Flipgrid Acceptance Instrument in Video Aided Oral Communication Validation: Confirmatory Factor Analysis

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Abstract
This study was conducted to validate an instrument to measure the acceptance of Flipgrid Apps in video-aided oral communication. This study aimed to perform a Confirmatory Factor Analysis (CFA) against seven components in Flipgrid application acceptance, namely Interactive Acceptance, Perceived Usefulness, Perceived Ease of Use, Perceived Feasibility, Attitude, Behavioral Intention, and Actual Acceptance derived from Exploratory Factor Analysis (EFA). This study used a Case Study design. A total of 279 respondents from Malay Language course students were involved in this study. CFA was conducted to obtain solutions to these seven factors using IBM SPSS-AMOS software. CFA used a survey to assess the appropriateness of the measurement model with the data in the study based on the Technology Acceptance Model (TAM). The results of the study showed that the measurement model was in line with the data collected and confirmed the appropriateness of the questionnaire instruments used. The results of the analysis showed that the Cronbach's Alpha value was above 0.70. The Feasibility construct was removed after not achieving the discriminant validity value. The results of the pooled-CFA analysis confirmed that the data were consistent with the TAM Modification model and suggested that the 39 items of the instrument will be used in further Structural Equation Model (SEM) analysis. Validation of the survey instrument developed to measure the acceptance of the Flipgrid application towards the teaching and learning of video-aided oral communication can be achieved. Therefore, it is recommended that this instrument be used by educators to assess construct relationships that influence students' actual use of technology acceptance.
Keywords: Flipgrid Application, Tam Model, Confirmatory Factor Analysis (CFA), Instrument, IBM-SPSS AMOS

Introduction

Since the early 21st century, driven by the ease of information retrieval at one's fingertips and preparation for the Fourth Industrial Revolution, the education system has undergone significant transformations. More recently, the global closure of schools due to the COVID-19 pandemic has exacerbated the situation by contributing to a widespread "learning poverty" crisis. On 11 March 2020, the World Health Organization officially declared COVID-19 a global pandemic, prompting all educational institutions to cease face-to-face operations and transition to online learning to safeguard the health and safety of students, staff, and the broader community. Consequently, students were required to adapt to a new mode of learning, distance education, to respond swiftly and effectively to the new reality (Ghebreyesus, 2020). In fact, in addressing this ongoing global learning crisis, the World Bank introduced a new vision for learning, which includes the integration of educational technologies (Berita Harian, December 3, 2020).

Exploring international studies on the use of technology in teaching, particularly the implementation of Flipgrid, reveals that this tool has proven highly effective in supporting online learning. A study by Green and Green (2018) in the United States highlighted that Flipgrid enables students to engage in discussions through short videos, allowing them to actively participate in learning activities. Such engagement enhances students' comprehension of content and improves their language proficiency (Mango, 2019). Furthermore, the use of this technology spans across various academic disciplines. For instance, Keiper et al. (2020) concluded that Flipgrid was beneficial and well-received by students in Business Education, while Stoszkowski (2018) found the application particularly suitable, user-friendly, and effective for facilitating formative feedback and accommodating diverse learning styles in the field of Sports Science in the United Kingdom. Additionally, Flipgrid contributes to the development of students' social learning, as its accessible and enjoyable format encourages greater peer interaction and familiarity among classmates. Nonetheless, Lowenthal and Moore (2020) recommend that broader and more comprehensive studies be conducted to further evaluate the effectiveness of Flipgrid.

In the Malaysian context, education must be aligned with the demands of industry to produce a sustainable and competent workforce. In response, the Malaysian education system has been adapted by the aspirations of the Malaysia Education Blueprint (2013–2025) and the Malaysia Education Blueprint for Higher Education (2015–2025). The Ministry of Education Malaysia (MoE) has also encouraged the use of smartphones and tablets in the Teaching and Facilitation (PdPc) process as supportive teaching aids (Ministry of Education Malaysia, 2018). Indeed, the current educational landscape demonstrates that the integration of technology into teaching and learning is unavoidable, particularly during the COVID-19 pandemic, which compelled educators, students, and parents alike to acquire and adapt to technological tools rapidly.

Subsequently, a circular dated 8 November 2020 was issued to all State Education Directors by the Ministry of Education, outlining the implementation of Home-Based Teaching and Learning (PdPR). This directive marked a significant shift from the conventional face-to-face and interactive classroom teaching methods to online-based home learning. