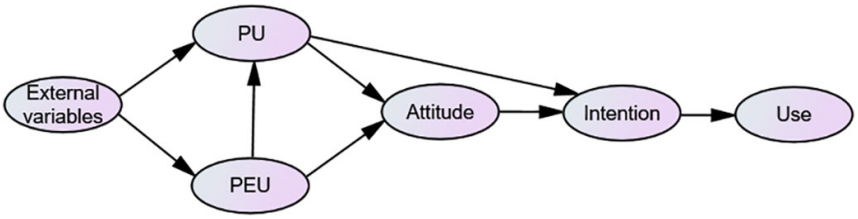

Fig. 2. Technology acceptance model (TAM) with external variables

2.2 Criticism on the TAM model

Despite the wide use of this model and its "adaptation for studies on many forms of technology and on the acceptance of learning systems using technology" [31] cited by [5], this model has been subject to some criticism [12] [24]. The TAM is inspired from behavioural theories; and these theories consider that reason and will are the drivers of behaviour. Action in these models is controlled by individuals. And intention is

conceived as a form of commitment by the individual in relation to future behaviours in terms of intention of use or maintenance of use. As a result, the TAM gives little weight to the influence of the outcomes of the practice of using a technology on the decision to adopt it. Whereas the feedback from the actual use of a technology in a real situation has a considerable impact on the behaviour towards the technology used. In other words, the situation of use of a technology influences the degree of its acceptance.

Therefore, researchers recommend that a model for each ICT should be designed taking into account the context of use. Thus, the models of ICT acceptance must be "situated". And this acceptance should be defined as "the testing of the technology in its context of use, allowing to concretely evaluate its contributions and limits, and to define its interest in relation to the activity and projects of the individual" [24]. In this perspective, two variables seem to have a strong impact on the dimensions of the TAM model: the training of users of a technology, and the conditions facilitating its use. Several studies have revealed the high interest of teachers in these two factors [2] [3] [32] [33].

3 Hypothesis and research model

Following the above recommendations, the present research aims to evaluate the influence of feedback related to the use of tablets in classroom practice in Moroccan primary schools on the acceptance of this technology and the maintenance of its use. This was achieved by studying the influence of two factors: teacher training in the technical and pedagogical use of tablets (T) and facilitating conditions (FC). To do this, the research was conducted in 6 schools that experimented tablets for 4 consecutive years, (from 2017–2018 school year to 2020–2021). This period was deemed sufficient for teachers to have a clear perception of the decision towards the appropriation of these artefacts and their use in school practice.

This study seeks to test the following research hypotheses:

H1: teacher training in the technical and pedagogical use of tablets has a positive influence on their perception of the usefulness of this tool in classroom practice.
H2: the conditions that facilitate teachers' work positively influence their perceptions of the ease of use of tablets in classroom practice.
H3: the perceived ease of use of tablets has a positive influence on the perceived usefulness of this tool in classroom practice.
H4: the training of teachers has a positive influence on their use of tablets.
H5: facilitating conditions positively influence the appropriation of tablets by teachers.
H6: the perceived ease of use of tablets has a positive influence on the appropriation of this tool by teachers.
H7: the perception of the usefulness of tablets in classroom practice has a positive influence on the appropriation of this tool by teachers.

The model for this study is presented in Figure 3 below:

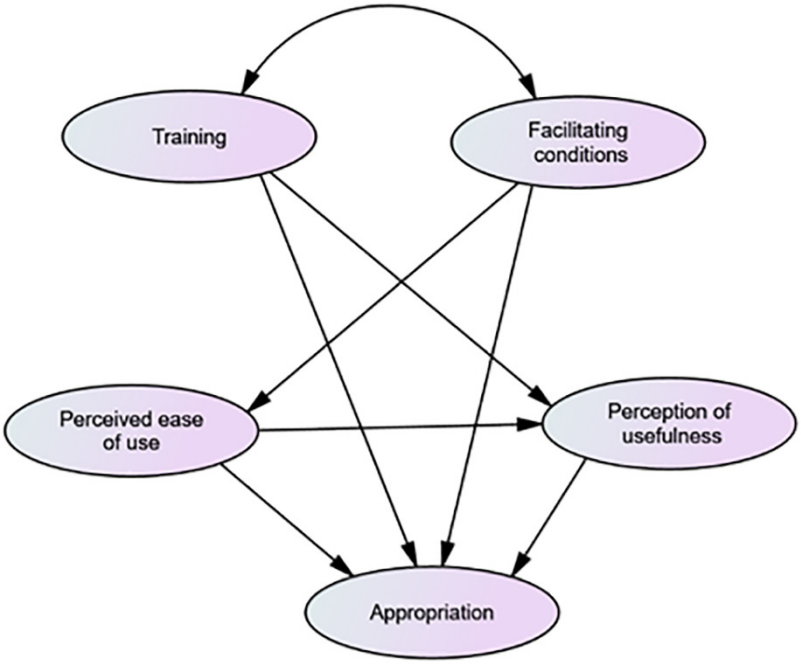

Fig. 3. Study model

4 Methodology

4.1 Target population

The research was conducted in the Beni Méllal-Khénifra region, one of the 12 regions of Morocco. The Regional Academy of Education and Training (RAET), which is the administration in charge of managing the educational affair in this region has given 13 of its primary schools a donation of tablets according to an agreement between the Ministry of National Education and the Samsung company. These schools were provided with 11 to 16 tablets each during the 2017–2018 and 2018–2019 school years.

