

## ORIGINAL ARTICLE

**Title:** Validation of a Modified, Malay Version of Extended Technology Acceptance Model Questionnaire: Assessing User Acceptance in Health Education Videos

**Authors:** Raja Nur Adilah Raja Abdul Rahman, Nik Mohd Mazuan Nik Mohd Rosdy, Budi Aslinie Md Sabri

**Submitted Date:** 20-12-2024

**Accepted Date:** 20-07-2025

**Please cite this article as:** Raja Nur Adilah Raja Abdul Rahman, Nik Mohd Mazuan Nik Mohd Rosdy, Budi Aslinie Md Sabri. Validation of a modified, malay version of extended technology acceptance model questionnaire: assessing user acceptance in health education videos. Education in Medicine Journal. Early view.

This is a provisional PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article.

## **Validation of a Modified, Malay Version of Extended Technology Acceptance Model**

### **Questionnaire: Assessing User Acceptance in Health Education Videos**

Raja Nur Adilah Raja Abdul Rahman<sup>1</sup>, Nik Mohd Mazuan Nik Mohd Rosdy<sup>2</sup>, Budi Aslinie Md Sabri<sup>1</sup>

<sup>1</sup>*Centre of Population Oral Health and Clinical Prevention Studies, Faculty of Dentistry Universiti Teknologi MARA*

<sup>2</sup>*Centre of Oral Maxillofacial Diagnostics and Medicine Studies*

#### **Corresponding Author**

Budi Aslinie Md Sabri, Centre of Population Oral Health and Clinical Prevention Studies, Faculty of Dentistry,

Universiti Teknologi MARA, 47000, Sungai Buloh, Selangor, Malaysia

Email: budiaslinie@uitm.edu.my

#### **ABSTRACT**

This study focused on the development and evaluation of a questionnaire based on the Extended Technology Acceptance Model (TAM) to assess user acceptance of health education videos. The process involved adapting, translating, and validating the instrument to ensure cultural and contextual relevance. Key steps included linguistic adaptation, expert review, and comprehensive psychometric testing to confirm the tool's validity and reliability. Validation processes included the Content Validity Index (CVI) and the Face Validity Index (FVI), which confirmed the relevance and appropriateness of the items. Exploratory Factor Analysis (EFA) was conducted on a sample of 345 participants to ensure adequate statistical power. The questionnaire evaluated constructs, such as social interaction, informativeness, perceived ease of use, perceived usefulness, attitude toward use, and help-seeking information in user acceptance. Descriptive statistics showed high mean scores for social interaction, informativeness, video attitude, perceived usefulness, perceived ease of use, and help-seeking intention (4.13–4.63), indicating positive user perceptions, while low mean scores for intrusiveness

(1.35–1.70) reflected minimal negative experiences. Kaiser-Meyer-Olkin (KMO) values (0.676–0.798) and significant Bartlett's Test results ( $p < 0.0001$ ) confirmed sample adequacy and strong interrelationships among variables. Principal Component Analysis (PCA) revealed strong factor loadings ( $>0.6$ ) across all constructs, supporting the questionnaire's validity and reliability. Reliability analysis demonstrated high internal consistency, with Cronbach's alpha exceeding 0.7 across constructs. The findings confirm the validity and reliability of the questionnaire in evaluating user acceptance of health education videos, highlighting its importance in guiding the development of effective educational content.

*Keywords: user acceptance, modified extended TAM, health education video, dentistry*

## INTRODUCTION

In dentistry, dental education is being revolutionized by technology, allowing users to access large amounts of material from a variety of sources at their convenience and from virtually any location [1]. Digital Oral Health Promotion (OHP) or Oral Health Education (OHE) can be implemented more widely by disseminating oral health messages and implementing Social Marketing (SM) through mass media campaigns, with specific aims to increase knowledge of the importance of oral health and oral health care, as well as ensuring that individuals of all ages have a healthy mouth [1]. Digital technology, such as social media, video streaming, smartphones, computers and others are some examples of the current technologies that can be utilized for digital OHP. Technology also may benefit parents and caregivers by enabling engagement in an online health message, allowing them to access information on their own schedules [2], and thus making it easier for them to gain new knowledge to disseminate to the children.

Besides that, technology-based programmes also encourage environmentally friendly behaviour (i.e., "green") and reduce the amount of money spent on supplies for the intervention [2]. In Malaysia, approximately 87.61 percent of the population used a smartphone in 2020, with this figure being anticipated to rise significantly in the next few years [3]. Malaysians spent an average of 7.5 hours per day on the Internet and 2.45 hours per day on social media, with smartphone ownership being linked to the Internet and social media usage [3]. This report showed the relevance of digital OHP in the

current situation, especially after COVID-19 pandemic highly impacted the usage of digital technology not only in Malaysia, but also globally. The digital transformation brings several substantial benefits, such as the aforementioned online activities and education [4].

Moreover, ICT solutions could improve the delivery of education, research, and training, among other things [4]. As the pandemic is still ongoing, digital technologies have an important role in a comprehensive response to outbreaks and pandemics, complementing conventional public health measures [5], including dissemination of OHE. An example is MySejahtera Application that allows users to gain information on COVID-19, to be tracked on his/her current COVID-19 status, directly communicate with Ministry of Health (MOH) and others.

Thus, to develop effective methods for conveying health messages through OHE or OHP, user acceptance is a crucial consideration. Although social video platforms are recognized as valuable educational resources for informal, self-directed learning, little is known about how users engage with these platforms as learning medium. User acceptance ultimately determines the effectiveness of these interventions since users are the end consumers of health education videos. Models like the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) are widely used to measure user acceptance of new technologies [6, 7].

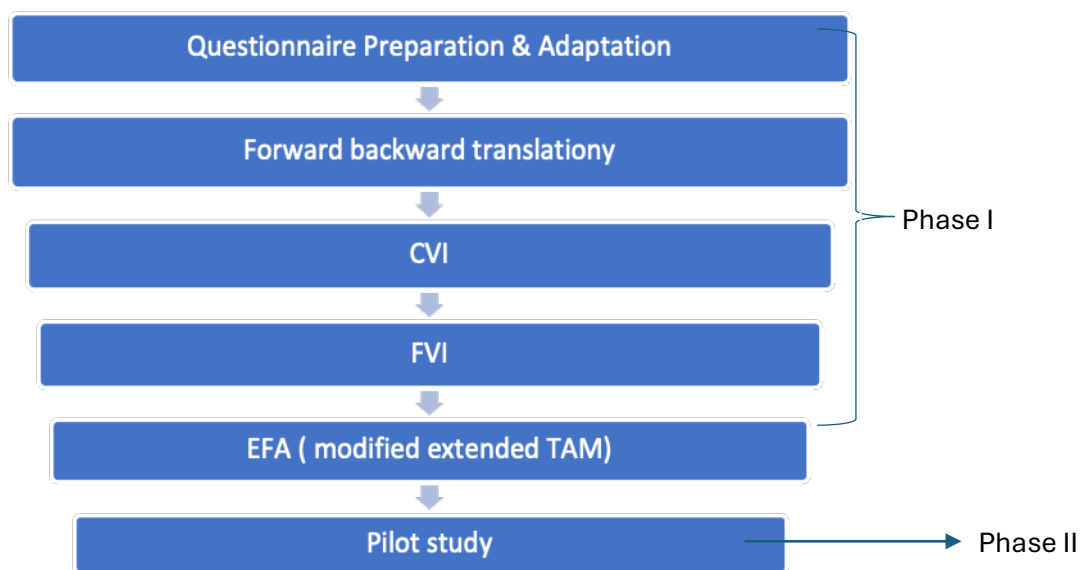
Previous studies have demonstrated the utility of TAM in modelling and quantifying user acceptance of online advertising across various media and social platforms [6]. A modified TAM incorporating factors, such as social interaction, intrusiveness, informativeness, and relevance has been proposed to better capture the dynamics of short-video commercials, positioning TAM as a robust framework for evaluating user acceptance of health education videos [6]. Additional constructs, such as perceived usefulness and perceived ease of use, are crucial for enhancing the effectiveness of social marketing campaigns aimed at promoting oral health. Perceived usefulness refers to an individual's belief in the practical benefits of health education content, which can motivate the engagement with materials and adoption of recommended practices [8], such as regular screenings or preventive measures for oral cancer. Similarly, perceived ease of use pertains to the accessibility and comprehensibility of

educational content; simpler and more intuitive materials can reduce barriers to engagement [8]. Both constructs significantly influence behavioural intentions, a key determinant of behaviour change, by fostering motivation and commitment among target audiences. Understanding these constructs enables social marketing campaigns to tailor messages that highlight benefits, utilize engaging platforms, and continuously refine strategies to maximize impact. These insights provide a framework for creating audience-centric health education initiatives that effectively promote positive behavioural outcomes [9].

Thus, this study focused on adapting, translating into Malay, and validating the modified extended TAM questionnaire to assess public user acceptance of health education videos, providing a critical tool to enhance the efficacy of digital oral health education initiatives.

## **METHODS**

Two main phases were involved: (i) Phase I: Adaptation, translation and validation of the questionnaire; and (ii) Phase II: Pilot study. In the adaptation stage, the research team members were responsible for reviewing the relevant questions in the extended TAM questionnaire before the translation and validation process. The questions selection was based on a thorough discussion on each item of the questionnaire in measuring user acceptance of oral health education video. Several modifications involving dropping irrelevant items and replacing them with relevant ones, were made to the questionnaire. Figure 1 shows the steps taken in questionnaire preparation.



**Figure 1** Schematic diagram of the questionnaire adaptation, validation and pilot study

### **Phase I: Adaptation, Translation and Validation of Modified Extended TAM**

The original extended TAM was adapted from Zhao and Wang (2020), where they examined health advertising on short-video social media platforms. The adapted model comprised eight constructs and a total of 25 measurement items [10]. It comprised closed-ended questions, including Likert-scale items, organized into different perceived ease of use, intention to use, and satisfaction with the system. Each question within the questionnaire was referred to as an item [6]. All items were scaled based on 5-point Likert scale consisting of (1) Strongly Disagree; (2) Disagree; (3) Neither Agree nor Disagree; (4) Agree; (5) Strongly Agree.

#### ***Forward-Backward Translation***

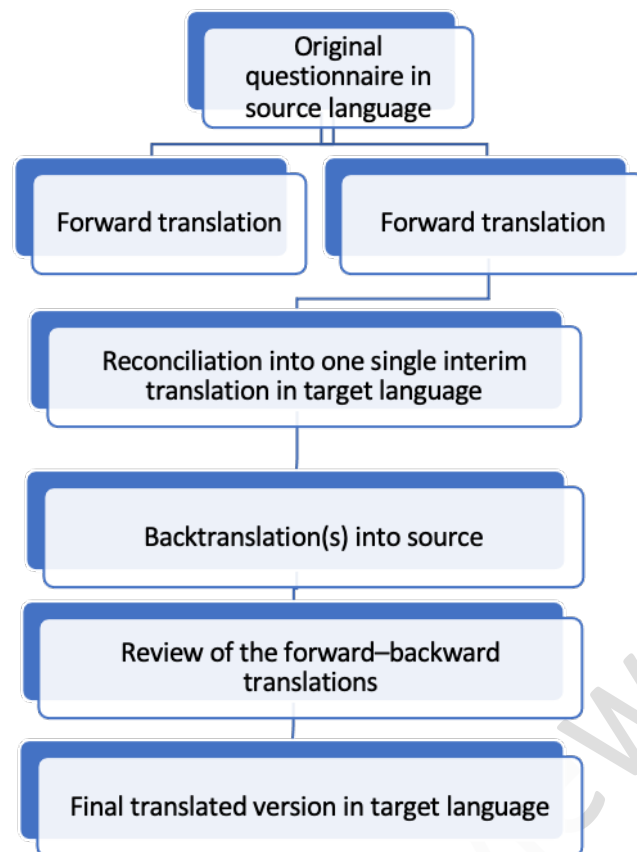
The process of reconciliation, which involves merging multiple independent forward translations into a single translation, is a crucial yet challenging step in the translation process [6]. The initial phase of

questionnaire translation involved forward translation, wherein the questionnaire was rendered from the source language which was English into the target language which was *Bahasa Melayu* by two certified and proficient bilingual translators. Each item was meticulously translated to capture the intended meaning for the target population. Subsequently, the forward translations were reconciled into a single interim version in *Bahasa Melayu* by another certified and proficient bilingual translator. This version was then reviewed, discussed, and finalized to accurately reflect the nuances and intended meanings of the original questionnaire.

Following the forward translation, the questionnaire underwent backward translation into English version, wherein a three independent translator proficient in both the target and source languages translated the questionnaire back to the original language. This step aimed to determine discrepancies, ambiguities, or cultural nuances that might have been inadvertently altered during forward translation. Next, the forward and backward translated versions were meticulously compared and harmonized to ensure congruence across translations by the research team members. Overview steps of forward backward translation are as shown in Figure 2.

To address cultural nuances, terms and phrases were carefully rephrased for better understanding. Technical health education terms were translated into commonly used Malay expressions, and examples were tailored to reflect local values and experiences.

Challenges included finding suitable equivalents for concepts like "perceived ease of use," which required careful adjustments for clarity. Pilot testing with a representative sample helped identify and refine ambiguous or culturally-sensitive elements, improving the questionnaire's relevance and effectiveness for the target population.



**Figure 2** Elements of Standardized Forward-Backward Translation Procedures adapted based on Koller et.al (2012)

### ***Content Validity Index (CVI)***

In this study, a softcopy version of the questionnaire was distributed to seven experts proficient in both English and *Bahasa Melayu*, who were also experts in the questionnaire's content. These experts evaluated the CVI to assess the appropriateness and adequacy of the included content items. The panel was asked to review the applicability of each item in the questionnaire. Four criteria were used in measuring the content validity: relevance, clarity, simplicity, and ambiguity [11, 12]. Data from the content validation was extracted and transferred to Microsoft® Excel® and was further analysed using the same application. The Scale-Level Content Validity Index based on the Average Method (S-CVI/AVE) was further calculated.

The Item-Level Content Validity Index (I-CVI) was calculated as the proportion of experts who rated each item as either 3 (quite relevant) or 4 (highly relevant) on a 4-point relevance scale. This index reflects the level of agreement among experts regarding the relevance of individual items. At the scale level, two approaches were used to compute the Scale-Level Content Validity Index (S-CVI). The first was the average method (S-CVI/Ave), calculated by taking the mean of all I-CVI values across the items. The second approach was the universal agreement method (S-CVI/UA), which represented the proportion of items that achieved an I-CVI score of 1.00, indicating unanimous agreement among experts on their relevance [11, 13].

A panel of seven experts was meticulously selected to evaluate the Content Validity Index (CVI) of the study materials, ensuring a comprehensive and multidisciplinary review. The panel included one medical public health specialist, two oral medicine and pathology specialists, two dental public health specialists, one specialist from the restorative department, and one expert from the Faculty of Film, Theatre, and Animation. This diverse group was chosen based on their professional credentials and relevance to the study's focus on oral health education and digital media. The health specialists contributed their expertise in public health, oral medicine, and clinical dentistry to ensure the content was medically accurate and aligned with current practices. Meanwhile, the media expert provided insights into the audiovisual design, ensuring the materials were engaging, visually appealing, and suitable for digital platforms. This multidisciplinary approach enhanced the overall quality of the educational materials, making them both scientifically robust and user-friendly for the intended audience.

### ***Face Validity Index (FVI)***

Next, FVI commenced with the development of the response process validation form. Ten target respondents representing the future potential subjects (public population) were included for the face-

to-face FVI process. The users were asked to rate the comprehensibility and clarity of the translated items in the questionnaire on a scale of 1 (item not clear and not intelligible) to 4 (item extremely clear and understood). Once the data was transferred into Microsoft Excel® 365®, it was reclassified as 1 (clear and understood) for scores 3 and 4, and as 0 (not clear and understandable) for scores 1 and 2 [14]. The scale average was used to calculate the face validity index [14].

The Item-Level Face Validity Index (I-FVI) was calculated as the proportion of respondents who rated each item as either 3 (clear) or 4 (very clear) on a 4-point clarity scale, reflecting the perceived clarity and understandability of each item by the target population. At the scale level, two methods were used to compute the Scale-Level Face Validity Index (S-FVI). The average method (S-FVI/Ave) involved calculating the mean of all I-FVI scores across the items, representing the overall face validity of the instrument [14]. In contrast, the universal agreement method (S-FVI/UA) was determined by calculating the proportion of items that received an I-FVI score of 1.00, indicating complete agreement among respondents regarding item clarity. These indices provide a quantitative evaluation of how well the instrument's items are understood by its intended users.

### ***Exploratory Factor Analysis (EFA)***

Subsequently, this study employed EFA to scrutinize the underlying structure of the questionnaire and validate its domain. Census sampling was done to gather data from 345 participants from undergraduates' dental students of Faculty of Dentistry, UiTM from Year 1 until Year 5. The sample size was chosen to ensure adequate statistical power for factor analysis and represent a unique subset of the public population, as they are both potential users of health education videos and individuals with relevant knowledge and exposure to health-related content.

The data analysis was conducted using IBM SPSS Statistics (version 29.0). Factor extraction was performed using Principal Component Analysis (PCA). The number of factors retained was

determined based on the eigenvalue criterion ( $\geq 1$ ) and analysis of the scree plot. Factors with eigenvalues greater than one were retained for further examination, as suggested by Shrestha (2021) [15].

Factor loadings were analysed to identify significant relationships between the variables and the factors. Loadings greater than 0.6 were considered indicative of strong associations, reflecting meaningful connections between the observed variables and their underlying constructs [16].

The reliability of identified factors was assessed using Cronbach's alpha coefficient, which measures internal consistency. Factors exhibiting satisfactory reliability ( $\alpha > 0.7$ ) were considered robust indicators of the underlying constructs [16, 17].

## **Phase II: Pilot Study**

The pilot study was to elicit and assess participant responses. This phase aimed to gather comprehensive feedback from the targeted population and measure the time taken for participants to complete the questionnaires. A pilot study involving 36 participants involving public who attended the primary care clinic in Faculty of Dentistry, UiTM was conducted. These individuals were selected as they represented a segment of the public population likely to utilize health education videos. The diverse pilot study sample ensured that the results were not only representative of young adults, but also applicable to a broader demographic. This diversity enhanced the external validity of the findings, making it possible to generalize the insights to a wider public audience that might utilize digital health education materials.

The pilot utilised hardcopy questionnaire to assess the clarity, perception, and comprehension of the questionnaire among respondents. Additionally, the pilot study aimed to gauge the time required to complete the questionnaire. Each participant spent approximately 10 to 15 minutes completing the questionnaire, which encompassed responding to the questionnaire and viewing one of the health education videos.

## **Ethical Approval**

The study was obtained from UiTM Research Ethics Committee REC/04/2022 (PG/MR/80), for research involving human subjects.

## **RESULTS**

### **Phase I: Adaptation, Translation and Validation of Modified Extended TAM**

The research team revised the domains, reducing them to seven by dropping one and updating the wording of some to align with relevant structure for assessing user acceptance of health education videos. Out of 26 items, three were removed. Irrelevant items in the original questionnaire were identified through a thorough content review by a panel of experts. These items were assessed for their contextual and cultural appropriateness, as well as their relevance to the study's objectives. Items deemed unsuitable, such as those not aligning with the cultural context or the focus on health education videos, were replaced or rephrased. The revised items were further refined during the translation process and validated through expert reviews and pilot testing to ensure clarity, relevance, and conceptual alignment with the original questionnaire.

Additionally, a detailed explanation of the construct was included to enhance the target audience's understanding of its scope. For this research, this version of the questionnaire will be known as modified extended TAM.

### ***Forward-Backward Translation***

Discrepancies identified between the original and backward-translated versions underwent iterative revisions and consultations with translators and subject matter experts to maintain consistency and accuracy.

Subsequently, the finalized translated questionnaire in *Bahasa Melayu* underwent pilot testing with a representative sample of target respondents to assess its comprehension, clarity, and cultural relevance. Feedback and comments were taken to solicit feedback on item wording, format, and interpretation, facilitating further refinement and enhancement. An example of the combined forward translations after the reconciliation process is shown in Figure 3.

**Bahagian B- Penerimaan pengguna terhadap OHP Digital**  
**Penerimaan Pengguna terhadap Promosi Kesihatan Mulut secara Digital**

Sila tandakan ( / ) dalam salah satu kotak bagi setiap item di bawah. /berikut

Keupayaan	Item	Sangat Tidak Setuju	Tidak Setuju	Neutral	Setuju	Sangat Setuju
Interaksi Sosial (Untuk menggalakkan interaksi sosial – dari segi mendapatkan bantuan)	Video ini menggalakkan peluang untuk mendapatkan interaksi yang membina dengan orang lain.  Video ini memberikan peluang untuk mendapatkan interaksi yang menarik dan menggalakkan dengan orang lain.					
(Untuk mempromosikan interaksi sosial – dari segi mendapatkan bantuan)	Secara umumnya, pada pendapat saya, video ini sangat membantu interaksi sosial.  Pada amnya, saya fikir video ini amat membantu dalam interaksi sosial.					
	Secara keseluruhannya, Saya berpuas hati dengan pendekatan budaya/gaya hidup yang ditayangkan di dalam video ini.  Pada keseluruhannya, saya berpuas hati dengan paparan pendekatan budaya/gaya hidup di dalam video ini.					

**Figure 3** Example of the combination of forward translations after reconciliation.

### ***Content Validity Index (CVI)***

Content validity was strong, as reflected in the CVI results presented in Table 1. The Individual Item-CVI (I-CVI) was 0.98, indicating excellent expert agreement on the relevance and clarity of each item. The Scale-Level CVI using the average method (S-CVI/Ave) also reached 0.98, demonstrating consistently high validity across all items. Using the universal agreement method (S-CVI/UA), a value of 0.87 was obtained, signifying substantial overall consensus among experts, albeit slightly lower than the average method.

### ***Face Validity Index (FVI)***

Face validity was similarly strong, with an Individual Face Validity Index (I-FVI) of 0.98, demonstrating exceptional agreement among experts regarding the relevance and clarity of individual items. The Scale-Level Face Validity Index using the average method (S-FVI/Ave) was 0.98, indicating robust overall validity across all items, while the universal agreement method (S-FVI/UA) yielded a score of 0.87, reflecting slightly lower but still high consensus among raters (Table 2).

