Designing a Measurement Tool to Analyze OER Usage Among Public Primary School Teachers in Morocco

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Abstract

This study aims to design a measurement tool to analyze the factors positively influencing the actual use of open educational resources by Moroccan teachers. Anchored in the Unified Theory of Acceptance and Use of Technology and the UNESCO reference framework of open educational resources. The adopted measurement tool includes three exogenous variables "the quality of OER, expected performance, facilitating conditions", and a dependent variable "the actual use of OER". A psychometric study was conducted with a random sample of 375 teachers, using a five-point Likert measurement scale and confirmatory factor analysis to interpret the collected data and assess reliability, validity, and the quality goodness of fit adopted statistical model.

The results confirm that the adopted measurement tool exhibits very favorable psychometric properties, particularly in terms of alpha Cronbach coefficients of correlation between the different variables and the items composing them, factor weights, composite reliability

coefficients, average variance extracted, and goodness of fit indices. Three variables "expected performance, facilitating conditions, and the quality of resources" have been identified as factors with a positive and direct impact on the use of OER by Moroccan teachers.

The study provides a reliable and valid measurement tool adapted to the Moroccan context. It could be utilized for the preliminary analysis of teachers' behavior toward the adoption of innovative technologies in teaching.

Keywords: Open educational resources, Moroccan teachers, measurement tool, UTAUT, psychometry, validity, reliability.

1. Introduction

1.1. Open educational resources: situation in Morocco and problem of use

The term "Open Educational Resources" (OER) originated in the UNESCO Forum on Open Courseware in 2002 [1] . UNESCO defines OER as materials in any form and medium, either in the public domain or under an open license, allowing free access, reuse, adaptation, and redistribution. OER encompass online materials like textbooks, courses, videos, and simulations, enhancing the learning process and fostering collaboration and innovation.

In 2022, the William and Flora Hewlett Foundation proposed defining OER as teaching, learning, and research resources that are free of cost and access barriers, and which also carry legal permissions for open use [2]. According to Creative Commons, OER are materials intended for education and research that can be either in the public domain or licensed in a way that grants free and perpetual permission to engage in the five" R" activities: retain, reuse, revise, remix, and redistribute [3]. A series of conferences have been organized to promote the use and dissemination of the culture of OER. The UNESCO Recommendation on OER defines OER as "learning, teaching and research materials in any format and medium that reside in the public domain or are under open license that permit no-cost access, reuse, adaptation and redistribution by others" [4].

Digital resource usage is categorized into five main types, serving purposes such as information search, concept acquisition, production, communication, and organization in educational settings. Morocco actively participates in the OER movement, exemplified by its involvement in ICDE and a comprehensive national strategy since 2005, focusing on ICT integration.

In Morocco, various initiatives are conducted to promote the use of OER by teachers and students.

In Morocco, various initiatives are being carried out to promote the use of OER by teachers and students. A Center for IT Innovation (CITE) contribute significantly to OER development, with the former establishing a centralized repository and pedagogical guides. A National Digital Resources Laboratory was established within the ministry in 2009 to manage, produce, and share digital educational content for free educational use. Despite these efforts, challenges persist, as revealed by a 2021 study indicating low OER utilization, particularly on the "taalimtice.ma" platform [5].

Furthermore, the OpenMed project [6], funded by the Erasmus+ programme, has played an important role in promoting open educational resources and open educational practices (OEP) in higher education institutions (HEIs) in Morocco. The project aims to raise awareness and encourage the participation of institutions with a group of higher education universities in several Arab countries participating in open education programs. It sets the agenda for open educational resources and strategic roadmaps, trains university professors in the use of open educational resources, pilots open education programs, and provides open content and learning pathways for students. The efforts of the OpenMed project culminated in the

Moroccan Declaration for Open Educational Resources, addressed to the Moroccan government, educational agencies, schools, universities, and all stakeholders involved in teaching and learning. The declaration called for the recognition and support for open educational resources to improve quality, equity, and innovation in education, presenting various recommendations for policymakers, teachers, learners, and other stakeholders.

With the Covid-19 pandemic, the urgent need for open digital resources emerged to ensure pedagogical continuity of study. In response, the Ministry of National Education launched an OER platform with video lessons for learners of all levels and backgrounds, facilitating distance learning with more than ten thousand educational videos [7].

The ICT in education strategy in Morocco focused on enhancing teachers' skills in innovative production and the use of digital resources. Workshops and educational programs were provided to develop learners' skills in programming and robotics principles. To ensure the sustainability and widespread adoption of OER, open-source platforms for sharing digital resources have been introduced, along with national competitions to encourage the creation, exchange, dissemination, and use of OER. Quality standards have also been established to evaluate innovations in free educational digital resources, covering technical, educational, scientific, linguistic, ethical, and legal aspects.

In fact, the ICT in Education Program in Morocco has played a crucial role in promoting open educational resources and fostering inclusive and innovative educational practices nationwide. The country has demonstrated strong commitment and leadership in developing the OER movement in the region.

Despite efforts to promote the use of OER by teachers, studies still reveal unsatisfactory results regarding their mainstreaming in education and training. On the other hand, the study carried out by the National Evaluation Authority in 2021 with the Supreme Council for Education, Training, and Scientific Research, in partnership with UNICEF, aimed to dissect the issue of the use of information and communications technology by teachers in the time of Covid-19 [8]. It revealed that few teachers resort to exploiting and using open educational resources on the "Telmid-Tice" platform, which hosts thousands of open resources in the form of video courses. In fact, only 21.3% of teachers said they used the platform developed by the Ministry of National Education. The study revealed that 13.5% of the teachers included in the study are not proficient in ICT, 67.1% have an average level, and only 19.4% have a very high level. However, there is still a need to overcome many challenges and obstacles, such as stimulating change in attitudes and behaviors, improving the school environment, quality of open educational resources, technical support, and educational supervision to overcome all the constraints that could arise.

However, efforts in terms of scientific research seem necessary, particularly in relation to the analysis of teachers' behaviors to meet the challenge and guide them towards a very positive change in the use of educational resources.

Based on these findings, it seems very interesting to carry out studies on this subject to better

understand the reasons for success that can drive teachers to use OER in teaching and learning. This will undoubtedly lead to increased interest in promoting the use of OER by teachers in teaching and learning. It will also help the competent authorities to determine the basic factors that should be considered for the success of such a strategy aimed at generalizing the use of these educational resources within the education and training system in Morocco.

To overcome these challenges, gain deeper knowledge of the obstacles, analyze the reality of using open educational resources, and study the basic factors for accepting and employing them, a crucial question arises about:

How can we develop a reliable and effective measurement tool to assess teachers' behavior in the practical implementation of Open Educational Resources (OER)?

The significant efforts undertaken by the national education sector in Morocco, through the intensification and diversification of various awareness and training programs and initiatives, aim to motivate teachers to utilize open digital resources for enhancing the teaching and learning process. This encourages researchers and stakeholders to contemplate proactive scientific studies that can contribute to understanding and analyzing the factors positively influencing Moroccan teachers to incorporate open educational resources into their teaching and learning practices.

1.2. Purpose of the study

The primary objective of this study is to construct a reliable and valid measurement tool for the proactive identification of factors influencing teachers' positive behavior towards the adoption of open educational resources (OER) for effective teaching and learning. The process of adapting and constructing the scale was grounded in the Unified Theory of Acceptance and Use of Technology (UTAUT) model [9] [10], and the UNESCO OER framework [3] [11]. This approach was employed to examine and analyze a set of variables that positively motivate Moroccan teachers to effectively utilize open educational resources (OER). These determinants encompassed the quality of digital content, expected performance, Facilitating conditions, and the actual use of OER.

1.3. Interest of the study

This study encompasses diverse interests. It seeks to enhance the scientific contributions of educational and psychological measurement by developing tools to measure teachers' behavior in using technology. The primary goal is to bolster the body of Moroccan scientific research on this topic, emphasizing the factors that lead to success and can effectively influence changes in teachers' behavior, encouraging the adoption of digital tools to enhance student learning outcomes. Additionally, it aims to offer valuable insights to individuals interested in understanding the barriers hindering the authentic adoption of technology in educational practice.

1.4. Literature review and theoretical framework

To understand the factors that motivate teachers to use OER and improve teaching and learning processes, given that OER involves technology in their use and production, it is necessary to deepen existing studies in the aim of exploring the different measures used in this area.

In this context, this study presents literary references and previous scientific research having used measurement tools based on theoretical models to analyze the actual use behavior of technology by its users. This article focused on previous studies conducted on the Unified Technology Acceptance Theory (UTAUT) [10], due to the scientific basis on eight most used theories to study user behavior and intentions towards technology in general. The measurement tools used in this model have often been adapted, depending on the characteristics of each study, to evaluate the correlations between the variables that compose them such as "performance expectancy", "social influence, expectancy effort, utility, performance, social influence, effort and life expectancy are predicted. Behavioral intention and enabling conditions determine actual technology usage.

In fact, this review is intended to enhance the methodology for constructing measurement tools in accordance with recognized psychometric standards. It aims to identify the theoretical framework that will inform the design of our measurement tool, facilitating the precise identification of the primary constructs influencing the behavior of Moroccan teachers towards the optimal use of technology in education.

In essence, the Unified Theory of Acceptance and Use of Technology (UTAUT) model comprises four primary factors: "Expectation of Performance", "Social Influence", "Expectation of Effort", and "Facilitating Conditions". Expectation of performance, social influence, expectation of effort, and facilitating conditions directly determine the behavioral intention to use technology, while behavioral intention and facilitating conditions directly determine the actual use of technology.
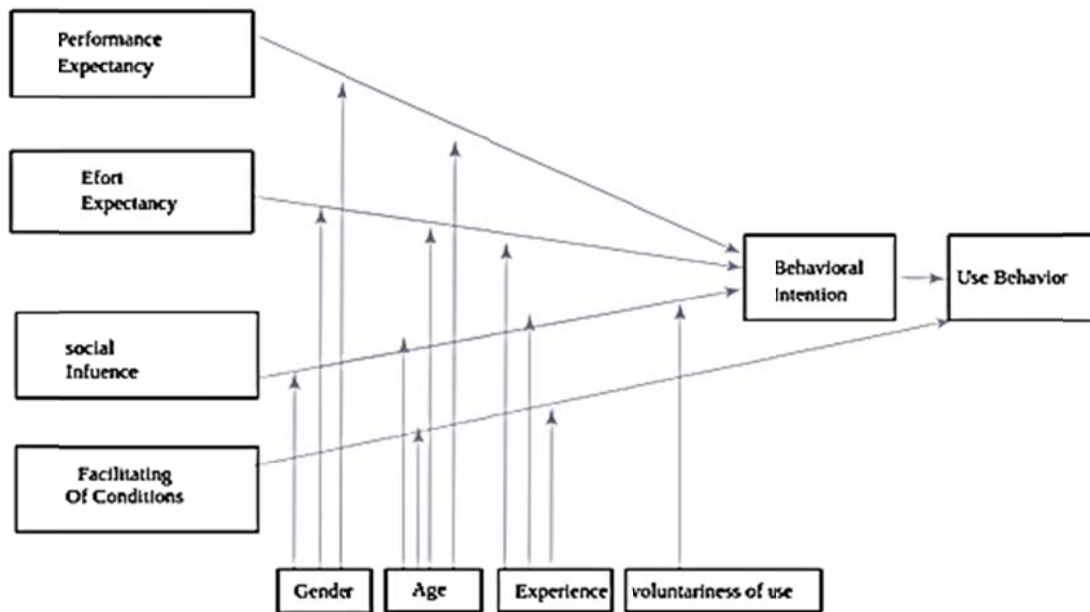
Figure 1. Unified Theory of Acceptance and Use of Technology model (UTAUT)

This model also encompasses four moderating factors: gender, age, experience, and willingness to use, each of which may influence the four foundational structures mentioned earlier. The UTAUT model elucidates over 40% of the variance in behavioral intention to use technology and approximately 10% of the variance in technology use.

Expected Performance: Refers to the extent to which individuals believe that using a particular technology will enhance their job [9]. Perceived benefit is a robust indicator of intent to use, signifying "the extent to which the individual believes that using the system will yield functional gains". Investigating this variable contributes to future advancements in educational productivity.

Expected Effort: This factor, second in importance in the UTAUT theory, gauges the ease associated with using a specific system or technology. It measures system complexity [12].

Social Influence: Expresses the degree to which an individual perceives that significant other believe the new system should be used. Social influence is also defined as the belief in the importance people place on adoption [12].

Facilitating Conditions: Reflects the degree to which an individual believes that organizational and technical infrastructure is in place to support the system's use [12]. This variable is tied to the availability of necessary capabilities, such as knowledge and technical means.

Behavioral Intention: Signifies an individual's intention to benefit from a specific tool in the future [12].

Actual Use: Denotes the practical utilization of the tool, specifically referring to the effective

use of Open Educational Resources (OER) by teachers in the classroom during teaching and learning practices.

In addition to the main variables, the UTAUT includes three variables that overlap in one way or another with the basic factors, namely: age, gender, and experience. The following diagram No. 1 illustrates the elements of the UTAUT theory.

The UTAUT model has been widely used to study the acceptance and use of open educational resources (OER) by its users in different contexts. Below, we include the most important and recent studies that have addressed the use of OER:

• The role of open educational resources in the adoption of e-learning by higher education teachers: the case of Saudi Arabia [13]:

This study utilized a measurement tool based on the UTAUT model to examine the role of open educational resources (OER) in the adoption of e-learning by higher education faculty in Saudi Arabia. The study is based on a survey conducted among 216 teachers from different Saudi universities. The results reveal that the four variables of the measurement tool (performance expectancy, effort expectancy, social influence, and facilitating conditions), as well as the perceived quality of OER, contributed to positive effects on teachers' intention to use OER. The article also provides suggestions for further improvement of the model adapted to promote the use of OER in the Saudi context (Alharbi et al., 2020).

• Acceptance and use of OER in Indian higher education: an empirical study using the UTAUT model [14] :

The adopted measurement tool enabled the analysis of professors' perceptions toward open educational resources (OER) in India using the UTAUT model. A set of variables were studied, including performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, habit, and behavioral intention towards OER usage behavior.

• Open educational resources and the unified theory of technology acceptance and use: A meta-analysis [15]:

This study presents a meta-analysis of 18 studies .it relied on a contextualized measurement tool at the base of the model (UTAUT). it made it possible to examine the factors influencing the adoption and use of open educational resources (OER) by teachers and students. The results show that the four main constructs of the UTAUT (performance expectancy, effort expectancy, social influence, and facilitating conditions) have a positive and significant effect on the behavioral intention to use OER. However, their relative importance varies depending on the context and type of user. The study also offers practical implications and recommendations for future research on OER and UTAUT.

• Acceptance and use of open educational resources: An empirical study using UTAUT2 [16]:

This study reports an empirical study using the UTAUT2 model to analyze the factors

affecting the acceptance and use of open educational resources (OER) by university students in China. The measurement tool was adapted and contextualized to collect and analyze data from 312 students who used OER in their courses. The results indicate that the six constructs of the UTAUT2 model (performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, and cost of use) have a significant impact on the behavioral intention to use OER, and this intention, in turn, influences the actual use of OER. The article also discusses the theoretical and managerial implications of these results for the promotion of OER in higher education.

• Using the UTAUT model to understand student use of e-learning systems in developing countries [17]:

This article also uses a contextualized measurement tool on the UTAUT model to analyze students' intentions, usage, and actual use of Moodle, an online learning system at Hashemite University in Jordan. The tool facilitated the exploration of the effects of performance expectancy, effort expectancy, social influence and facilitating conditions on students' acceptance and use of Moodle.

Acceptance and adoption of technology in education [18]:

This research provides an overview of the main tools adapted based on the UTAUT model to analyze the acceptance and adoption of educational technologies. The study synthesizes the results of 122 empirical studies that have applied the UTAUT model in various educational contexts and contexts.

The results from all these studies suggest that the UTAUT model is robust and valid for studying OER adoption. However, there are limitations, such as single subjects, single information systems, cross-sectional studies, and self-reported use. Future research is suggested to expand the application of UTAUT to other contexts, systems, cultures, and countries.

In conclusion, these studies demonstrated that UTAUT constitutes an appropriate framework to construct reliable and valid measurement tools to analyze the factors affecting the adoption and use of open educational resources by teachers.

Referring to the Moroccan context, we found some studies that applied this model to the study of the behavior of using open educational resources by teachers in teaching and learning. we include some of the most recent publications regarding the application of the UTAUT model in the field of Moroccan education. A recent study focused on "exploratory qualitative analysis identifying the particularities of the adoption of e-learning: case of the Moroccan Ministry of National Education [20]. We note in this research the absence of a psychometric analysis of the measurement tool adopted to study the factors concerned. Another recent study focused on "the adoption of distance learning during the COVID-19 pandemic by Moroccan university students [19] ;It focused on a descriptive analysis of the factors of the UTAUT model without prior psychometric analysis [1]. In fact, we found few psychometric studies applying this model.

Therefore, we decided to conduct this study to build a reliable and valid measurement tool to identify and analyze the factors that motivate or hinder the use of open educational resources by Moroccan teachers. Indeed, this study will contribute to the scientific literature in Morocco.

2. Research methodology

Methodological steps were undertaken, employing descriptive statistical analysis and confirmatory factor analysis, to examine and assess the variables in the adopted measurement model. The objective was to study overall reliability, composite reliability, and internal correlations among the measured variables, including factor weights. Additionally, the verification of internal fit quality was conducted to construct a path model adhering to the necessary factorial conditions.

2.1 Building a prototype of the measuring tool

To advance and enhance research on measuring technology use behavior in education, our initial efforts were focused on constructing variables for the tool to be adopted. Drawing on face validity and the expertise of educational psychometrics professionals, we consulted with a group of supervisors who oversee and participate in the evaluation of the use of educational resources in Moroccan institutions. This process provided insights into variables derived from both the international framework for open educational resources and previous research, including the UTAUT model, to explore factors influencing the actual usage of technology.

During this stage, the recommendations from the experts emphasized the importance of developing a measurement tool with variables related to resource quality, expected performance, institutional technical support, and actual use. Based on their field experiences and observations of teachers using educational technologies, they affirmed that these variables constitute the essential basis for studying the factors influencing the actual use of open educational resources by Moroccan teachers in education (Appendix A).

2.2 Validate the measurement tool

The process of developing the measurement tools is based on information derived from both the International Framework for Open Educational Resources and previous research, including the UTAUT model, to explore factors influencing usage. real technology.

To ensure the validity of the measurement tool's claims, the study first used the validity of the raters (three professors of psychometrics and educational technology). They checked its content, consistency, clarity, completeness, and effectiveness. They also took notes to edit and revise certain sentences to ensure linguistic accuracy. The tool has also been translated into Arabic and French to make it accessible to all primary school teachers.

During this first phase, the experts' recommendations highlighted the importance of developing a measurement tool with variables linked to the quality of the resource, expected performance, institutional technical support, and actual use. Drawing on their professional experiences in evaluation and educational technology, they affirm that these variables

constitute the essential basis for studying the factors influencing the actual use of open educational resources by Moroccan teachers in education.

Indeed, the number of item variables was reduced at their request to focus on the most important factors for teachers, simplify the tool and facilitate its use on a very large scale at the national level.

Therefore, a hypothetical model was proposed for study to examine its constructs, reliability and validity while considering the hypothesized causal relationships and the quality of internal adjustments between all proposed variables. The table below outlines the variables selected for the proposed measurement model.

As indicated in table 4 (Appendix A), the study examines four primary variables: expected performance, expected quality, facilitation conditions, and the actual use of OER. These variables constitute the components of our measurement model, and they are expected to influence the effective use of OER by Moroccan teachers.

We have formulated three main hypotheses for this measurement model:

H1: The expected performance significantly influences the actual usage of OER by teachers in Moroccan school education.

H2: There exists a significant relationship between the quality of OER and the actual use of OER among teachers in Moroccan school education.

H3: Facilitating conditions positively influence the effective use of OER by Moroccan school teachers in their teaching and learning.
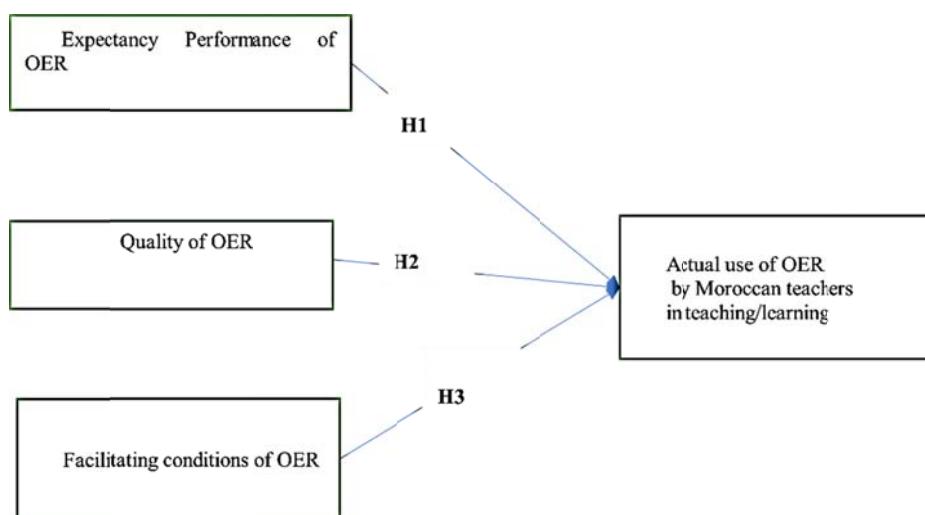

Figure 2. Proposed model of measurement (USE_OER)

3. Research methodology and data analysis

3.1 Study sample:

The Sample for the study testing the measurement tool includes 375 teachers (266 men and 109 women), carefully selected according to the principles of factor analysis. This methodology requires that the number of respondents be greater than the number of elements multiplied by 10 to guarantee the reliability of the confirmatory factor analysis (CFA) carried out.

By adhering to this rigorous criterion, we aim to improve the robustness and validity of our analyses. The selection of our sample size exceeds the recommended threshold. It will allow you to discover meaningful patterns and relationships within the data. This allows us to confidently apply the principles of CFA, ensuring that the results derived from our study are not only statistically valid, but also reflect the underlying concepts we seek to explore among the teaching population.

3.2 Experience of using digital re sources

As Figure 4 demonstrates, a significant number of teachers possess digital resource skills in teaching, affirming the feasibility of proceeding with the study. Those who took part in the research exhibit the capabilities and knowledge necessary to integrate digital resources into their pedagogical approaches.

Additionally, numerous teachers excel in utilizing digital resources for teaching, further solidifying the ongoing feasibility of the study. Participants possess the skills and knowledge required to seamlessly incorporate digital resources into their educational programs. This, in turn, streamlines the process of identifying the variables constituting our measurement model, which can either impede or support teachers in the use of OERs. in the actual utilization of open educational resources in teaching and learning.
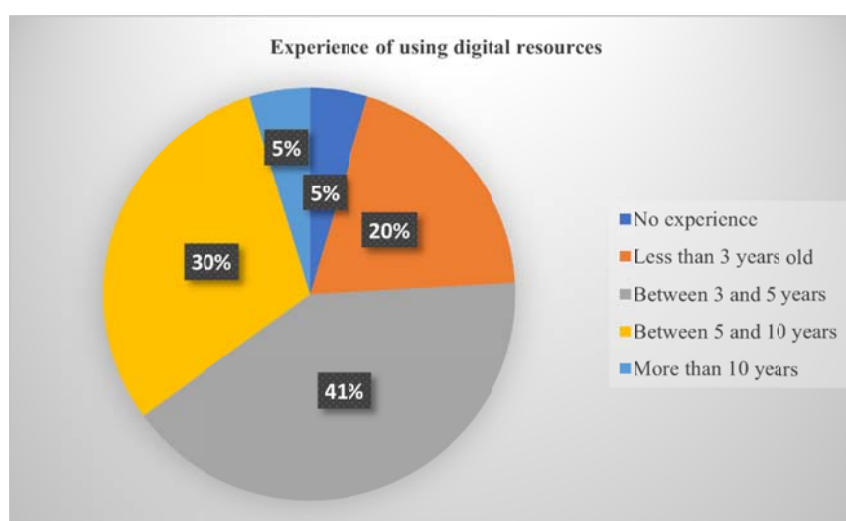

Figure 3. Experience of using digital resources

3.3 Analysis of the Validity and Reliability: Measurement model

As mentioned previously, the study employed confirmatory factor analysis to process the data and analyze the psychometric characteristics of the adopted model, confirming its constructs and hypotheses. Our analysis was done in two steps. The first step aimed to assess the validity and reliability of the chosen measurement model, while the second step focused on the analysis of the structural model to test the research hypotheses.

To make sure the measurement model is valid and reliable, we followed Fornell and Larcker [21], who suggested three criteria:

• Measurement validity: Internal reliability measured by Cronbach's alpha: a value above 0.6.

• Convergent validity: Composite reliability (CR) with a value above 0.60.

• Discriminant validity: Average variance extracted (AVE) with a value above 0.50.

The study used confirmatory factor analysis (CFA) to check the validity of the measurement instrument adopted, which consisted of 15 items measuring four latent factors: Quality, Expected Performance, Facilitating Conditions, and Actual Use of OER. As a statistical technique that tests whether the observed data fits a hypothetical measurement model, CFA assesses the validity of the measurement instrument by examining the factor structure, the factor loadings, and the item reliability. The model fit is assessed by various indices, such as the chi-square, the comparative fit index (CFI), the root means square error of approximation (RMSEA), etc.

3.3.1 Validity of measurement

3.3.1.1 Convergent validity measurement of the adopted model:

his study aims to explore and validate the measurement model variables influencing teachers in Morocco to use OER. Validation will be conducted using three indicators: factor loadings, composite reliability (CR), and average variance extracted (AVE). To perform the variables analysis, the study used the Principal Component Analysis method for data extraction and the Varimax with Kaiser normalization method for rotation.

Table 1. The reliability and validity of the measurement model : Results of laoding factors, average variance extracted, composite reliability and Cronbach's alpha of the items of each variable.

Rotation de la matrice des composantes[a]

	Composante				variance extracted (AVE)	Composite Reliability (CR)	Cronbach's alpha (α)
	1	2	3	4			
Tech Quality	,715				,553	,881	,86
Peda Quality	,787						
Ergo_Quality	,765						
Scienti_Quality	,755						
Ling_Quality	,741						
Ethic_val_Quality	,697						
Expect_perfor1			,806		597,	-1,8	,746
Expect_perfor_2			,717				
Expect_perfor3			,793				
Fa_conditions_1		,866					
Fa_conditions_2		,829					
Fa_conditions_3		,917			,759	,904	,854
Actual_Use1				,750			
Actual_Use2				,811	74,5	801,	,734
Actual_Use3				,710			

Méthode d'extraction : Analyse en composantes principales.

Méthode de rotation : Varimax avec normalisation Kaiser.

a. Convergence de la rotation dans 5 itérations.

3.3.1.2 Discriminant validity of the measurement model:

To assess the discriminant validity of the factors of the measurement model, the study followed the recommendation of Fornell and Larcker [21] to compare the square root of the average variance extracted (AVE) with the correlations between the variables. The square root of the AVE should be higher than the correlation coefficients of any other construct. In fact, the degree to which the constructs are different from each other is measured by discriminant validity. The study tested the discriminant validity by comparing the square root of the AVE of each construct with its correlations with all other constructs.

Table 2 shows that all the constructs are distinct, as the correlation coefficients between them are lower than the suggested value of 0.85.

Table 2. Discriminant Validity

Correlations

		AVE	Quality_OER	Expected_Performace	Facilitate_conditions	Actual_Use
Quality_OER	Correlation of Pearson	,553	**,743**			
	N		375			
Expected_Performace	Correlation of Pearson	,597	,359[**]	**,772**		
	Sig. (bilateral)		<,001			
	N		375	375		
Facilitate_conditions	Correlation of Pearson	,759	,124[*]	,148[**]	**,871**	
	Sig. (bilateral)		,016	,004		
	N		375	375	375	
Actual_Use	Correlation of Pearson	,574	,369[**]	,441[**]	,239[**]	**,757**
	Sig. (bilateral)		<,001	<,001	<,001	
	N		375	375	375	375

**. The correlation is significant at the level 0.01 (bilateral).

*. The correlation is significant at the level 0.05 (bilateral).

The values of Cronbach's alphas and composite reliability (CR) for each construct are presented in Table 2 and are all above 0.7, indicating a good internal consistency. The average variance extracted (AVE) values, which are also shown in Table 1, are all greater than 0.5, suggesting a sufficient convergent validity. Moreover, Table 3 reveals that the square root of the AVE for each construct exceeds its correlations with the other constructs, confirming a satisfactory discriminant validity. These results indicate that the constructs respect the criteria of the measurement model.

3.3.2   Quality of fit indices of the adopted model:

According to Hair [22], the validation of a measurement model requires appropriate fit statistics and specific evidence of construct validity to demonstrate its suitability to the study's data. Hair and his team suggested certain index values as reference points for achieving a satisfactory fit and ensuring the quality of the study model. These include the chi-square/degrees of freedom (CMIN/DF) ratio, which should be less than 5. Additionally, fit indices such as CFI, RFI, NFI, IFI, and TLI should exceed 0.9, while the RMSEA value should preferably be below 0.09. In this study, the data collected from the research sample

were analyzed using AMOS version 26 software, and the reliability and validity of the CFA (confirmatory factor analysis) were assessed. The adequacy of the model was evaluated through the fit index tests mentioned above. The obtained values (figure 3) were compared to the thresholds recommended by Hair et al [22].

The results indicate that the model fits the observed data well which proves its quality. (Table 3).

Table 3. Results of the test values of the fit quality indices of the adopted model

Adjustment index	Value obtained	Recommended threshold
CMNI/DF	2,55	<5
P	,000	<0,05
CFI comparative fit index	,942	> 0.90 (Hair et al., 2010)
TLI Tucker-Lewis index	,927	> 0.90 (Hair et al., 2010)
Root mean square error approximative (RMSEA)	,065	< 0.05 ou <0.08 (Herry & Stone, 1994; Byrne, 2001)

3.3.3 Analysis of Structural Model

According to Hair [22], The Figure 5 illustrates the final structural model derived from applying the refinement criteria to the measurement model used, which includes a total of 15 items. It is in the form of a diagram. It displays the results of the data collected from 375 teachers. It shows the set of hypotheses on the relationships between the observed variables measured in this study, namely: the quality of open educational resources (OER), the expected performance and the latent variable, which is the actual use of OER, which is supposed to influence or be influenced by the observed variables.
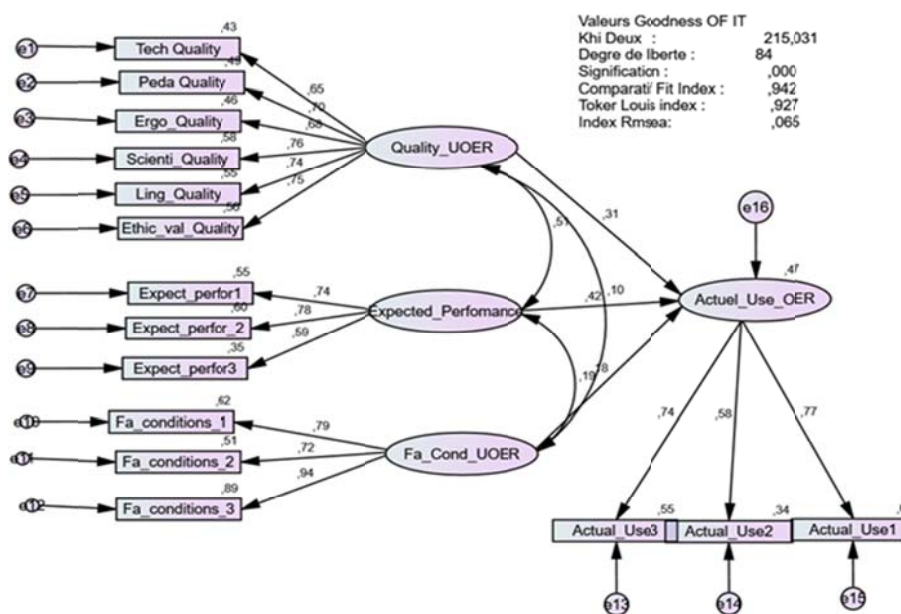

Figure 2. Final structural model

The variables are represented by circles and their items by rectangles, depending on whether they are latent or observed. The relationships between the variables are represented by arrows, which can be unidirectional or bidirectional depending on whether they express correlation. The arrows are accompanied by numbers called standardized regression coefficients, and they vary between -1 and +1, indicating the strength and direction of the relationship. The closer the coefficient is to 1 or -1, the stronger the relationship. The closer the coefficient is to 0, the weaker the relationship between the study variables. The figure also contains a paragraph in the top right corner with numerical values for different indices, which allow evaluating the quality of the model of the study. These indices are:

- The value of the chi-square test (Chi-Square), which measures how well the model fits the data. A model is acceptable if the ratio between chi-square and degrees of freedom (DF) is less than 3 or 5.

- The value of the Comparative Fit Index (CFI), which compares the model to a null model (without any relationship between variables). A model is acceptable if CFI is greater than 0.9.

- The value of Root Mean Square Error of Approximation (RMSEA), which measures the average gap between model and data. A model is acceptable if RMSEA is less than 0.09 or 0.08.

- The interpretation of results is done through standardized regression coefficients to understand relationships between study variables, and quality indices of adopted model to verify its consistency with data.

In fact, results obtained using AMOS software for our study model of actual use of OER by Moroccan teachers showed:

- A good internal correlation generally between items of each variable that exceeds 0.7. These results were previously confirmed by convergent validity.

- The coefficient between Quality and Actual use of OER is 0.31. It indicates a positive relationship between these two variables Quality of OER and expected performance towards use of OER by teachers. It means that higher quality of OER leads to higher expected performance.

- The coefficient between Expected_Performance and Actual_Use_OER is 0.42, it also indicates a positive relationship. This result means that higher expected performance leads to higher actual use of OER.

- The coefficient between facilitating conditions and actual use of OER is 0.18, it represents a positive relationship between these two variables. This means that better facilitating conditions towards OER lead to higher use of them by teachers.

- The diagram also shows positive relationships between three different observed variables.

- The value of chi-square is 2.45, which is low. The ratio between chi-square and degrees

of freedom is 0.82, which is less than 3. This indicates that model is well adjusted to data.

- The value of CFI is 0.942. It is close to 1. This indicates that model is better than a null model

- The value of RMSEA is 0.06. It is close to 0. This indicates that the model has a low gap compared to the data.

