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Developing Questionnaires for the Technology Acceptance Model (TAM): A Study on the Teachers' Acceptance of Using Online Education

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ABSTRACT

Since the Movement Control Order (MCO) in 2020, Malaysia's Ministry of Education (MOE) has recommended online learning sessions. Traditional teaching methods need to be replaced with more modern approaches. This change allows students to participate in distance learning, making online learning more widely accepted in education. However, the challenges of online communication have intensified due to the pandemic. Some teachers may find the complexity of online platforms an obstacle and may use this as an excuse to avoid using technology. Another issue is the lack of computer proficiency, which can create a fear of technology. Additionally, the convenience of learning from any location at any time should be considered. Previous studies have shown that user motivation plays a crucial role in accepting technology. This study aims to develop an instrument that measures teachers' acceptance of online learning based on the Technology Acceptance Model (TAM). The article will focus on developing a questionnaire to assess the following variables: teacher's Perceived Usefulness, Perceived Convenience, Perceived Ease of Use, Attitude, Intention to Use, and Usage Behaviour in accepting technology. The study used a quantitative approach. The pilot test was conducted on the instrument for 40 secondary school teachers in Perak. The data were analysed both descriptively and inferentially. The reliability and validity results were significant and are expected to aid future researchers in developing better assessment tools.

Keywords: *Instrument development, questionnaire, Technology Acceptance Model, teachers' acceptance, online education.*

INTRODUCTION

Education is essential in providing our generations with the knowledge to thrive in the future. Malaysia has a blueprint for planning the rapid growth of the education sector through the timeline from 2013 to 2025 (Bakar, 2023). The blueprint is a guide to fulfilling the intellectual needs of the country. Other than that, many studies have been done to better understand the weaknesses or other inadequacies that can be overcome (Ag-Ahmad et al., 2023; Bakar, 2023; Ghani et al., 2019; Shan et al., 2018). Every study should be backed up or proven with trusted and reliable data (Duggineni, 2023). To achieve that, researchers have to develop a decent tool for gathering data. Both the qualitative and quantitative study have their way of

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collecting data. In this paper, we will develop a questionnaire using quantitative research based on the Technology Acceptance Model (TAM).

LITERATURE REVIEW

TAM is a popular model that has been used to study the use of technology (Rashid et al., 2021). The original model, first introduced by Fred Davis, was crafted from the Theory of Reasoned Action by Fishbein & Ajzen in 1975 (Lai, 2017). Figure 1 shows the original model used by Davis in 1989. This model was later expanded and enhanced, resulting in the appearance of TAM 2 and TAM 3 (Ambiya et al., 2022).

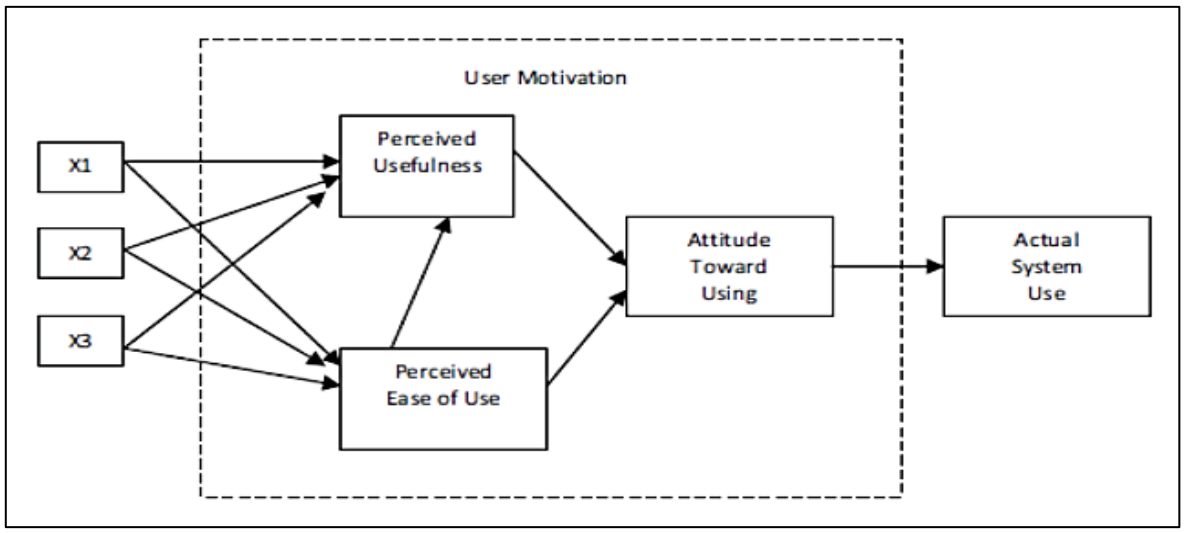

Figure 1: Original Technology Acceptance Model (TAM)

Apart from that, this study will use the original version of TAM by adding a couple more variables, as shown in Figure 2. Variable Perceived Convenience and Intention to Use are added to better understand the use of technology from the respondent's perspective. The addition of Perceived Convenience and Intention to Use to the original Technology Acceptance Model (TAM) provides a more comprehensive understanding of the factors that influence user behaviour, particularly in the context of ease and practicality. These variables allow for a deeper analysis of how user perceptions of convenience and their intention to adopt technology can drive overall acceptance and utilization, aligning better with current digital trends.

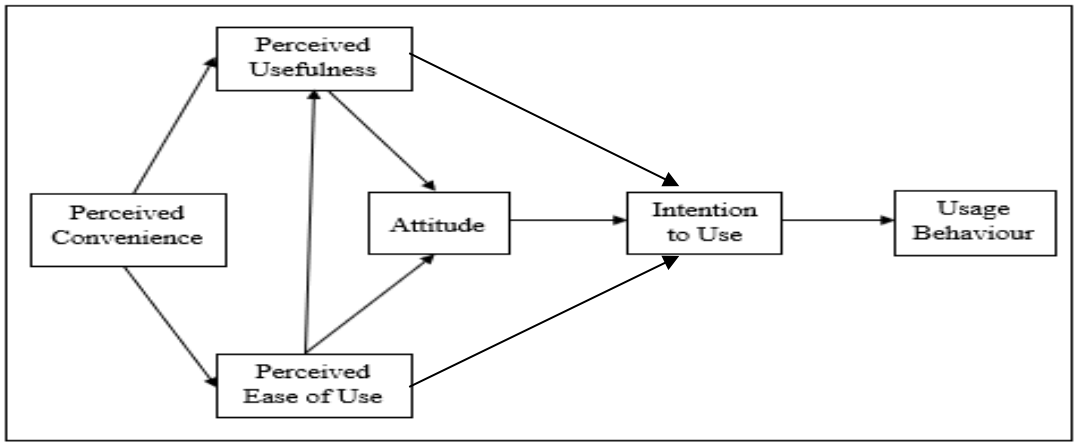

Figure 2: Theoretical framework

The original variables in the model are Perceived Usefulness, Attitude, Perceived Ease of Use, and Usage Behaviour. This research included two more variables: Perceived Convenience and Intention to Use. There are many aspects to see in each of the variables, but researchers have made certain boundaries to be more focused. Perceived Convenience will look at the time, place, and execution. Perceived Usefulness will gather data on the respondents' feelings towards the benefit of technology use, then the attitude toward using the technology, the level of difficulty the respondents have to go through, their intention to continue using the technology, and finally, the usage behaviour where they declare to continue using it or not. The table below shows the operational definition of the variables.

Table 1: Operationalisation of the variables

Variables	**Operational Definition**
Perceived Convenience (PC)	Convenience level of time, place, and execution
Perceived Usefulness (PU)	Respondent's feelings towards the benefit of online learning to the students and work performance
Attitude (Att)	Attitude of the teachers in using technology to carry out online teaching
Perceived Ease of Use (PEOU)	Level of difficulties that were faced by the respondent when conducting an online class
Intention to use (IU)	The willingness of the teacher to continue using online teaching
Usage Behaviour (UB)	The continuous commitment of the teacher in adopting online teaching

The Questionnaire

There are many types of questionnaires built according to the study being done (Al-Adwan et al., 2023; Al-rahmi et al., 2021). Researchers must first determine what topic to study, what model to use, and finally, the types of instruments needed. Researchers could conduct a systematic review to find related questionnaires that can be used (Nja et al., 2023; Barrot et al., 2021). It is said that research tools are the greatest method for collecting data but developing valid and reliable tools is painstakingly tough. Most papers do not include the instruments used (Younas & Porr, 2018). The items included in the questionnaire vary depending on the hypotheses listed (Ballouk et al., 2022).

There are various ways of delegating questionnaires. It can be conducted using an online platform, through phone calls, hard copies such as papers, or even a face-to-face interview (Mo et al., 2021). In addition, the items included in a questionnaire should reflect the hypotheses being tested. For instance, Ballouk et al. (2022) note that the design of

questionnaire items is directly influenced by the specific research questions posed. However, any kind of survey selected should answer the researchers' hypotheses.

The development of reliable measurement tools is often labour-intensive and complex. Younas & Porr (2018) highlight that many research articles do not provide adequate details about the instruments used, which can hinder replicability and validation efforts. Furthermore, different studies may employ varied definitions and constructs when assessing online learning acceptance, leading to inconsistencies in findings.

The Technology Acceptance Model (TAM) is frequently employed to investigate teachers' acceptance of e-learning platforms. For example, a study involving Malaysian ESL teachers utilized TAM to explore relationships between perceived ease of use, perceived usefulness, and actual use of e-learning for professional development (Al-Adwan et al., 2023; Barrot et al., 2021). Similarly, Saleh et al. (2022) applied TAM to analyze university staff's acceptance of e-learning. It revealed that perceived usefulness and ease of use significantly influenced staff attitudes toward online teaching. The research stresses that developing valid measurement tools is essential for capturing these constructs effectively and for informing future e-learning implementations.

Characteristics of Good Questionnaire Items

Developing effective questionnaire items is essential for accurately measuring the constructs within the Technology Acceptance Model (TAM), particularly in the context of teachers' acceptance of online education. This literature review focuses on the characteristics of well-designed questionnaire items, emphasising clarity, relevance, specificity, and methodological considerations.

Clarity and Understandability

The clarity of questionnaire items is paramount. Items should be articulated in straightforward language to ensure that all respondents, regardless of their background, can comprehend them without confusion. Ambiguity can lead to varied interpretations, which compromises the reliability of the data collected (Joshi et al., 2021). For instance, a poorly worded item like "Do you find online teaching to be beneficial in some way?" is vague and open to interpretation. A clearer statement would be "I find online teaching to be beneficial for my students' learning." This revised item enables respondents to provide accurate reflections of their perceptions regarding constructs like Perceived Usefulness and Perceived Convenience.

Relevance to Constructs

Each item in the questionnaire must directly relate to the specific variables being measured within TAM: Perceived Usefulness, Perceived Ease of Use, Attitude towards using technology, Intention to Use, and Usage Behaviour. Items should be developed based on a thorough understanding of these constructs as defined in previous literature. For example, a statement like "Using online platforms enhances my teaching effectiveness" directly assesses Perceived Usefulness and aligns with established research findings (Maatuk et al., 2022). In contrast, an irrelevant item such as "Online teaching is a waste of time" does not clearly measure any TAM construct. Ensuring that each item is relevant not only supports the validity of the instrument but also enhances its ability to capture meaningful data.