### ***Exploratory Factor Analysis (EFA)***

Descriptive statistics revealed high mean scores in constructs that promoted social interaction, informativeness, appropriateness, usefulness, ease of use, and help-seeking intentions. Conversely, intrusiveness received low mean scores, indicating positive reception and effectiveness of the educational videos (Table 3).

**Table 1:** The clarity and comprehension ratings on the item scale by seven expert panels

Domain 1												
Item	1	2	3	4	5	6	7		Raters in Agreement	I-CVI	UA	
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
Domain 2												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	0	1	1	1	0	1		5	0.7	0	
4	1	1	0	1	1	1	1		6	0.9	0	
Domain 3												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
Domain 4												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
Domain 5												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
Domain 6												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
4	1	1	1	1	1	1	0		6	0.9	0	
Domain 7												
1	1	1	1	1	1	1	1		7	1	1	
2	1	1	1	1	1	1	1		7	1	1	
3	1	1	1	1	1	1	1		7	1	1	
									S-CVI/Ave	0.98		
<b>Proportion Clarity &amp; Comprehension</b>	1	0.96	0.96	1	1	0.96	0.96		S-CVI/UA		0.87	
	Average proportion of items judged clarity & comprehension across the 7-expert panel (raters)							0.98				

**Table 2:** The clarity and comprehension ratings on the item scale by 10 raters

Domain 1														
Item	1	2	3	4	5	6	7	8	9	10		Raters in Agreement	I-FVI	UA
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
Domain 2														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	0	0	1	1	1	1	1	1	1		8	0.8	0
4	1	1	1	1	1	0	1	1	0	1		8	0.8	0
Domain 3														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
Domain 4														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
Domain 5														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
Domain 6														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
4	0	1	1	1	1	1	1	1	1	1		9	0.9	0
Domain 7														
1	1	1	1	1	1	1	1	1	1	1		10	1	1
2	1	1	1	1	1	1	1	1	1	1		10	1	1
3	1	1	1	1	1	1	1	1	1	1		10	1	1
												S-FVI/Ave	0.98	
<b>Proportion Clarity &amp; Comprehension</b>	0.96	0.96	0.96	1	1	0.96	1	1	0.96	1		S-FVI/UA		0.87
	Average proportion of items judged clarity & comprehension across the 10 raters										0.98			

**Table 3:** Descriptive statistic of All Constructs' Items (n = 345)

Construct	Construct Items	Mean (SD) of each item score	Std. Deviation <sup>a</sup>	Analysis N <sup>a</sup>
Social Interaction	Q1	4.27	0.656	345
(To promote social interaction- in terms of getting help)	Q2	4.30	0.691	345
	Q3	4.32	0.662	345
	Q4	1.70	0.748	345
Intrusiveness	Q5	1.40	0.503	345
	Q6	1.39	0.516	345
	Q7	1.35	0.478	345
	Q8	4.57	0.572	345
Informativeness	Q9	4.56	0.588	345
	Q10	4.45	0.659	345
(2) scientifically correct information				
(3) evidence-based practices				
Video attitude (Appropriateness)	Q11	4.13	0.738	345
	Q12	4.22	0.709	345
	Q13	4.18	0.718	345
Perceived Usefulness	Q14	4.46	0.604	345
	Q15	4.51	0.523	345
	Q16	4.37	0.651	345
Perceived Ease of Use	Q17	4.51	0.620	345
	Q18	4.57	0.577	345
	Q19	4.63	0.514	345
	Q20	4.41	0.701	345
Help seeking intention	Q21	4.45	0.559	345
	Q22	4.44	0.608	345
	Q23	4.41	0.672	345

Next, the Kaiser-Meyer-Olkin (KMO) values for all constructs ranged from 0.676 to 0.798, surpassing the acceptable threshold of 0.6 [18]. The KMO values for specific constructs were as follows: Social Interaction (0.731), Intrusiveness (0.792), and Informativeness (0.714), all indicating good sampling adequacy. These findings confirmed the sample's suitability for factor analysis and ensured reliable

results in assessing the instrument's constructs. Bartlett's Test of Sphericity was significant for all constructs, validating the interrelatedness of variables and justifying factor analysis (Table 4).

**Table 4:** KMO and Bartlett's Test for All Constructs

Construct	KMO and Bartlett's Test			
Social Interaction (To promote social interaction- in terms of getting help)	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.731
	Bartlett's Test of Sphericity	Approx. Chi-Square		506.030
		df		3
		Sig.		0.000
Intrusiveness	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.792
	Bartlett's Test of Sphericity	Approx. Chi-Square		1223.794
		df		6
		Sig.		0.000
Informativeness (1) accuracy-credibility of content, and/or (2) scientifically correct information (3) evidence-based practices	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.714
	Bartlett's Test of Sphericity	Approx. Chi-Square		504.521
		df		3
		Sig.		0.000
Video attitude (Appropriateness)	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.676
	Bartlett's Test of Sphericity	Approx. Chi-Square		513.065
		df		3
		Sig.		0.000
Perceived Usefulness	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.698
	Bartlett's Test of Sphericity	Approx. Chi-Square		459.329
		df		3
		Sig.		0.000
Perceived Ease of Use	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.798
	Bartlett's Test of Sphericity	Approx. Chi-Square		696.799
		df		6
		Sig.		0.000
Help seeking intention	Kaiser-Meyer-Olkin Adequacy.	Measure of Sampling		0.708
	Bartlett's Test of Sphericity	Approx. Chi-Square		455.843

Construct	KMO and Bartlett's Test	
	Sphericity	df
	Sig.	0.000

In this study, EFA was conducted separately for each domain rather than across the whole questionnaire because each TAM construct (such as perceived usefulness, perceived ease of use, and attitude toward use) represented a distinct conceptual area. Analysing them separately allowed us to more precisely explore the internal structure of each domain without the risk of cross-construct contamination, ensuring clearer interpretation of factor loadings within each theoretical framework.