The study involved all teachers working under the supervision of 6 schools out of the 13 mentioned above. The total number of the target audience was 132 (47% female and 53% male). Given the travel restrictions dictated by the Covid 19 pandemic, the schools chosen were those closest to the centre of the region.

4.2 Procedures and means of investigation

An anonymous questionnaire of 25 items was administered to participants in paper form via the principal of each school. We believed that this procurement method would guarantee us a greater number of returns than the online mode. Indeed, the number of collected responses was 102 out of 132 respondents (52% female and 48% male). Their ages range from 25 to 61. The subjects taught are: languages (Arabic, French and Amazigh), science awareness and mathematics. These demographic characteristics and the descriptive statistics (Table 1), demonstrate that the data collection process is not biased.

In addition to demographic data, the questionnaire includes 18 items based on a 5-point Likert scale (1 for "strongly disagree", 5 for "strongly agree"). The questionnaire includes measures validated by previous research studies; it is an adaptation of the Davis scale to tablet use for the three constructs: perceived usefulness (3 items), perceived ease of use (3 items) and appropriation (2 items). The study added 5 items for the measurement of the dimension (training) and 4 items for the dimension (facilitating conditions).

To validate the content of the questionnaire, three experts in the field of information and communication technology (ICT) reviewed all items and made the necessary corrections. Also, a pre-study of 10 teachers was conducted one week prior to the study to ensure the clarity of the questions asked.

Table 1. Descriptive statistics of the constructs

Construct	Mean	Standard Deviation	Skewness	Kurtosis
Training (F)	4,290	0,860	–1,202	1,387
Facilitating conditions (FC)	4,310	0,885	–1,239	1,134
Perceived ease of use (PEU)	3,263	1,359	–0,140	–1,312
Perceived usefulness (PU)	4,293	0,799	–0,969	0,629
Appropriation (App)	4,21	0,865	–0,781	–0,299

The purpose of this research is exploratory and confirmatory. For this reason, the techniques of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) have been used to analyse the obtained results. The software used is SPSS 22 and its module AMOS 22. We opted for the principal axis factorization method as an extraction method, given its relevance in social science research and its low sensitivity to the normality of variables [34], as cited in [35]. The rotation used is the oblique rotation. This type of rotation was used because it better reflects the reality of the social sciences [36], as cited in [37], in the sense that it does not have the restriction of forcing the factors to be uncorrelated [37]. The delta coefficient is set to 0 (default value) indicating that the factors are fairly correlated [38].

The reliability of the items was measured by Cronbach's Alpha. This estimator remains more stable even if the factor loadings are low [39]. Next, the causal model based on structural equation analysis (SEA) was analysed through the SPSS module Amos 22 in two steps: the first step consisted of checking the measurement models for the latent variables via confirmatory factor analysis, whereas the second consisted

of checking the relationships between the latent variables via structural analysis. In this step, unweighted least squares extraction was used with "Oblimin" rotation for the same reasons mentioned above. The bootstrapping technique was added to get the significance of the relationships between the variables. In addition, we used the most commonly used fit indices in this kind of research gathering absolute measure indices, incremental indices and others of parsimony.

5 Results

5.1 Reliability of dimensions

The internal reliability of the dimensions is calculated by the Cronbach's alpha coefficient. The overall scale has an alpha value of 0.899. The result for each group of items is satisfactory. All coefficients are greater than or equal to 0.7, a value commonly accepted by researchers [40], [41], cited in [42]. Nevertheless, by removing one item from the "Training" dimension, the alpha coefficient increases to 0.8. The following table explains these results:

Table 2. Reliability of dimensions measured by Cronbach's alpha

Dimension	Number of Items	Cronbach's Alpha
Training (T)	5	0.80
Perceived ease of use (PEU)	3	0.88
Perception of usefulness (PU)	3	0.78
Facilitating conditions (FC)	4	0.70
Appropriation (App)	2	0.87

5.2 Exploratory factor analysis

In this step, we opted for an exploratory factor analysis, using principal axis factorization as an extraction method, with oblique rotation, such as "Direct Oblimin". According to the model defined earlier in this article, the number of factors to be extracted is fixed at 5. Setting the number of factors a priori is acceptable if we have a conceptual foundation [43]. The Cattell's scree test that shows the number of factors visually on the eigenvalue scree plot supports this choice.

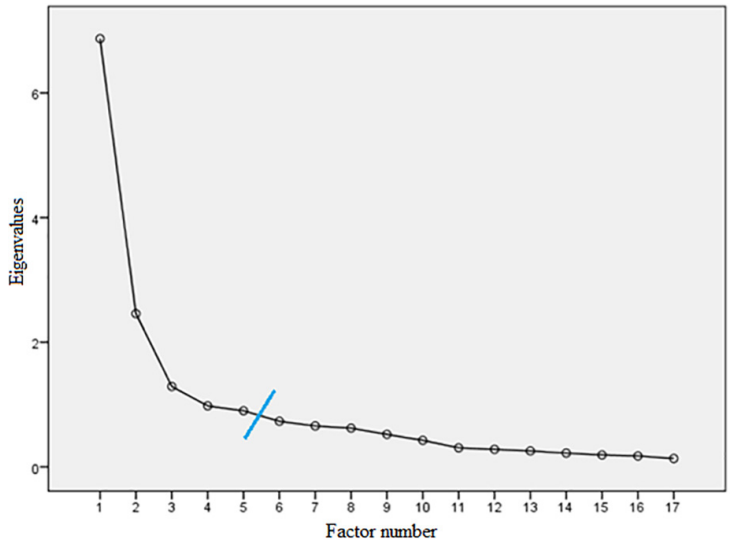

Fig. 4. Eigenvalue scree plot

To justify the presence of a statistically acceptable factorial solution, the Kaiser-Meyer-Olkin KMO index, which is an adequacy index of the factorial solution, must be greater than 0.6 [37]. In our study, this index is 0.843, which is quite meritorious. The determinant of the correlation matrix is equal to 2.65 $.10^{-5}$. This is an indicator of the absence of multi-collinearity between the data [34], and proves that the correlation matrix is positively defined. The Barlett's test of sphericity is significant at the 5% level.

Table 2 below shows the quality of the representation. This allowed us to judge the relevance of keeping a variable in the factorial solution or not. Researchers advise to keep only values above 0.3 or ideally above 0.4 [44]. In this study, almost all values exceeded 0.46, except for one which was equal to 0.31, but was still within the norm. This assured us of the validity of the one-dimensionality of each construct. All these results are very satisfactory. This model explains 73.48% of the total variance. Thus, the explanation of the construct "impulsivity" by the 17 selected items is also very satisfactory [44].

Table 3. Result of the exploratory analysis. Extraction method: Principal axis factorisation

	Factors				
	1	**2**	**3**	**4**	**5**
T_Item1	0.596				
T_Item2	0.653				
T_Item3	0.562				
T_Item4	0.641				
T_Item5	0.603				
FC_Item1		0,465			
FC_Item2		0,316			
FC_Item3		0,470			
FC_Item4		0,594			
PEU_Item1			0.693		
PEU_Item2			0.706		
PEU_Item3			0.663		
PU_Item1				0.557	
PU_Item2				0.487	
PU_Item3				0.754	
App_Item1					0.758
App_Item2					0.705
KMO = 0.847, Significance of Barlett = 0.000, Percentage of variance explained = 73,48%					

5.3 Confirmatory factor analysis

To test the reliability and validity of the constructs, we subjected the results of the exploratory phase to a confirmatory analysis, in which we opted for the unweighted least squares method. This method is less sensitive to the normality condition. It is more recommended when it comes to research using Likert scales [38], as is the case in our research.

Before testing the causal model, we tested each of its component measurement models [45]. The goodness of fit is checked by the following indices: the standardized chi two ($\chi 2/df$), the GFI (Goodness of Fit Index), the AGFI (Adjusted Goodness of Fit Index), the RFI (Relative Fit Index), the NFI (Normed Fit Index), the RMR (Root Mean Square Residual) and the SRMR (Standardized RMR).

Initially, we obtained a satisfactory fit of the "training" measurement model. But by adding correlations between the measurement errors e1 and e2, we were able to reduce the value of chi two. This resulted in a more considerable fit with the empirical data.