Specificity and Focus

Good questionnaire items should be specific and focused on one aspect at a time. This specificity helps avoid confusion and ensures that respondents understand exactly what is being asked. For example, instead of asking "How do you feel about using technology in your teaching?", a more focused item would be "I feel confident using technology for online teaching." This approach allows for clearer responses and facilitates better analysis of the data collected (South et al., 2022). Each statement should clearly reflect a single construct associated with TAM to maintain clarity in measurement. A vague item like "Technology makes teaching easier" could be interpreted as measuring either Perceived Usefulness or Perceived Ease of Use, making it difficult to attribute responses to a specific construct.

Balanced Item Construction

To mitigate response bias, it is beneficial to include both positively and negatively framed items within the questionnaire. This balance encourages respondents to engage thoughtfully with each statement rather than simply agreeing or disagreeing out of habit (Snyder, 2019). For example, including statements such as "I struggle with using online teaching tools" alongside "I find online teaching tools easy to use" provides a more comprehensive view of respondents' attitudes towards technology. Relying solely on positively worded items can lead to acquiescence bias, where respondents tend to agree with statements regardless of their content.

Pilot Testing and Validation

Conducting pilot tests is crucial for refining questionnaire items before full-scale administration. Pilot testing allows researchers to identify unclear or ineffective items and make necessary revisions based on feedback from a sample representative of the target population (Al-Adwan et al., 2023; Teresi et al., 2022). This iterative process enhances both the reliability and validity of the instrument by ensuring that it effectively measures the intended constructs. For example, an item that performs poorly in a pilot test, such as "Online teaching is a modern approach to education," could be rephrased to "Online teaching is an innovative way to deliver course content" to better align with the Perceived Usefulness construct.

Developing effective questionnaire items requires careful attention to clarity, relevance, specificity, balanced construction, and rigorous testing. By adhering to these principles and providing clear examples of both poorly and well-designed items, researchers can create robust instruments that accurately assess teachers' acceptance of online education through the lens of the Technology Acceptance Model.

METHODOLOGY

This study employed a quantitative research method, which was deliberately chosen to assess the extent of the relationships between two or more variables. This approach offers significant advantages, including the ability to achieve a larger sample size, which enhances the reliability and generalizability of the findings. A larger sample reduces the impact of outliers that could skew results, thereby leading to more accurate conclusions (Guoyan et al., 2021). While there is a possibility of result duplication in quantitative studies, this can be mitigated by concentrating on the actual findings rather than merely replicating previous results. Additionally, the anonymous nature of the research instrument encourages

respondents to provide honest feedback, as they feel more secure sharing their true opinions without fear of identification. Overall, the quantitative approach not only facilitates a more precise analysis but also fosters an environment conducive to genuine responses from participants (Noor, Manan & Kuthoos, 2019).

The questionnaire generated for this study is a mix of adopted, adapted, and developed. There are eight sections consisting of demographics, psychographics, and the six variables to be measured: Perceived Convenience, Perceived Usefulness, Attitude, Perceived Ease of Use, Intention to Use, and Usage Behaviour. The questionnaire used a 5-point Likert scale developed by Rensis Likert. This scale is commonly used to measure the respondent's opinion or attitude toward a specific subject or market research. It starts with 1 as "Strongly Disagree", and ends with the number 5, "Strongly Agree". Other than that, the questionnaire also used a 5-point Likert Scale for behaviour, starting with 1 as "Never" and ending with 5 as "Always". It is particularly useful as one of the most essential and commonly used psychometric instruments in educational and social science research (Azizah, Nur, & Putra, 2022). Likert scale measures respondents' agreement or disagreement with various statements with a 5-, 7- or 9-point agreement scale (Joshi et al., 2021).

As mentioned earlier, there are eight sections in the questionnaire. Section A is the demographic of the subjects. The section consists of nine questions: gender, age, teaching experience, level of education, subjects taught, income level, residency area, internet experience, and ownership of an electronic device. These are regularly asked in most questionnaires to categorise and generalise the subjects (Maatuk et al., 2022).

Section B asks about the psychographics of the subjects. This section consists of eight questions: secluded working space, internet speed use, knowledge in using applications, applications used to communicate with students, the challenges faced, knowledge in using computers, knowledge in using digital devices, and do they face problems conducting lessons remotely.

Section C is on the first variable, Perceived Convenience. This variable focuses on the convenience level of time, place, and execution in using technology to conduct lessons online. The section consists of ten statements using the 5-point Likert scale. Some of the items are adopted and developed to cater to the needs of this study. The two items adopted are from the study by Tahir (2023), and the remaining eight items are developed.

Section D is on the second variable, Perceived Usefulness. This section also consists of ten items developed and adapted from previous studies (Cheung et al., 2023). Perceived Usefulness will be looking at the respondents' feelings towards the benefit of online learning to their students and whether they affect their work performance. All ten items will also be rated using the 5-point Likert scale. In this section, only one item is developed, while the rest are adapted from past research by Wozney et al. (2006), and five questions are adapted from the model itself by Davis (1986).

Section E consists of ten items that will measure Attitude. It is supposed to collect data on how the respondents feel about using technology in online teaching. It includes both adopted and developed items. Seven questions are developed, and three other questions are adopted from the study of Wozny et al. (2006).

Next is section F, Perceived Ease of Use. This section also contains ten items that are adapted and developed. It is tailored to collect data on the level of difficulty faced by the teachers or respondents while conducting online teaching. However, most of the items are developed. Only three questions are adapted from the original TAM by Davis (1989).

Section G is about the Intention to Use. The ten items are going to measure the willingness of the teachers to continue using technology in teaching or go back to the regular teaching methods. These items are also a mix of adapted and developed. Additionally, Durnalı et al. (2022) argue that there is a need for a considerable amount of research papers and journals to be reviewed to develop a set of items to represent a particular variable. In this section only four questions are developed; the rest are adapted from other studies (Alami, & El Idrissi, 2022; Al-Adwan et al., 2023; Fentoullis et al., 2021). All of the data from Section C to Section G will be using a 5-point Likert scale.