Although the theoretical domains of the TAM were established, EFA was performed to examine whether the items were grouped into factors as expected within our specific study population and context.

Consequently, the factor loadings and reliability scores as shown in Table 5 illustrated that all items exhibited strong factor loadings, exceeding the critical threshold of 0.6, which affirmed their substantial contributions to their respective constructs. Additionally, Cronbach's alpha coefficients for all constructs exceeded 0.7, confirming high internal consistency and reliability of the instrument. These findings validated the robustness of the scale in capturing user perceptions effectively.

**Table 5:** Extracted Factors, Factor Loadings, and Reliability

Construct	Item	Factor Loading	Cronbach's Alpha
Social Interaction (To promote social interaction- in terms of getting help)	Q1	0.893	0.867
	Q2	0.906	
	Q3	0.868	
Intrusiveness	Q4	0.696	0.872
	Q5	0.944	
	Q6	0.926	
	Q7	0.945	
Informativeness (1) accuracy-credibility of content, and/or (2) scientifically correct information (3) evidence-based practices	Q8	0.886	0.859
	Q9	0.916	
	Q10	0.855	

Construct	Item	Factor Loading	Cronbach's Alpha
Video attitude (Appropriateness)	Q11	0.902	0.848
	Q12	0.922	
	Q13	0.802	
Perceived Usefulness	Q14	0.877	0.838
	Q15	0.912	
	Q16	0.833	
Perceived Ease of Use	Q17	0.847	0.855
	Q18	0.900	
	Q19	0.870	
	Q20	0.757	
Help seeking intention	Q21	0.896	0.840
	Q22	0.898	
	Q23	0.829	

## Phase II: Pilot Study

### *Reliability Analysis*

Cronbach's statistical analysis was utilised in assessing test reliability [19]. The reliability analysis was performed to gauge the internal consistency of the survey instrument utilised for assessing participants' acceptance of digital oral health promotion. Cronbach's alpha coefficient was computed to evaluate the scale's reliability, indicating how effectively the items within the scale consistently measured the same underlying domain.

The study found that all measured constructs demonstrated strong internal consistency, with Cronbach's alpha values exceeding the acceptable threshold of 0.7. Intrusiveness and Informativeness showed the highest reliability (0.94 and 0.95, respectively), indicating well-defined and cohesive measures. Help Seeking Intention also exhibited strong reliability (0.86), while Social Interaction, Video Attitude (Appropriateness), Perceived Usefulness, and Perceived Ease of Use showed

acceptable reliability, with alpha values ranging from 0.79 to 0.88. These results affirmed the questionnaire's effectiveness in capturing user perceptions and behavioural intentions. The findings of the reliability analysis revealed the value between acceptable and good internal consistency across all domains, with each domain surpassing Cronbach's alpha value of 0.70 as noted in Table 6. This suggests that the survey instrument provided dependable and consistent measurements of participants' acceptance levels.

Other than that, participants in the pilot study provided useful feedback on the video content. For Video 1, one participant mentioned that the audio was slightly too soft, which could affect understanding, while another said everything was good and that they learned something new. Feedback on Video 2 showed that the content was simple and easy to understand. For Video 3, participants appreciated the visuals, saying they matched the content well and made it more appealing. However, one participant suggested adding real-life examples or using a real actor to make the video more relatable. Overall, the feedback highlighted both the strengths of the videos and areas that could be improved, especially in terms of clarity and engagement. Revisions were made to the videos where appropriate, based on the feedback received.

**Table 6:** Value of Cronbach's Alpha for Pilot Study

<b>Construct</b>	<b>Cronbach's Alpha</b>	<b>Cronbach's Based on Standardized Items</b>	<b>Alpha on</b>	<b>N of Items</b>
Social Interaction				
(To promote social interaction- in terms of getting help)	0.84	0.84		3
Intrusiveness	0.94	0.94		4

## Informativeness

(1) accuracy-credibility of content, and/or	0.95	0.95	3
(2) scientifically correct information			
(3) evidence-based practices			
Video attitude (Appropriateness)	0.88	0.88	3
Perceived Usefulness	0.79	0.81	3
Perceived Ease of Use	0.82	0.84	4
Help seeking intention	0.86	0.86	3

---

**DISCUSSION**

A questionnaire can either be newly developed or adapted from existing tools. In this study, we adapted the relevant questionnaire based on the extended TAM to assess the user acceptance of health education video [10]. These constructs are particularly relevant when evaluating the acceptance of digital tools in health education, as they provide insights into the likelihood of adoption and sustained use by the target audience.

Adapting a valid and culturally appropriate questionnaire is essential for its applicability across diverse populations, including those from different cultural and linguistic backgrounds [20]. Cross-cultural translation and validation go beyond direct translation; it ensures that the instrument remains valid and relevant for use across various populations, cultures, and languages [21].

In adapting the questionnaire, care was taken to ensure its validity and reliability, accurately reflecting the constructs it measures. This process involved expert reviews and a pilot study to assess the appropriateness of the questions for the context of oral health education videos. Feedback from these stages led to refinements, including adjustments for clarity, relevance, and cultural sensitivity. This focus on ensuring validity and reliability aligns with the growing need for tools to assess user engagement and acceptance as digital health interventions become more prevalent in healthcare settings.

Given the increasing integration of technology in healthcare, robust instruments are essential for identifying barriers to adoption and improving digital health interventions. Thus, this study contributes to the growing body of knowledge necessary to optimize the use of technology in health education and enhance health outcomes. The adaptation and validation of the Modified Extended TAM questionnaire for OHP have demonstrated its robust psychometric properties, making it a reliable instrument for assessing user acceptance of health education videos. This enhanced model integrates additional dimensions such as social interaction, intrusiveness, informativeness, video attitude, and help-seeking intention, broadening the framework to capture complex user dynamics and behavioural change. The inclusion of help-seeking intention further highlights the model's capacity to evaluate the likelihood of actionable health behaviours resulting from the video engagement.