These interpretations suggest that the structural equation model is valid and relevant for studying the relationships between variables related to OER. Therefore, we can deduce that the adopted measurement model could be used to test the research hypotheses and to make predictions about the effects of OER on performance and their use and acceptance by Moroccan teachers

3.4 Verification of hypotheses and discussion of results

The results of the analysis, show the estimation results, the critical ratios (CR) and the significance (p-value) of the correlation between the internal structures and the explanatory factors of the adopted model. The results also reveal the constructs that influence the use of OER by Moroccan teachers.

The figure 7 offers a summary of the metrics assessing model fit. These evaluations were obtained after examining the adopted measurement model and analyzing the structural model. Indeed, the results indicate a satisfactory alignment with the dataset.

Figure 3. Results of Regression Weights (Summary of the hypothesis test)

			Estimate	S.E.	C.R.	P	Hypothesis
Actuel_Use_OER	<---	Expected_Perfomance	,309	,056	5,479	***	Confirmed
Actuel_Use_OER	<---	Fa_Cond_UOER	,074	,022	3,318	***	Confirmed
Actuel_Use_OER	<---	Quality_UOER	,172	,038	4,516	***	Confirmed

- **H1: The expected performance significantly influences the actual usage of OER by teachers in Moroccan school education**

As shown in Figure 6, Table 3, and Figure 5 above, the expected performance as a latent construct consists of three indicators (Expect_Perfor1, expect_Perfor2, and expect_Perfor3).

The conducted test reveals a significant relationship with the current use of teachers to accept

the OER in their teaching and learning (Estimate = .31, P = 0.000). These results demonstrate that the expected performance positively influences teachers to use OER in their teaching and learning. As the expected performance increases, teachers' utilization of OER also increases. These findings support those presented in the works of various researchers [9] [23].In fact, the teachers perceive this factor as beneficial for the pedagogical use of OER. Educational institutions and stakeholders must consider this aspect in the training and awareness of teachers regarding the use of OER to support and enhance learning among Moroccan students.

•H2: There exists a significant relationship between the quality of OER and the actual use of OER among teachers in Moroccan school education

The results presented in Table 3, Figure 5, and Figure 6, show a significant correlation between the latent construct Quality of OER and their actual use by teachers (Estimation =,172, p = 0.000). This correlation is significant and predictive for our adopted measurement model. This is undoubtedly due to the importance of technical, pedagogical, scientific, linguistic quality and respect for values as a selection criterion for their use in their teaching/learning. These criteria are adopted by the Moroccan educational system in the evaluation of digital resources for educational use [24]. These conditions required by the school curriculum constitute for them a primary factor of acceptance of the use of open educational resources. Therefore, this construct "Quality" is a determining factor for the use of OER by Moroccan teachers in their pedagogical practices. Thus, for Moroccan teachers to adhere to any strategy aimed at adopting digital resources in their teaching and learning a process of selecting more qualitative resources must be put in place to facilitate and popularize their use among teachers. A training strategy (MOOC-OER) focusing on research and monitoring, self-evaluation, and selection of OER in line with the school curriculum and the establishment of networking and expertise platform on this subject. This second hypothesis is strongly validated and proven by our adopted measurement model.

• H3: Facilitating conditions positively influence the effective use of OER by Moroccan school teachers in their teaching and learning.

The outputs of the structural model (Table 3, figure 5, and Figure 6) reveal that the facilitating conditions factor, composed of three items related to the availability of multimedia equipment, technical assistance, and connectivity in the classroom, has a significant and positive contribution to the usage of OER in teaching/learning. The test values are positively significant and in line with the hypothesis (Estimation = 0.074, p= 0.00). These results align well with the UTAUT model [9]and confirm the hypothesis. They highlight the significant positive effect of infrastructure status on teachers' usage behavior of OER. If the institution promotes necessary technical conditions and internet connectivity, makes OER accessible, and provides good assistance and support to teachers within appropriate time and space for teaching activities, this factor can positively impact their usage of OER.

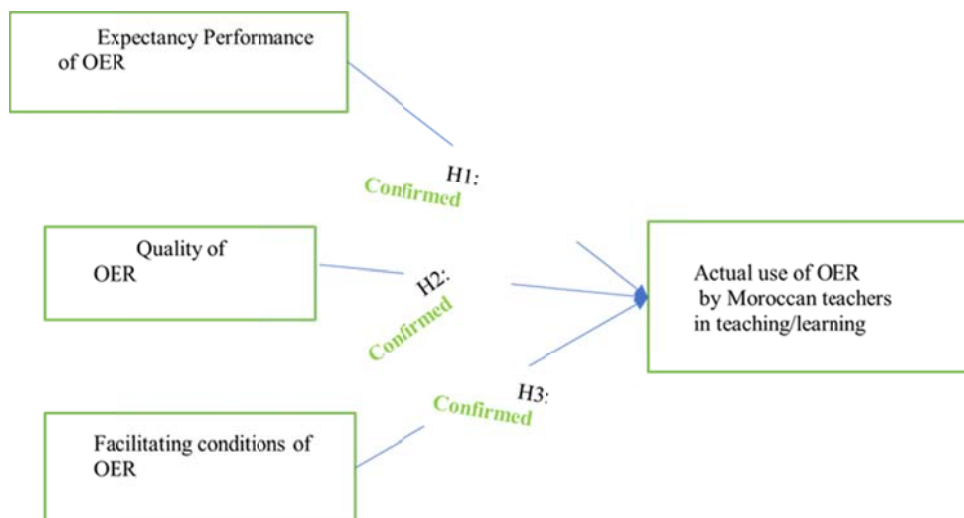The following figure summarizes the measurement model adopted for this research.

Figure 6. Final Model measurement confirmed

These results obtained are consistent with those of previous research [10]. In fact, the main concern of Moroccan teachers was to improve their teaching and learning using OER. They perceived OER, as innovative didactic aids, that would help them to properly implement their teaching in the classroom. In view of these results, the educational actors of the Moroccan education system should attach importance to the promotion of OER to improve the teaching and learning of Moroccan students.