Last but not least is Section H on the Usage Behaviour variable. This variable consists of 11 items that are developed. This section uses a 5-point behaviour Likert scale ranging from 1 to 5, starting with "Never", followed by "Rarely", "Sometimes", and "Often", and ending with "Always". The items are tailored to assess the commitment of respondents to continuously using and finally adopting online teaching. In other words, can they substitute the modern teaching method with the regular ones? Below is the list of variables and the number of items adopted, adapted, and developed.

Table 2: Items for questionnaire

Items measured	Items Adopted	Items Adapted	Items Developed	Original study
Perceived Convenience	2	-	8	Tahir (2023)
Perceived Usefulness	-	9	1	Wozney et al. (2006) Davis (1989)
Attitude	3	-	7	Wozney et al. (2006)
Perceived Ease of Use	-	3	7	Davis (1989)
Intention to Use	-	6	4	Almekhlafi & Almeqdadi, (2010) Klecker et al. (2005**)** Wozny et.al (2006) Shih et al. (2010)
Usage Behaviour	-	-	11	-
TOTAL	5	18	38	-

Pilot Study

A pilot test was conducted with 40 teachers from various secondary schools in Perak. This preliminary phase is a crucial aspect of any research study, as it allows researchers to tailor their instruments to meet the specific needs of the target population (Manan, et al., 2023; Teresi et al., 2022). Most importantly, a pilot test serves as a model survey for researchers, providing essential data that inform various aspects of the study, including time allocation, word choice, question flow, and the identification of any flaws that may require correction in the questionnaire. As a result of this pilot test, several modifications were made to the questionnaire, including corrections of spelling errors in certain items. Overall, conducting a pilot test enhances the reliability and validity of the research by ensuring that the instruments used are effective and appropriate for the intended audience.

Construct Validity

This study has been sent to the expert to be examined as a part of a validity check. This study has been reviewed by an expert to ensure the validity of the research design, instruments, and methodology, ensuring that the findings are reliable and accurate. The expert examination serves as a crucial step in enhancing the credibility of the study by identifying potential biases, errors, or inconsistencies, thus strengthening the overall quality of the research. Apart from that, it is being improved by pilot testing. Moreover, the instrument had undergone a reliability check. In the pilot test, the researcher used Cronbach's Alpha to determine the reliability. In simple words, Cronbach's Alpha is used to measure the internal consistency or reliability of a set of items or variables in a survey or test. It indicates how well the items in a scale are correlated and whether they collectively measure the same underlying concept or construct. A higher Cronbach's Alpha value (typically above 0.7) suggests that the items have a good level of consistency and reliability in assessing the intended concept (Dom-Nwachukwu & Onuoha, 2021). The item's validity could also be seen by analysing the data using correlation analysis in the Statistical Package for Social Sciences (SPSS). The SPSS software version 26 was used for the analysis. The Table 3 shows the reliability of the pilot test.

Table 3: Reliability analysis of the variables

Variables	Cronbach's Alpha
Perceived Convenience	0.857
Perceived Usefulness	0.878
Attitude	0.830
Perceived Ease of Use	0.850
Intention to Use	0.910
Usage Behaviour	0.845

To assess the validity of the research tools, researchers must first know the degree of freedom and the critical value. The degree of freedom could be obtained using the formula "N-2", where N is the sample size. Then, take the answer and refer to it in the Pearson Correlation and Coefficient Table at α =.05. Finally, the value obtained from the calculation must be higher than the critical value from the Pearson Correlation and Coefficient table (Manan, Sapiee, Mustafa, & Ghazali, 2023). Table 4 shows the value of the correlation of items in Perceived Convenience. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. Seven questions are highly significant, with one negative correlation (I always allocate time for my classes).

Table 4: Pearson Correlation for items perceived convenience

	Adapted / Developed		Total
It is easy for me to incorporate digital technology into my teaching.	Adapted	Pearson Correlation	.793**
		Sig. (2-tailed)	.000
		N	30
I find it easy to use online assessment applications.	Developed	Pearson Correlation	.791**
		Sig. (2-tailed)	.000
		N	30
Overall, I find online learning platform very convenient.	Developed	Pearson Correlation	.781**
		Sig. (2-tailed)	.000
		N	30

I can conduct my class without interruption. (E.g., kids, chores, etc.)	Adapted	Pearson Correlation Sig. (2-tailed) N	.649** .000 30
Using online learning platform saves me time.	Developed	Pearson Correlation Sig. (2-tailed) N	.645** .000 30
My class schedule is very convenient.	Developed	Pearson Correlation Sig. (2-tailed) N	.634** .000 30
I like to use digital pedagogy tools in my class (e.g., padlet, mentimeter)	Developed	Pearson Correlation Sig. (2-tailed) N	.621** .000 30
At home, I have an appropriate space to conduct my classes.	Developed (Item is deleted due to low loading value)	Pearson Correlation Sig. (2-tailed) N	.345 .062 30
I made the necessary preparations for my classes.	Developed (Item is deleted due to low loading value)	Pearson Correlation Sig. (2-tailed) N	.127 .504 30
I always allocate time for my classes.	Developed (Item is deleted due to low loading value)	Pearson Correlation Sig. (2-tailed) N	-.155 .412 30

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Table 5 shows the value of the correlation of items in Perceived Usefulness. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. All the items show a high significance level and validity.

Table 5: Pearson Correlation for items perceived usefulness

	Adapted / Developed		**Total**
Using online learning platform improves my job performance.	Adapted	Pearson Correlation Sig. (2-tailed) N	.780** .000 30
Using an online learning platform is effective because I believe I can implement it successfully.	Adapted	Pearson Correlation Sig. (2-tailed) N	.763** .000 30
Online learning platform promotes student collaboration.	Adapted	Pearson Correlation Sig. (2-tailed) N	.758** .000 30
Using an online learning platform enables me to accomplish tasks more quickly.	Adapted	Pearson Correlation Sig. (2-tailed) N	.731** .000 30
Overall, I find online learning platform useful in my job.	Adapted	Pearson Correlation Sig. (2-tailed) N	.721** .000 30
Online learning platform increases academic achievement.	Adapted	Pearson Correlation Sig. (2-tailed) N	.709** .000 30
Using an online learning platform gives me greater control over my work.	Adapted	Pearson Correlation Sig. (2-tailed) N	.678** .000 30
Using an online learning platform allows me to accomplish more work than is otherwise possible and increases my productivity.	Adapted	Pearson Correlation Sig. (2-tailed) N	.660** .000 30

An online learning platform is very useful to enhance my student understanding.	Developed	Pearson Correlation	.624**
		Sig. (2-tailed)	.000
		N	30
An online learning platform promotes the development of communication skills (e.g., writing and presentation skills).	Adapted	Pearson Correlation	.480**
		Sig. (2-tailed)	.007
		N	30

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 6 shows the value of the correlation of items in Attitude. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. The analysis found that all items in Table 6 are valid.

Table 6: Pearson Correlation for items attitude

	Adopted / Developed		**Total**
I think an online platform is the easiest way for me to conduct my classes.	Developed	Pearson Correlation	.746**
		Sig. (2-tailed)	.000
		N	30
I think an online learning platform makes teachers feel more competent as educators.	Adopted	Pearson Correlation	.681**
		Sig. (2-tailed)	.000
		N	30
I feel that I have enough knowledge to conduct classes online.	Developed	Pearson Correlation	.673**
		Sig. (2-tailed)	.000
		N	30
I think my students prefer digital learning than face to face.	Developed	Pearson Correlation	.638**
		Sig. (2-tailed)	.000
		N	30
I think online teaching is an important skill all teachers should have.	Developed	Pearson Correlation	.614**
		Sig. (2-tailed)	.000
		N	30
I think an online learning platform gives teachers the opportunity to be learning facilitators instead of information providers.	Adopted	Pearson Correlation	.560**
		Sig. (2-tailed)	.001
		N	30
I think an online learning platform does not limit my choices of instructional materials.	Adopted	Pearson Correlation	.556**
		Sig. (2-tailed)	.001
		N	30
I think that the current generation prefers online learning platforms.	Developed	Pearson Correlation	.462*
		Sig. (2-tailed)	.010
		N	30
Digital learning is a must in current teaching and learning.	Developed	Pearson Correlation	.451*
		Sig. (2-tailed)	.012
		N	30
Overall, I am very much relying on the technology to conduct my online classes.	Developed (Item is deleted due to low loading value)	Pearson Correlation	.262
		Sig. (2-tailed)	.162
		N	30

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 7 shows the correlation value of items in Perceived Ease of Use. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. Based on the result in Table 7, it is found that the items are valid.

Table7: Pearson Correlation for items perceived ease of use

	Adapted / Developed		Total
The application often behaves in unexpected ways. (e.g., screen pause, unsaved work, loss of audio, etc.)	Adapted	Pearson Correlation	.853**
		Sig. (2-tailed)	.035
		N	30
An online learning platform makes it easier for me to manage my classes.	Developed	Pearson Correlation	.804**
		Sig. (2-tailed)	.000
		N	30
My job is easier with an online learning platform.	Developed	Pearson Correlation	.782**
		Sig. (2-tailed)	.000
		N	30
I find it easy to get it to do what I want.	Adapted	Pearson Correlation	.747**
		Sig. (2-tailed)	.000
		N	30
With the digital platform, I can communicate clearly with my students.	Developed	Pearson Correlation	.746**
		Sig. (2-tailed)	.000
		N	30
I feel that it is easy for me to conduct classes and communicate online.	Developed	Pearson Correlation	.744**
		Sig. (2-tailed)	.000
		N	30
Overall, I find the online learning platform easy to use.	Adapted	Pearson Correlation	.684**
		Sig. (2-tailed)	.000
		N	30
The user manual is my number one source of reference.	Developed	Pearson Correlation	.572**
		Sig. (2-tailed)	.001
		N	30
I did not have difficulty installing and using the video conferencing app.	Developed	Pearson Correlation	.552**
		Sig. (2-tailed)	.002
		N	30
I did not have difficulty in connecting to the internet.	Developed (Item is deleted due to low loading value)	Pearson Correlation	.359
		Sig. (2-tailed)	.051
		N	30

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Table 8 shows the correlation value of items in Intention to Use. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. The table shows that all ten items are highly significant and valid.

Table 8: Pearson Correlation for items intention to use

	Adapted / Developed		Total
Overall, I find the online learning platform is a great help in lowering my workload.	Developed	Pearson Correlation	.801**
		Sig. (2-tailed)	.000
		N	30
It can achieve goals related to my work.	Developed	Pearson Correlation	.757**
		Sig. (2-tailed)	.000
		N	30
It is an effective tool for students of all abilities.	Adapted	Pearson Correlation	.754**
		Sig. (2-tailed)	.000
		N	30
It eases the pressure on me as a teacher.	Developed	Pearson Correlation	.751**
		Sig. (2-tailed)	.000
		N	30

It does not make classroom management more difficult.	Developed	Pearson Correlation Sig. (2-tailed) N	.727** .000 30
I can use technology resources to facilitate higher-order and complex thinking skills, including problem-solving, critical thinking, informed decision-making, knowledge construction, and creativity.	Adapted	Pearson Correlation Sig. (2-tailed) N	.646** .000 30
I can use a variety of media and formats, including telecommunications, to collaborate, publish, and interact with peers, experts, and other audiences.	Adapted	Pearson Correlation Sig. (2-tailed) N	.589** .001 30
It helps me keep track of my teaching progress.	Adapted	Pearson Correlation Sig. (2-tailed) N	.559** .001 30
Classes were equipped with proper technology setups.	Adapted	Pearson Correlation Sig. (2-tailed) N	.551** .002 30
I can troubleshoot common computer problems.	Adapted	Pearson Correlation Sig. (2-tailed) N	.435* .016 30

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 9 shows the correlation value of items in Usage Behaviour. The value with a double or single asterisk shows that the item is highly significant and considered a valid question. Nine items were valid.

Table 9: Pearson Correlation for items usage behaviour

	Adapted / Developed		**Total**
Overall, I am very satisfied with the use of the online teaching platform.	Developed	Pearson Correlation Sig. (2-tailed) N	.782** .000 30
I will continue to use it in the future.	Developed	Pearson Correlation Sig. (2-tailed) N	.746** .000 30
I collaborate with other teachers to develop content for the students.	Developed	Pearson Correlation Sig. (2-tailed) N	.699** .000 30
I use social networking sites to connect with my students. (e.g., Facebook, Instagram, TikTok, YouTube, etc.)	Developed	Pearson Correlation Sig. (2-tailed) N	.637** .000 30
I put all my teaching material online to assist my online teaching.	Developed	Pearson Correlation Sig. (2-tailed) N	.615** .000 30
I upload my teaching materials to cloud storage (e.g., Google Drive, YouTube, TikTok, Instagram, Telegram, etc.)	Developed	Pearson Correlation Sig. (2-tailed) N	.594** .001 30
I use an online meeting application to conduct my class. (e.g., Google Classroom/ Zoom/ Webex/ Skype, etc.)	Developed	Pearson Correlation Sig. (2-tailed)	.558** .001
I use digital applications to conduct the assessment (e.g., Quizziz, Kahoot, Form Builder, Google Forms,etc.)	Developed	Pearson Correlation Sig. (2-tailed) N	.557** .001 30

I create my own class content using PowerPoint presentations.	Developed	Pearson Correlation Sig. (2-tailed) N	.555** .001 30
I use teaching videos on YouTube in my teaching.	Developed (Item is deleted due to low loading value)	Pearson Correlation Sig. (2-tailed) N	.293 .117 30
I communicate with my students using mobile applications (e.g., WhatsApp, Telegram, Google Classroom, Google Meet, etc.)	Developed (Item is deleted due to low loading value)	Pearson Correlation Sig. (2-tailed)	.209 .267

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Construct Reliability

In maintaining the reliability of the survey questionnaire, the researcher ensured that all of it was only administered to the target respondents. The SPSS software version 26 was used for the analysis. The table below shows the reliability of the pilot test. Table 9 shows the reliability of Cronbach's Alpha for Perceived Convenience. From the 30 respondents used in the pilot study, the value of Cronbach's Alpha is α=.889. Table 10 shows all ten items used and the Cronbach's Alpha value if deleted. It shows that the reliability value would be increased to α=.904 if item number 1 is deleted. However, researchers have decided to keep the item as the present value is already more than α=.7 (Dom-Nwachukwu & Onuoha, 2021).

Table10: Reliability for perceived convenience

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.889	.880	10

Table 11: Items for perceived convenience

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I always allocate time for my classes.	32.7000	28.355	.130	.667	.904
My class schedule is very convenient.	33.5333	23.706	.727	.722	.871
I made the necessary preparations for my classes.	32.8333	26.557	.449	.816	.889
At home, I have an appropriate space to conduct my classes.	33.0000	24.897	.515	.610	.886
Using an online learning platform saves me time.	33.4000	23.007	.658	.682	.876
I can conduct my class without interruption. (e.g., kids, chores, etc.)	33.8667	23.913	.677	.622	.875
It is easy for me to incorporate digital technology into my teaching.	33.4333	21.426	.825	.937	.862
I find it easy to use online assessment applications.	33.5667	22.323	.781	.882	.866

I like to use digital pedagogy tools in my class (e.g., padlet, mentimeter)	33.5333	24.326	.631	.723	.878
Overall, I find an online learning platform very convenient.	33.4333	22.668	.785	.900	.866

Table 12 below shows the reliability analysis for Perceived Usefulness. The value of Cronbach's Alpha for this section is α=.925. All the ten items also show a value of α > .07.

Table 12: Reliability for perceived usefulness

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.925	.928	10

Table 13: Items for perceived usefulness

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
An online learning platform is very useful to enhance my student understanding.	30.5000	30.672	.625	.769	.923
Online learning platform increases academic achievement.	30.8333	30.833	.733	.744	.916
Online learning platform promotes student collaboration.	30.8333	28.764	.774	.903	.914
Using an online learning platform is effective because I believe I can implement it successfully.	30.7667	31.771	.742	.793	.916
Online learning platforms promote the development of communication skills (e.g., writing and presentation skills).	30.7667	32.116	.596	.892	.923
Using an online learning platform improves my job performance.	30.5333	31.982	.724	.738	.917
Using an online learning platform allows me to accomplish more work than is otherwise possible and increases my productivity.	30.6667	31.885	.755	.919	.916
Using an online learning platform enables me to accomplish tasks more quickly.	30.5333	30.740	.728	.960	.916

Using an online learning platform gives me greater control over my work.	30.5000	31.086	.733	.790	.916
Overall, I find online learning platform useful in my job.	30.3667	30.792	.792	.899	.913

Next, we are going to look at the reliability of Attitude. Table 14 shows the reliability for the variable that is α =.852. Table 14 shows that all other items also show a similar reading even if items were deleted.