5.4 The measurement models and the results of their contributions

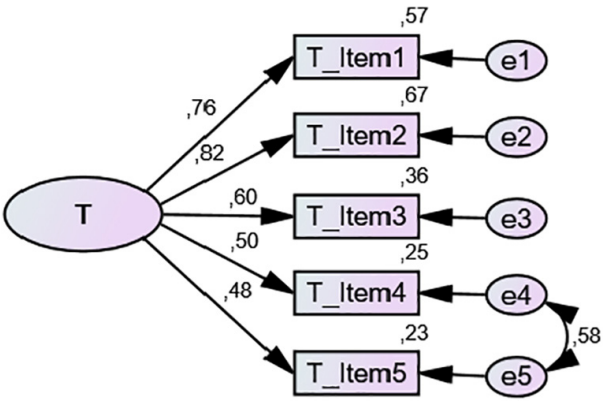

Fig. 5. Measurement model for the "training" dimension

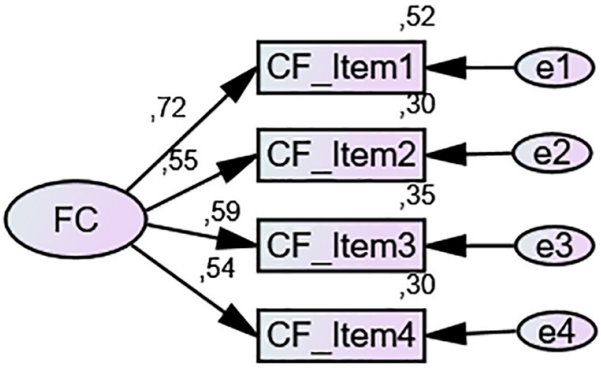

Fig. 6. Measurement model for the "facilitating conditions" dimension

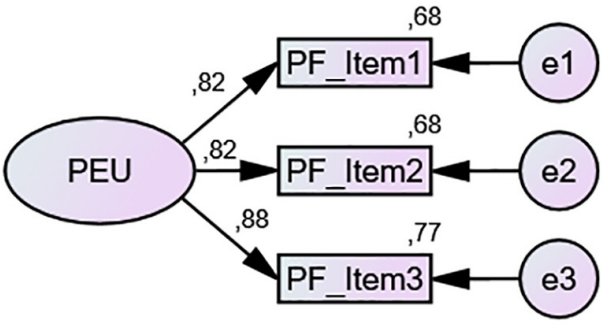

Fig. 7. Measurement model for the "perceived ease of use" dimension

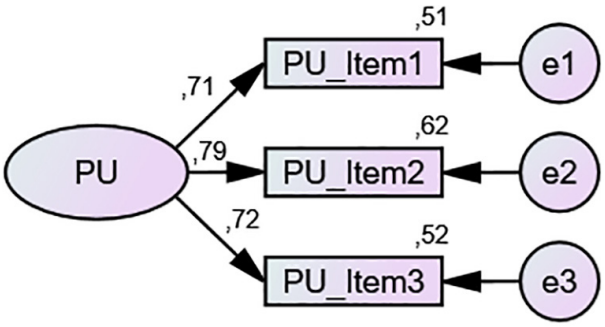

Fig. 8. Measurement model for the "perception of utility" dimension

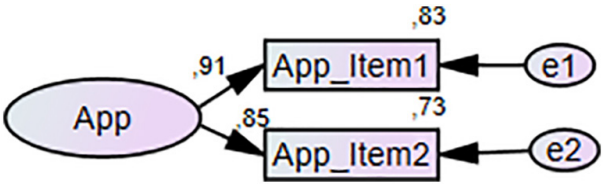

Fig. 9. Measurement model for the "appropriation" dimension

The following Table 4 shows the results of the fit indices of the measurement models:

Table 4. Measurement models fit indices

Measurement Model	NPAR	CMIN	χ^2/df	GFI	AGFI	NFI	RFI	RMR	SRMR
T	11	1.67	0.42	0.99	0.97	0.98	0.96	0.03	0.05
FC	8	0.40	0.20	0.99	0.98	0.99	0.97	0.02	0.03
PEU	4	4.60	2.30	0.99	0.98	0.99	0.98	0.08	0.04
PU	4	0.48	0.24	0.99	0.98	0.98	0.98	0.03	0.04
App	Model just identified (df = 0, GFI = 1, SRMR = 0)								
Cut-off values			≤ 3	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≤ 0.08	≤ 0.10

While the cut-off value for GFI, AGFI, NFI and RFI is 0.9 (ideally above 0.95) [46], that of RMR is 0.08 (ideally below 0.6), and that of SRMR is 0.10 (ideally below 0.08) [47]. For the standardised chi-square the preferred threshold is 3 (usually less than 5). The results obtained (Table 3) show a very good fit of all measurement models.

5.5 Reporting the results of the causal model and validating the research hypotheses

The fit of the causal model is verified by the same fit indices used above. Moreover, the research hypotheses are tested by structural equation modelling (SEM). The p-value is less than 0.05, but the model cannot be rejected for this reason alone as long as the χ2/df value is less than 3 [48]. The following table shows the results which turn out to be very satisfactory:

Table 5. Causal model fit indices

NPAR	CMIN	χ^2/df	GFI	AGFI	NFI	RFI	RMR	SRMR
42	51.949	0.47	0.98	0.97	0.97	0.96	0.058	0.07

Figure 10 shows the final structural model.

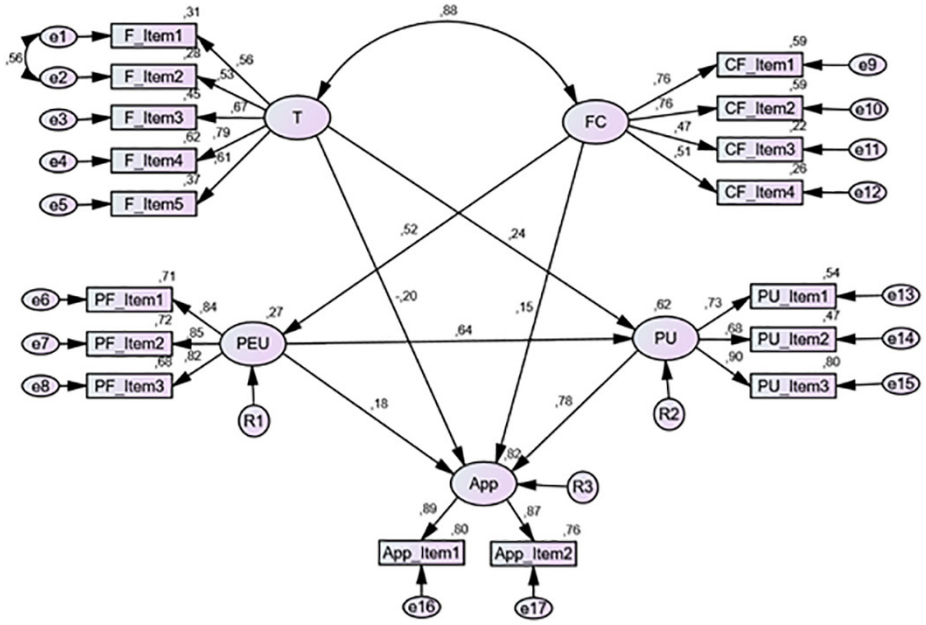

Fig. 10. The final structural model

To validate the research hypotheses, a test of the significance of the standardised β regression coefficients was required. Given the non-parametric nature of the modelling used, we resorted to Efron's resampling technique: the bootstrap [49] by setting the confidence interval at 90%. The Table 6 shows the results obtained:

Table 6. Hypothesis validation

Causal Link	β	Significance	Hypothesis Validation
H_1: T → PU	0,24	0,047*	H1 validated
H_2: FC → PEU	0,52	0,002**	H2 validated
H_3: PEU → PU	0,64	0,002**	H3 validated
H_4: T → App	– 0,20	0,363	H4 not validated
H_5: FC → App	0,15	0,663	H5 not validated
H_6: PEU → App	0,18	0,619	H6 not validated
H_7: PU → App	0,78	0,002**	H7 validated
Significance (sig)	sig*: $p \leq 0.05$ sig**: $p \leq 0.01$		

Hypothesis H1 is validated ($\beta = 0.24$ and $p = 0.047$): Teachers' training in the use of tablets positively influences their perceptions of the usefulness of this tool in classroom practice.

- Hypothesis H2 is also validated ($\beta = 0.52$ and $p = 0.002$): the facilitating conditions for integrating tablets in the teaching context has a positive effect on the perception of the ease of use.
- Hypothesis H3 is also validated ($\beta = 0.64$ and $p = 0.002$): the perception of the ease of use of tablets positively influences the perception of the usefulness of this tool in classroom practice.
- Hypothesis H4 is rejected: the standardised regression coefficient is negative, and the link is not significant ($p = 0.36$). Teacher training in the use of tablets does not directly influence the appropriation of this tool in classroom practice.
- Hypothesis H5 is also rejected; the relationship is not significant ($p = 0.66$): the conditions facilitating the integration of tablets in teaching practices do not directly influence the appropriation of this tool.
- Hypothesis H6 is also rejected; the relationship is not significant ($p = 0.61$): the perception of the ease of use of tablets does not directly affect the appropriation of these artefacts in teaching.
  In contrast, hypothesis H7 is validated ($\beta = 0.78$ and $p = 0.002$): the perception of the usefulness of tablets in teaching practice has a positive and direct effect on the appropriation of this technology by the teaching staff.
  Additionally, we tested the significance of the following indirect links:

  - Training → Appropriation: Values found: $\beta = 0.19$, $p = 0.048$
  - Facilitating conditions → appropriation: Values found: $\beta = 0.26$, $p = 0.002$
  - Perceived ease of use → appropriation: Values found: $\beta = 0.5$, $p = 0.002$
  - CF → PU: Values found: $\beta = 0.33$, $p = 0.002$

These results show that the perception of the usefulness of using tablets in the classroom is a mediating variable in the relationship between teacher's training, facilitating conditions, and the perception of the ease of use, on the one hand, and the appropriation of tablets on the other. It is also a mediating variable in these relationships: facilitating conditions and perceived usefulness.

6 Discussion

Part of the results of this study is in line with the research that has argued that the perceived usefulness of an information and communication technology has a positive and direct effect on the acceptability of that technology [4] [12] [14] [18] [28]. the teachers who believe that the use of tablets in teaching adds value to their teaching practice are willing and able to take ownership and use them. This supports the notion that "experience with a particular technology is a key determinant of future adoption of that technology" [4].

But the direct effect of the perceived ease of use on the intention to use an ICT (evidenced by the TAM), is not confirmed in this research. In this case, this research

supports the results of several studies such as, [4] and [29], which have come to the same conclusion. Nevertheless, this variable (PEU), positively and indirectly influences the appropriation of the ICT used. The same result is obtained by another study [4] in other contexts of mobile technology use. The perception of the ease of use has a positive effect on the perception of usefulness, which in turn positively influences the appropriation of the ICT in question. This proves that teachers can only accept an ICT in school practice if they perceive some utility related to its use. More importantly, the ease of use of the ICT is only one factor that reinforces the perception of usefulness. For teachers, a technology that does not offer added value to classroom practice, however easy it may be, cannot be adopted.

In addition, the results showed that the usefulness of the tablet in teaching-learning can be highlighted for teachers, by training them to make good use of it on two levels: technical and didactic. The first will ensure mastery of the tool's operation, and the second will show how teachers can benefit from this technology in teaching practice. Previous studies [2] [3] [5] [33], have shown that teachers with strong ICT skills are more likely to adopt the technology in teaching practice than those with less ICT skills. Thus, teacher training in the use of tablets is an inducing factor to the acceptance of the use of this artefact. This effect is mediated by the perceived usefulness of this tool, which is the key factor in its appropriation.

On their part, the conditions facilitating the integration of tablets in education have an indirect impact on the acceptance of the use of this technology. These conditions will ensure a favourable ecosystem for the use of this technology without obstacles and will encourage teachers to adopt it.

This finding confirms other research that has emphasised the important role of conditions that facilitate the integration of ICT into classroom practice. In an exploratory study on the integration of tablets in teaching and learning [3], teachers stressed the importance and influence of this factor on its appropriation and use. In another study on the management of digital learning [2], the researchers reported that the main cause of rejection was the lack of equipment followed by the lack of teachers training.

Thus, to ensure effective and efficient integration of the tablet in Moroccan primary education, it is necessary, on the one hand, to encourage teachers to be convinced that this integration will bring an added value to their classroom practices and improve their teaching practices. The results presented above show that this factor has a direct impact on the appropriation of this technology and therefore it is decisive regarding the intention to use it and to persist using it. This can be achieved through specific training that targets teachers' needs and improve their mastery the use of this technology. On the other hand, it is strongly recommended to create a favourable environment for such use by removing obstacles that could hinder or disrupt the use of this artefact. These obstacles, if they exist, would make the teacher's work more difficult [3]. As a result, the use of the tablet would, in this case, have more disadvantages than advantages.

The following diagram summarises the above relationships and explains the model for integrating tablets into classroom practice in formal education. It is a T-model like "Tablet".

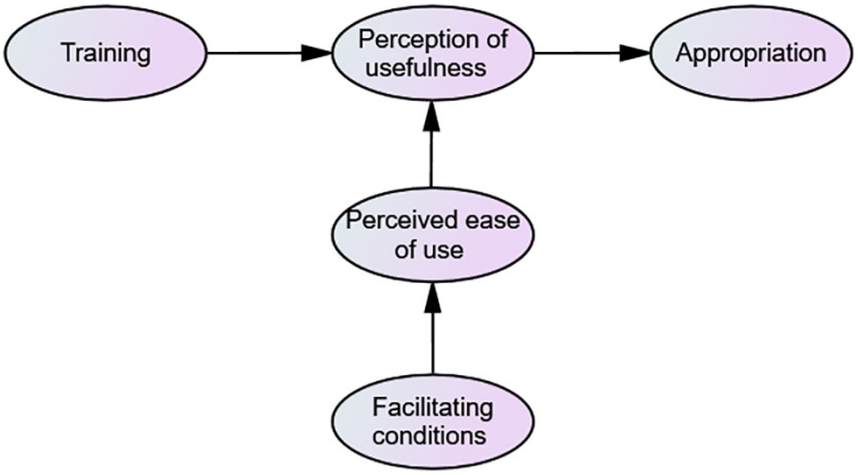

Fig. 11. Model for the integration of tablets in formal education (T-model)

7 Limitations and future research

This study used rigorous research procedures involving robust inferential statistics. The respondents were from different disciplines, of different ages and covering both sexes. Nevertheless, there are some limitations. The sample size is rather small (102 respondents), and covers a limited number of schools. the interpretation of the results should be done with caution. Future research can expand the study to cover other regions of the country with larger samples, and using different data collection tools. This triangulation will help to compensate for the biases specific to each instrument [50].

8 Conclusion

The aim of this research has been to establish a model of situated acceptance of tablets in the Moroccan primary education context based on Davis' TAM model. It equally sought to study the effect of two external factors on the TAM variables: perceived usefulness (PU) and perceived ease of use (PEU). These two factors are: teacher training (T) in the use of tablets, and the facilitating conditions (FC) for the integration of this technology in teaching practice. To do this, we opted for exploratory research followed by a confirmatory study using a questionnaire whose results were analysed using SPSS and Amos software. The results of our research showed a direct positive influence of the perceived usefulness of the tablet in classroom practice on the appropriation of this technology as predicted by the TAM model. But contrarily to what this model predicts, the perception of the ease of use of this artefact does not have a direct effect on the acceptance of use. But it does have an indirect positive impact. Such an impact is mediated by the perceived usefulness of the technological tool. In addition, the study showed that the two TAM variables (PEU and PU) are influenced by two external

factors. The PEU is influenced by facilitating conditions. These conditions help to create a favourable environment for the use of tablets in school practice without barriers, and facilitate the handling and management of such technology. PU, on the other hand, is influenced by teacher training. This training will ensure the belief that the use of tablets in a school context will bring an added value to the teaching-learning process. Thus, these two factors act directly or indirectly on the perception of the usefulness of the tablet, which turns out to be the main factor that directly influences the acceptance of the integration of digital tablets in teaching practices and mediates the influence of external factors on this acceptance.

This study contributes to elucidating the factors that influence teachers' decisions to adopt or not to use tablets in classroom practice. Nevertheless, other actors in the teaching-learning process are not affected by this study, such as learners. Research devoted to these actors will help better define the conditions for the integration of this technology in classroom practice in Moroccan primary schools.

9 References

[1] F. Villemonteix, D. Hamon, S. Nogry, A. Séjourné, B. Hubert, & J. M. Gélis. "Expérience tablettes tactiles à l'école primaire-ExTaTE". (Doctoral dissertation, Laboratoire EMA). 2015.

[2] S. Poultsakis, S. Papadakis, M. Kalogiannakis, & S. Psycharis. "The management of digital learning objects of natural sciences and digital experiment simulation tools by teachers". Advances in Mobile Learning Educational Research, vol. 1, no. 2, pp. 58–71, 2021. https://doi.org/10.25082/AMLER.2021.02.002

[3] E. A. Rahali, A. Chikhaoui, K. E. Khattabi, & F. Ouzennou,"Use of tablets in moroccan primary school, inventory and impact of teacher training", International Journal of Information and Education Technology. vol. 11, no. 12, pp. 651–657, 2021. https://doi.org/10.18178/ijiet.2021.11.12.1577

[4] M. Kalogiannakis, & S. Papadakis. "Evaluating pre-service kindergarten teachers' intention to adopt and use tablets into teaching practice for natural sciences". International Journal of Mobile Learning and Organisation, vol. 13, no. 1, pp. 113–127, 2019. https://doi.org/10.1504/IJMLO.2019.096479

[5] S. Papadakis. "Evaluating pre-service teachers' acceptance of mobile devices with regards to their age and gender: a case study in Greece". International Journal of Mobile Learning and Organisation, vol. 12, no. 4, pp. 336–352, 2018. https://doi.org/10.1504/IJMLO.2018.095130

[6] K. Ciampa. "Learning in a mobile age: an investigation of student motivation". Journal of Computer Assisted Learning, vol. 30, no. 1, pp. 82–96, 2014. https://doi.org/10.1111/jcal.12036

[7] F. Villemonteix, D. Hamon, S. Nogry, A. Séjourné, B. Hubert, & J. M. Gélis. "Expérience tablettes tactiles à l'école primaire Ex. Ta. TE". Rapport final–Avril. 2014.