The study revealed that three exogenous factors (quality of OER, expected performance and facilitating conditions) had a positive and significant impact on the actual use of OER by Moroccan teachers, while an endogenous factor (actual use of OER) was used as the outcome variable. These results obtained are consistent with those of previous research, notably "expected performance" which also used the UTAUT theory to examine the adoption of OER by Korean teachers [25]. He founds similar effects of exogenous factors influencing actual usage behavior.

The study also revealed that the main concern of Moroccan teachers was to improve their teaching/learning using OER. They perceived OER as innovative didactic aids that would help them in the proper implementation of their teaching in the classroom. They expected OER to enhance their professional development, enrich their teaching practices, and enhance their students' learning experiences. They also revealed that adequate technical and institutional support could push the user of OER in their teaching/learning process.

In view of these results, the educational actors of the Moroccan education system should attach importance to the promotion of OER to improve the teaching/learning of Moroccan students. They should raise awareness and train more Moroccan teachers on how to find, assess, adapt, and use OER in their classroom teaching. They must also ensure that OER are

relevant, accurate, up-to-date, and engaging for Moroccan teachers and learners. Moreover, they should continue to encourage and reward more Moroccan teachers to further popularize the use of OER in their teaching/learning process.

In summary, this study contributes to the literature on OER adoption by developing and applying a simple and reliable measurement tool to analyze the factors that affect the actual use of OER by Moroccan teachers. it also offers valuable information on how to improve the quality and availability of OER for Moroccan teachers. By using OER in their teaching and learning process, Moroccan teachers can enhance their professional development, enrich their teaching practices, and improve their students' learning experiences.

4. Conclusion

This study proposed and empirically tested a measurement tool tailored to the Moroccan school context, especially the teaching and learning frameworks that integrate digital resources. This tool enabled testing and validating a set of three exogenous factors that determine the use of open educational resources (OER) by Moroccan teachers (the quality of OER, the expected performance and the facilitating conditions) and one endogenous factor (the effective use of OER). This tool will allow measuring, analyzing, and evaluating the use of emerging technological innovations in the Moroccan educational field, to improve the quality of learning among Moroccan students. The results showed that the measurement tool has good psychometric properties. The tool successfully identified a set of factors that influence the effective use of open educational resources among Moroccan teachers, such as the expected performance, the availability of multimedia equipment and the quality of resources. We found that the three exogenous factors had a positive and significant impact on the effective use of OER by Moroccan teachers, the quality of OER being the most influential factor. These results have implications for the promotion and adoption of OER by Moroccan teachers. They indicate that the quality of OER is a key factor that determines whether teachers will use them in their classroom instruction. Therefore, it is important to ensure that OER are relevant, accurate, up-to-date, and attractive for Moroccan teachers and students. The use of open educational resources by Moroccan teachers is a recent and understudied phenomenon, which was stimulated by the Covid-19 pandemic and the need to ensure pedagogical continuity and skill development of students. This study contributes to filling the gap of knowledge on the factors that influence the behavior of teachers towards open digital resources, by using a proven theory (UTAUT) adapted to the Moroccan context. This study also opens prospects for future research on the impact of open educational resources on the quality of teaching and learning in Morocco, as well as on the challenges and opportunities for their dissemination and appropriation by educational actors. Future research could extend this study by examining the effect of using OER on the outcomes and satisfaction of students. Moreover, more studies are needed to explore the barriers and facilitators of adopting OER by Moroccan teachers in different contexts and levels of education. In addition, policy makers and educators should provide more support and incentives for Moroccan teachers to use OER in their teaching/learning process. By using OER in their teaching and learning process, Moroccan teachers can improve their professional development, enrich their teaching and

learning and enhance their learning experiences

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Appendix A

Approved factor, reference, number of items

Expected performance from use OER in teaching/learning (Expect_Perfor) :

Definition	References	Items
The extent to which an innovation is perceived as better than the old one	Perceived usefulness (TAM, CTAM-TPB) [22]; (Extrinsic Motivation, MM); (Fit for use, MPCU) [25] (relative advantage (TDI) [23];	• Expect_Perfor1: I think that the use of OER is useful in the teaching / learning of my students in general • Expect_Perfor2: I think that the use of OER improves the performance of my students • Expect_Perfor3: I find that the use of OER would increase the productivity of my students.

Definition	References	Items

The "degree to which an individual believes that there is an organizational and technical infrastructure to support the use of the system".	(Venkatesh, Morris, M.G, Davis, & Davis, 2003) [9]. Facilitating conditions MPCU); (Compatibility, TDI)	- Fa_Conditions1: Multimedia equipment in my school is available for OER use with my students in class - Fa_Conditions2: For my part, the conditions of access to OER are suitable in my school - Fa_Conditions3: technical help support in my school is available for me on how to use OER in my teaching/learning

Facilitating conditions for the use of OER by teachers in their teaching/learning (Fa_conditions):

Actual use of OER by teachers in their teaching/learning (Actual_Use):

Definition	References	Items
These are the physical and mental acts involved in integrating the information found into the person's existing information base	(Wilson & Nicholas, 2008) [24]	• Actual_Use1: I really want to use OER in my teaching/learning • Actual_Use2: frequently use OERs in my teaching/learning • Actual_Use3: In most of my teaching activities, I use OER

- **Quality of OER used by teachers in their teaching/learning (Quality_UOER)**

Definition	References	Items
The quality of OER depends on the resources chosen, the degree of adaptation to the educational context, and integration into various teaching and learning activities, all of which require advanced skills in resource seeking, selection, adaptation, and evaluation.	UNESCO, Commonwealth of Learning [25]	• Tech_quality: The available OER have simple technical requirements for their use in my teaching/learning. • Peda_Quality : The available OER are suitable for our recommended pedagogical approaches according to our school curriculum. • Ling_Quality: The OER I use provide an appropriate language option for my teaching discipline. • Ergo_Quality: The OER I use have user-friendly features suitable for primary school students. • Scien_Quality: The OER I use have scientific quality

		appropriate for my students' level.
		• Ethics and values:
		The OER I use respect the ethics and values of our Moroccan context.