Table 14: Reliability for attitude

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.852	.853	10

Table 15: Items for attitude

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I feel that I have enough knowledge to conduct classes online.	31.3667	22.309	.470	.748	.845
I think online teaching is an important skill all teachers should have.	30.7667	22.944	.373	.581	.852
I think that the current generation prefers online learning platforms.	31.5000	21.086	.532	.602	.841
I think an online platform is the easiest way for me to conduct my classes.	31.8000	19.200	.802	.802	.814
I think my students prefer digital learning than face to face.	32.0333	18.792	.675	.664	.827
I think an online learning platform makes teachers feel more competent as educators.	31.7000	20.079	.774	.892	.819
I think an online learning platform gives teachers the opportunity to be learning facilitators instead of information providers.	31.6000	21.007	.643	.548	.831
I think an online learning platform does not limit my choices of instructional materials.	31.2000	21.131	.667	.638	.830
Digital learning is a must in current teaching and learning.	31.4000	23.007	.352	.466	.854
Overall, I am very much relying on technology to conduct my online classes.	31.3333	22.506	.313	.430	.861

Below is Cronbach's Alpha for the variable Perceived Ease of Use. The value stated is α =.854. Apart from that, all the items in Table 16 also show similar values if one has been taken out. Hence, the researcher maintains all the items.

Table 16: Reliability for perceived ease of use

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.854	.847	10

Table 17: Items for perceived ease of use

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
The user manual is my number one source of reference.	30.5333	22.464	.519	.491	.844
I did not have difficulty in connecting to the internet.	30.2000	24.648	.274	.516	.862
I did not have difficulty installing and using the video conferencing app.	30.4000	23.076	.483	.695	.846
My job is easier with an online learning platform.	30.6667	20.506	.766	.791	.820
I feel that it is easy for me to conduct classes and communicate online.	30.9333	21.857	.649	.715	.832
With the digital platform, I can communicate clearly with my students.	30.8333	19.592	.809	.814	.814
An online learning platform makes it easier for me to manage my classes.	30.9667	21.895	.715	.755	.828
I find it easy to get it to do what I want.	30.8333	20.557	.755	.822	.821
The application often behaves in unexpected ways. (E.g., screen pause, unsaved work, loss of audio, etc.)	30.6667	27.195	-.073	.224	.886
Overall, I find the online learning platform easy to use.	30.5667	21.840	.701	.723	.829

The next table is Intention to Use. The value for this variable is α =.920. All the items in this section also show excellent reliability.

Table 18: Reliability for intention to use

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.920	.919	10

Table 19: Items for intention to use

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I can troubleshoot common computer problems.	29.4000	37.972	.449	.538	.923
I can use a variety of media and formats, including telecommunications, to collaborate, publish, and interact with peers, experts, and other audiences.	29.2333	36.737	.574	.739	.918
I can use technology resources to facilitate higher-order and complex thinking skills, including problem-solving, critical thinking, informed decision-making, knowledge construction, and creativity.	29.0333	35.757	.664	.773	.913
Classes were equipped with proper technology setups.	30.1333	33.292	.693	.700	.913
It is an effective tool for students of all abilities.	29.6000	32.800	.823	.816	.904
It helps me keep track of my own teaching progress.	29.1667	35.661	.657	.477	.914
It does not make classroom management more difficult.	29.6000	33.283	.812	.711	.905
It eases the pressure on me as a teacher.	29.5000	32.741	.756	.840	.908
It can achieve goals related to my work.	29.3000	33.734	.753	.799	.908
Overall, the online learning platform is a great help in lowering my workload.	29.3333	34.161	.798	.783	.906

The last variable is Usage Behaviour. As shown in the table below, Cronbach's Alpha for Usage Behaviour is α =.912. Apart from that, all the items in this section show a substantial value.

Table 20: Reliability for usage behaviour

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.912	.914	11

Table 21: Items for usage behaviour

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I use an online meeting application to conduct my class. (E.g., Google Classroom/ Zoom/ Webex/ Skype, etc.)	35.2667	39.030	.718	.616	.901
I use digital applications to conduct the assessment (e.g., Quizziz, Kahoot, Form Builder, Google Forms, etc.)	35.1333	39.706	.747	.629	.900
I upload my teaching materials to cloud storage (e.g., Google Drive, YouTube, TikTok, Instagram, Telegram, etc.)	35.2000	37.821	.700	.674	.902
I communicate with my students using a mobile application (e.g., WhatsApp, Telegram, Google Classroom, Google Meet, etc.)	34.5333	42.947	.421	.535	.915
I use social networking sites to connect with my students. (e.g., Facebook, Instagram, TikTok, YouTube, etc.)	35.7000	38.079	.618	.516	.908
I use teaching videos on YouTube in my teaching.	35.3333	41.747	.452	.314	.915
I create my own class content using PowerPoint presentations.	35.1333	39.775	.652	.688	.904
I collaborate with other teachers to develop content for the students.	35.5000	39.431	.710	.661	.902
I put all my teaching material online to assist my online teaching.	35.2333	39.702	.690	.654	.903
Overall, I am very satisfied with the use of the online teaching platform.	35.3333	38.713	.798	.904	.897
I will continue to use it in the future.	35.3000	38.631	.856	.927	.895

RESULTS

From the pilot study, it is proven that the questionnaire has a validity standard and a very good reliability value. The table below shows the validity of the questionnaire constructed. From 61 questions, only seven show the value < .361, which is insignificant.

Table 22: Summary of the Pearson Correlation of items

Section	Variables	Number of Items	Items With Value> .361 (Valid)	Invalid Item
C	Perceived Convenience	10	7	3
D	Perceived Usefulness	10	10	-
E	Attitude	10	9	1
F	Perceived Ease of Use	10	9	1
G	Intention to Use	10	10	-
H	Usage Behaviour	11	9	2
	TOTAL	**61**	**54**	**7**

As concluded in Table 23, the value of Cronbach's Alpha reading for all sections exceeded the minimum value of α =.07. Finally, Table 3.2 shows the value of Cronbach's Alpha for all sections, α =.971.