[8] S. Henderson, & J. Yeow. "iPad in education: a case study of iPad adoption and use in a primary school." 2012 45th Hawaii International Conference on System Sciences. IEEE, pp. 78–87, 2012. https://doi.org/10.1109/HICSS.2012.390

[9] I. Ismail, S. N. Azizan, & T. Gunasegaran. "Mobile learning in malaysian universities: are students ready?", International Journal of Interactive Mobile Technologies, vol. 10, no. 3, 2016. https://doi.org/10.3991/ijim.v10i3.5316

[10] F. Amadieu, J. Mulet, J. Van Der Linden, J. Lombard & C. Van De Leemput. "Acceptabilité des technologies d'apprentissage mobile: le cas des tablettes". Education permanente, vol. 219, pp. 31–40, 2019.

[11] S. Papadakis, "Can Preschoolers Learn Computational Thinking and Coding Skills with ScratchJr? A Systematic Literature Review". *International Journal of Educational Reform*, 2022, 10567879221076077

[12] A. Stockless. "Acceptance of learning management system: the case of secondary school teachers", Education and Information Technologies, vol. 23, no. 3, pp. 1101–1121, 2018. https://doi.org/10.1007/s10639-017-9654-6

[13] M. Kalogiannakis, M. Ampartzaki, S. Papadakis, & E. Skaraki. "Teaching natural science concepts to young children with mobile devices and hands-on activities. A case study". International Journal of Teaching and Case Studies, vol. 9, no. 2, pp. 171–183, 2018. https://doi.org/10.1504/IJTCS.2018.090965

[14] S. Papadakis. "The impact of coding apps on young children computational thinking and coding skills. A literature review." *Frontiers in Education*, 6, 657895, 2021, https://doi.org/10.3389/feduc.2021.657895

[15] C. P. Brown, & J. Englehardt. "Preservice teachers reconfiguring teaching young children in a high-stakes early education context through the use of iPads: a case study", Early Education and Development, vol. 28, no. 8, pp. 976–995, 2017. https://doi.org/10.1080/10409289.2017.1336403

[16] B. Haßler, L. Major, & S. Hennessy. "Tablet use in schools: a critical review of the evidence for learning outcomes". Journal of Computer Assisted Learning, vol. 32, no. 2, pp. 139–156, 2016. https://doi.org/10.1111/jcal.12123

[17] OCDE. "Perspectives des politiques de l'éducation 2015: les réformes en marche". Paris: OCDE. 2015. https://doi.org/10.1787/9789264227330-fr

[18] T. D. Cochrane. "Critical success factors for transforming pedagogy with mobile Web 2.0". British Journal of Educational Technology, vol. 45, no. 1, pp. 65–82. 2014. https://doi.org/10.1111/j.1467-8535.2012.01384.x

[19] K. Drossel, B. Eickelmann, & J. Gerick. "Predictors of teachers' use of ICT in school – the relevance of school characteristics, teachers' attitudes and teacher collaboration", Education and Information Technologies, vol. 22, no. 2, pp. 551–573, 2017. https://doi.org/10.1007/s10639-016-9476-y

[20] T. Wang. "Overcoming teachers' concerns – where are we in the harnessing of mobile technology in K-12 classrooms in Hong Kong?", in: Churchill, D. et al. (Eds): Mobile Learning Design, Lecture Notes in Educational Technology, Springer, Singapore, pp. 239–248, 2016. https://doi.org/10.1007/978-981-10-0027-0_14

[21] B. W. O'Bannon, & K. M. Thomas. "Mobile phones in the classroom: preservice teachers answer the call", Computers & Education, 2015. https://doi.org/10.1016/j.compedu.2015.02.010

[22] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Q, vol. 13, no. 3, p. 319, sept. 1989. https://doi.org/10.2307/249008

[23] T. C. Keong, & L. K. Wah. "Exploring pre-service teachers' perspectives towards online learning: an intervention of technology acceptance model". Proceedings of Australia and New Zealand Business Research Conference 2016, Novotel Sydney Central, Sydney, Australia, 17–18 September, pp. 21–28, 2017.

[24] M.-E. Bobillier Chaumon, "L'acceptation située des technologies dans et par l'activité: premiers étayages pour une clinique de l'usage ", Psychol. Trav. Organ, vol. 22, no. 1, pp. 4–21, March 2016. https://doi.org/10.1016/j.pto.2016.01.001

[25] I. Ajzen, & M. Fishbein, "A Bayesian analysis of attribution processes". Psychol. Bull, vol. 82, no. 2, pp. 261–277, march 1975. https://doi.org/10.1037/h0076477

[26] I. Ajzen, "The theory of planned behavior". Organizational Behavior and Human Decision Processes, vol. 50, pp. 179–211, 1991. https://doi.org/10.1016/0749-5978(91)90020-T

[27] S. Atarodi, A. M. Berardi, & A.-M. Toniolo, "Le modèle d'acceptation des technologies depuis 1986 : 30 ans de développement", Psychol. Trav. Organ, vol. 25, no. 3, pp. 191–207, sept. 2019. https://doi.org/10.1016/j.pto.2018.08.001

[28] Q. Ma, & L. Liu, "The technology acceptance model: a meta-analysis of empirical findings", Journal of Organizational and End User Computing (JOEUC), vol. 16, no. 2, pp. 59–72, 2004. https://doi.org/10.4018/joeuc.2004010104

[29] M. Chuttur, "Overview of the technology acceptance model: origins, developments and future directions", Working Papers on Information Systems, vol. 9, no. 37, pp. 9–37. 2009.