Globally, research highlights the effectiveness of digital health tools in promoting health education and behaviour change. Research by Zhang et al. (2019) and Perski et al. (2021) further supported these enhancements. For example, research by Zhang et al. (2019) emphasized the relevance of social interaction and informativeness in influencing user engagement with health communication tools, supporting their inclusion in this framework [22]. Similarly, Perski et al. (2021) highlighted the role of behavioural intention, such as help-seeking, in predicting engagement with digital health interventions, reinforcing the importance of this construct in assessing health education videos [23]. These findings aligned with Davis et al.'s (1989) foundational TAM constructs of perceived usefulness and perceived ease of use, as further adapted by Venkatesh and Bala (2008) for broader

technology contexts [24, 25]. Additionally, constructs such as perceived usefulness, perceived ease of use, and social interaction are consistently recognized as significant factors influencing user engagement [23]. The role of informativeness and behavioural intention has also been underscored as critical to the success of health communication tools. Our findings align with these global trends, supporting the integration of these constructs into the modified extended TAM framework for assessing health education video.

Locally, however, research on the acceptance of digital health interventions in Malaysia, particularly in the context of oral health education, is more limited. This study contributes to filling this gap by adapting the extended TAM model to the local context and ensuring the cultural relevance of the constructs. The addition of help-seeking intention is particularly notable as it captures users' readiness to seek further healthcare information or services, which has been shown to be a significant predictor of health behaviours in various digital health interventions [26]. This local adaptation expands the applicability of the TAM framework to the Malaysian population, addressing cultural nuances and promoting greater user engagement with health education videos.

The results of this study also contrast with some findings in the literature, particularly in terms of the inclusion of more localized and context-specific constructs. For example, while global studies have often focused on core TAM constructs, our study's inclusion of social interaction, intrusiveness, and video attitude provides a more holistic view of the factors influencing user acceptance of health education videos. These additional dimensions offer deeper insights into the complexities of user engagement with digital health tools, which is an essential consideration for future interventions in Malaysia and similar settings. Thus, our findings contribute both to the growing body of literature on digital health education tools and to the broader understanding of user engagement in diverse cultural contexts. Furthermore, the systematic development and validation process employed in this study confirm the questionnaire's effectiveness as a robust tool for assessing user acceptance of health education videos, grounded in the extended TAM. The validation process, which included high CVI and FVI scores, supports the instrument's relevance, clarity, and appropriateness.

Moreover, to ensure that the instrument measured what it intended to, EFA was conducted separately for each domain of the TAM. This analysis utilized an orthogonal rotation method, specifically Varimax rotation, which assumes that the factors are uncorrelated, thereby simplifying the interpretation of the factor structure [27]. This methodological choice aligns with previous research where Varimax rotation has been successfully applied to preserve conceptual clarity among distinct constructs. Varimax is commonly used in EFA when the theoretical framework assumes that factors are independent or uncorrelated as it simplifies the interpretation of factor loadings [28]. Nonetheless, it is important to acknowledge that the assumption of uncorrelated factors may not always hold in real-world data. Some researchers advocate for oblique rotation methods, such as Promax, which allow for correlations among factors and may provide a more accurate representation of the underlying data structure, particularly when constructs are theoretically related [29]. Thus, the choice between orthogonal and oblique rotation should be guided by both theoretical underpinnings and empirical evidence.

Regarding the instrument's validation, PCA revealed strong factor loadings ( $>0.6$ ) across constructs, affirming the meaningfulness of the identified dimensions. Furthermore, KMO values and Bartlett's Test of Sphericity confirmed the sample adequacy and inter-item correlations necessary for factor analysis. Regarding reliability, it is essential to ensure the accuracy of the translated version of the instrument, including semantic equivalence, technical precision, and textual completeness. The translated version was found to be clear and grammatically appropriate, adhering to the linguistic norms of the target language [30]. Reliability analysis demonstrated high internal consistency, with Cronbach's alpha values exceeding the acceptable threshold of 0.7 across all constructs. This reflects the instrument's robustness in capturing key dimensions, such as social interaction, intrusiveness, informativeness, video attitude, perceived usefulness, perceived ease of use, and help-seeking intention.

Overall, the validated, Malay version of this extended TAM questionnaire has demonstrated strong validity and reliability, providing valuable insights into user acceptance and behaviours in digital oral

health promotion. These positive results indicate its effectiveness in capturing key dimensions relevant to digital health education. While further research across diverse demographic groups would help enhance its generalizability, the tool has shown significant promise for advancing digital health education. In conclusion, the instrument offers a robust foundation for understanding user acceptance and behaviour, making it a valuable resource for future applications in the field.

## CONCLUSION

To the best of our knowledge, this is the first instrument translated and validated in Malay for assessing user acceptance of health education videos, marking a significant advancement in the development of culturally and linguistically appropriate tools for evaluating digital health interventions. The findings underscore the instrument's potential as a reliable tool for evaluating user perceptions and behaviours in digital health promotion. By incorporating key constructs such as social interaction, perceived usefulness, perceived ease of use and help-seeking intention, this instrument provides valuable insights into the factors influencing user acceptance of health education videos. As digital technology continues to play a central role in healthcare and education, the availability of a validated and reliable instrument is crucial for understanding user engagement and acceptance, ultimately enhancing the effectiveness of digital health education interventions.

## ACKNOWLEDGMENTS

We would like to express our sincere gratitude to the participants for their involvement in this study. We also appreciate the expert panels who helped validate the video content and ensured its quality.