Table 23: Summary of the reliability test

	N= (40)	**Cronbach's Alpha**			
	α				
Section	**Variables**	**Mean**	**SD**	**Number of items**	**Pilot study**
C	Perceived Convenience	37.0333	5.42334	10	0.889
D	Perceived Usefulness	34.0333	6.16712	10	0.925
E	Attitude	34.9667	5.07518	10	0.852
F	Perceived Ease of Use	34.0667	5.21228	10	0.854
G	Intention to Use	32.7000	6.50809	10	0.920
H	Usage Behaviour	38.7667	6.89169	11	0.912

Table 24: Reliability

Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**N of Items**
.971	.970	61

DISCUSSION

The 38 developed items are particularly significant as they were specifically tailored to address the unique context of online education for teachers in Malaysia. These items encompass key variables such as Perceived Usefulness, Perceived Convenience, Perceived Ease of Use, Attitude, Intention to Use, and Usage Behaviour. By focusing on these variables, the developed items provide a comprehensive framework for understanding how teachers perceive and interact with online learning technologies.

The implications of these developed items are profound. They not only reflect the specific challenges and benefits that teachers associate with online learning but also highlight their attitudes towards technology integration in education. For instance, items related to Perceived Usefulness gauge how teachers believe online learning enhances student outcomes and their teaching effectiveness. This is crucial as it aligns with existing literature that emphasizes the role of perceived benefits in technology acceptance (Davis, 1989; Silva, 2015; Fentoullis et al., 2021). Furthermore, the inclusion of items measuring Perceived Convenience is essential in today's fast-paced educational environment, where flexibility and accessibility

are paramount. Teachers' perceptions regarding the convenience of online platforms can significantly influence their willingness to adopt these technologies. The developed items also address potential barriers such as technical difficulties or lack of familiarity with online tools, which can deter effective implementation (Manan, et al. 2022).

The 23 adopted/adapted items serve to ground the questionnaire in established research while allowing for contextual relevance. By integrating these pre-existing measures, the researchers ensure that their instrument is not only reliable but also comparable to previous studies on technology acceptance. This approach enhances the validity of the findings and facilitates a broader understanding of how various factors contribute to teachers' acceptance of online learning.

The findings derived from both the developed and adopted/adapted items highlight critical areas for intervention and support in teacher training programs. Understanding the specific dimensions that influence teachers' acceptance can guide policymakers and educational leaders in designing targeted professional development initiatives that address identified gaps. For example, if Perceived Ease of Use is found to be a significant barrier, training programs can focus on enhancing teachers' technical skills and confidence in using digital tools.

Moreover, these insights can inform the development of more user-friendly online platforms that cater to teachers' needs, ultimately fostering a more supportive environment for online education. As educational institutions continue to navigate the challenges posed by digital transformation, leveraging data from this instrument will be vital in shaping effective strategies for technology integration in teaching practices. Referring to Table 21 above, 90% of the items show a highly significant value. However, the remaining 10% is indeed insignificant.

The analysis of the developed items revealed that seven items exhibited low loading values, indicating they did not significantly contribute to the overall construct being measured. These items were deemed ineffective in capturing the intended perceptions of teachers regarding online education, potentially due to unclear wording or a lack of relevance to the context. Consequently, these items will be removed from the questionnaire to enhance its reliability and clarity. The remaining 31 items, which demonstrated high loading values and reliability, will be integrated into the final questionnaire. This integration ensures that the instrument remains robust and focused on key variables such as Perceived Usefulness and Perceived Ease of Use, ultimately providing a more accurate reflection of teachers' attitudes towards online learning technologies.

Apart from that, table 22 in the reliability table shows a high-reliability value for all 61 items in the questionnaire. Revising the invalid items, the researcher noticed that the statements were unclear or hard to understand. Therefore, the statements will need to be rephrased to make them simpler and more understandable. The item must be amended because the reliability score is good, and the item itself is crucial.

Finally, the 31 developed items, after the exclusion of the seven low-loading items, are integral to understanding teachers' acceptance of online learning within the Malaysian context. They provide valuable insights that can inform both practice and policy while contributing to the broader discourse on technology adoption in education. The combination of these newly developed items with established measures ensures a robust framework for

future research endeavours aimed at enhancing educational technology acceptance among educators.

CONCLUSION

The pilot study conducted with 40 teachers from various secondary schools in Perak yielded several key findings that will significantly shape the next stages of the research. Firstly, the pilot test confirmed the reliability and validity of the developed questionnaire, which is essential for ensuring that the instrument accurately measures teachers' acceptance of online learning based on the Technology Acceptance Model (TAM). The analysis of the pilot data revealed strong correlations among items within each variable, indicating that the items effectively capture the constructs of Perceived Usefulness, Perceived Ease of Use, Perceived Convenience, Attitude, Intention to Use, and Usage Behaviour. For instance, Tables 4 through 9 demonstrated high significance levels across all variables, with most items achieving strong correlation coefficients, thereby validating their inclusion in the final instrument.

Moreover, feedback from the pilot test highlighted areas for improvement in the questionnaire. Specific modifications were made based on participants' responses regarding question clarity and flow. For example, certain items were rephrased to enhance understanding and ensure they accurately reflected the intended constructs. This iterative process not only improves the quality of the instrument but also increases respondents' engagement and willingness to provide honest feedback in subsequent studies.

The implications of these findings are profound for the next stages of research. With a validated instrument in hand, future studies can focus on larger sample sizes to enhance generalizability and explore deeper insights into teachers' acceptance of online learning. Additionally, the refined questionnaire will facilitate comparative analyses across different educational contexts or demographic groups, allowing researchers to identify specific factors that influence technology acceptance among various teacher populations.

In summary, the pilot study's outcomes underscore the importance of rigorous testing and validation in research design. The insights gained will guide subsequent phases of this research project by ensuring that the instrument is not only reliable but also tailored to capture the complexities of teachers' experiences and attitudes towards online education effectively. This foundation will ultimately contribute to a more nuanced understanding of how to support educators in integrating technology into their teaching practices.

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