[30] S. Y. Yousafzai, G. R. Foxall, & J. G. Pallister, "Technology acceptance: a meta-analysis of the TAM: Part 2", J. Model. Manag, vol. 2, no 3, pp. 281–304, 2007. https://doi.org/10.1108/17465660710834462

[31] S. Gokcearslan. "Perspectives of students on acceptance of tablets and self-directed learning with technology", Contemporary Educational Technology, vol. 8, no. 1, pp. 40–55, 2017. https://doi.org/10.30935/cedtech/6186

[32] M. Kalogiannakis. "The dual form of further education of educators in ICT: technological and pedagogical training". Information and communication technology, 2007.

[33] B. G. Tabachnick, & L. S. Fidell, "Using multivariate statistics", (6e éd.). Boston, MA: Pearson Education, 2013.

[34] J. C. Watson, "Establishing evidence for internal structure using exploratory factor analysis", Meas. Eval. Couns. Dev, vol. 50, no. 4, pp. 232–238, October 2017. https://doi.org/10.1080/07481756.2017.1336931

[35] M. A. Pett, N. R. Lackey, & Sullivan, J. J. "Making sense of factor analysis. The use of factor analysis for instrument development in health care research", Thousand Oaks, CA: Sage, 2003. https://doi.org/10.4135/9781412984898

[36] J. Bourque, N. Poulin, & A. F. Cleaver, "Évaluation de l'utilisation et de la présentation des résultats d'analyses factorielles et d'analyses en composantes principales en éducation", Rev. Sci. Léducation, vol. 32, no. 2, pp. 325–344, Feb 2007. https://doi.org/10.7202/014411ar

[37] C. Durand, "L'analyse factorielle et l'analyse de fidélité", Notes de cours, manuscrit inédit. Université de Montréal, p. 31. 2003.

[38] J. Bourque, D. Doucet, J. LeBlanc, J. Dupuis, et J. Nadeau, "L'alpha de Cronbach est l'un des pires estimateurs de la consistance interne : une étude de simulation ", Rev. Sci. Léducation, vol. 45, no. 2, p. 78, 2019, https://doi.org/10.7202/1067534ar

[39] J. M. Bland, & D. G. Altman, "Statistics notes: Cronbach's alpha", BMJ, vol. 314, no. 7080, pp. 572–572, feb. 1997. https://doi.org/10.1136/bmj.314.7080.572

[40] J. C. Nunnally & I. H. Bernstein, "Psychometric theory", 3rd ed, New York: McGraw-Hill, 1994.

[41] D. Iacobucci, & A. Duhachek, "Advancing alpha: measuring reliability with confidence", J. Consum. Psychol, vol. 13, no. 4, pp. 478–487, January 2003, https://doi.org/10.1207/S15327663JCP1304_14

[42] A. G. Yong, & S. Pearce, "A beginner's guide to factor analysis: focusing on exploratory factor analysis", Tutor. Quant. Methods Psychol., vol. 9, no. 2, pp. 79–94, Oct 2013. https://doi.org/10.20982/tqmp.09.2.p079

[43] A. Field, "Discovering statistics using IBM SPSS statistics", (4th ed.). London, UK: Sage, 2013.

[44] J. C. Anderson, & D. W. Gerbing, "Structural equation modeling in practice: a review and recommended two-step approach", Psychological bulletin, vol. 103, no. 3, 1988. https://doi.org/10.1037/0033-2909.103.3.411

[45] H. Baumgartner, & C. Homburg, "Applications of structural equation modeling in marketing and consumer research: a review", Int. J. Res. Mark., vol. 13, no. 2, pp. 139–161, Apr 1996. https://doi.org/10.1016/0167-8116(95)00038-0

[46] L. Hu, & P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives", Struct. Equ. Model. Multidiscip. J, vol. 6, no. 1, pp. 1–55, January 1999. https://doi.org/10.1080/10705519909540118

[47] J. de Carvalho, & F. O. Chima, "Applications of structural equation modeling in social sciences research", American International Journal of Contemporary Research, vol. 4, no. 1, pp. 6–11, 2014.

[48] A. C. Davison, & S. Sardy, "méthodes de rééchantillonnage pour l'estimation de variance en sondage", Journal de la Société française de statistique, vol. 147, no. 3, pp. 3–32, 2006.

[49] C. Baribeau, & R. Chantal. " L'entretien individuel en recherche qualitative: usages et modes de présentation dans la Revue des sciences de l'éducation ". Revue des sciences de l'éducation. vol. 38, no. 1, pp. 23–45, 2013. https://doi.org/10.7202/1016748ar

10 Authors

El Ayachi Rahali is a PhD in science didactics, University Sidi Mohamed Ben Abdellah, USMBA, Fez. And he is a trainer in the regional center for education and training in Béni Mellal. Morocco. His specialties are educational technologies and science didactics.

Khalid El khattabi is a professor of Higher Education (PESA) University Sidi Mohamed Ben Abdellah (USMBA), Fes Morocco. His specialties are pedagogy and didactics of physics.

Ahmida Chikhaoui is a professor of Higher Education (PES). University Sidi Mohamed Ben Abdellah, USMBA, Fez, Morocco. His specialties are nuclear physics, computer science and didactics of science.

Fatima Ouzennou is a Professor of Higher Education (PH). Trainer in the regional center for education and training. Fes, Morocco. Her specialties are information and communication technologies in education (ICTE) and didactics.

Article submitted 2022-01-23. Resubmitted 2022-04-18. Final acceptance 2022-05-02. Final version published as submitted by the authors.