Finally, thank you to everyone who contributed to the success of this study.

## References

1. Das, D., A. Jnaneswar, and V. Suresan, *Social marketing and Dentistry*. 2017: LAP LAMBERT Academic Publishing.

2. Swindle, T.M., et al., *Technology Use and Interest Among Low-Income Parents of Young Children: Differences by Age Group and Ethnicity*. J Nutr Educ Behav., 2014. **46**.
3. Müller, J. *Smartphone users in Malaysia 2010-2025*. 2021; Available from: <https://www.statista.com/statistics/494587/smartphone-users-in-malaysia/>.
4. Umar, S.M.R.Y.S., M.N.M. Arshad, and M.I. Ariffin, *COVID-19 PANDEMIC AND ADDRESSING DIGITAL DIVIDE IN MALAYSIA*. Journal of Information Systems and Digital Technologies, 2021. **3**.
5. Budd, J., et al., *Digital technologies in the public-health response to COVID-19*. Nature Medicine, 2020. **26**.
6. Zhao, J. and JianfeiWang, *Health Advertising on Short-Video Social Media: A Study on User Attitudes Based on the Extended Technology Acceptance Model*. International Journal of Environmental Research and Public Health, 2020. **17**.
7. Williams, M.D., N.P. Rana, and Y.K. Dwivedi, *The unified theory of acceptance and use of technology (UTAUT): a literature review*. Journal of Enterprise Information Management, 2015. **28**(3).
8. Deng, Z., et al., *What Predicts Patients' Adoption Intention Toward mHealth Services in China: Empirical Study*. JMIR Mhealth Uhealth, 2018. **6**(8): p. e172.
9. Tomczyk, S., et al., *Utilizing Health Behavior Change and Technology Acceptance Models to Predict the Adoption of COVID-19 Contact Tracing Apps: Cross-sectional Survey Study*. J Med Internet Res, 2021. **23**(5): p. e25447.
10. Zhao, J. and J. Wang, *Health advertising on short-video social media: A study on user attitudes based on the extended technology acceptance model*. International journal of environmental research and public health, 2020. **17**(5): p. 1501.
11. Yusoff, M.S.B., *ABC of Content Validation and Content Validity Index Calculation*. Education in Medicine Journal, 2019.
12. Yaghmaie, F., *Content validity and its estimation*. J Mec Educ, 2003(3): p. 25-27.
13. Polit, D.F. and C.T. Beck, *The content validity index: are you sure you know what's being reported? Critique and recommendations*. Res Nurs Health, 2006. **29**(5): p. 489-97.
14. Yusoff, M.S.B., *ABC of response process validation and face validity index calculation*. Educ Med J, 2019. **11**(10.21315).
15. Shrestha, N., *Factor analysis as a tool for survey analysis*. American Journal of Applied Mathematics and Statistics, 2021. **9**(1): p. 4-11.
16. Awang, Z., *Research methodology and data analysis second edition*. 2012: UiTM Press.
17. Awang, Z.H., *Research methodology for business & social science*. 2010: Pusat Penerbitan Universiti, Universiti Teknologi MARA.

18. Chan, L.L. and N. Idris, *Validity and reliability of the instrument using exploratory factor analysis and Cronbach's alpha*. International Journal of Academic Research in Business and Social Sciences, 2017. **7**(10): p. 400-410.
19. Jain, S. and V. Angural, *Use of Cronbach's alpha in dental research*. Medico Research Chronicles, 2017. **4**(03): p. 285-291.
20. Lee, Y.Y., et al., *Validity and reliability of the Malay-language translation of the Rome III Diagnostic Questionnaire for irritable bowel syndrome*. Journal of gastroenterology and hepatology, 2012. **27**(4): p. 746-750.
21. Mohamad Marzuki, M.F., N.A. Yaacob, and N.M. Yaacob, *Translation, Cross-Cultural Adaptation, and Validation of the Malay Version of the System Usability Scale Questionnaire for the Assessment of Mobile Apps*. JMIR Hum Factors, 2018. **5**(2): p. e10308.
22. Zhang, Y., et al., *Factors Influencing User Engagement of Health Information Disseminated by Chinese Provincial Centers for Disease Control and Prevention on WeChat: Observational Study*. JMIR Mhealth Uhealth, 2019. **7**(6): p. e12245.
23. Perski, O. and C.E. Short, *Acceptability of digital health interventions: embracing the complexity*. Translational behavioral medicine, 2021. **11**(7): p. 1473-1480.
24. Venkatesh, V. and H. Bala, *Technology acceptance model 3 and a research agenda on interventions*. Decision sciences, 2008. **39**(2): p. 273-315.
25. Davis, F.D., *Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology*. 1989. **13**: p. 319-340.
26. Eaton, C., et al., *User Engagement With mHealth Interventions to Promote Treatment Adherence and Self-Management in People With Chronic Health Conditions: Systematic Review*. J Med Internet Res, 2024. **26**: p. e50508.
27. Hair, J.F., et al., *Multivariate data analysis: A global perspective (Vol. 7)*. 2010, Upper Saddle River, NJ: Pearson.
28. Howard, M.C., *A Review of Exploratory Factor Analysis Decisions and Overview of Current Practices: What We Are Doing and How Can We Improve?* International Journal of Human-Computer Interaction, 2016. **32**(1): p. 51-62.
29. Beauducél, A. and N. Hilger, *Robust oblique Target-rotation for small samples*. Frontiers in Psychology, 2023. **14**: p. 1285212.
30. Lau, A.S.-Y., et al., *Development, translation and validation of questionnaires for diarrhea and respiratory-related illnesses during probiotic administration in children*. Education in Medicine Journal, 2017. **9**(4).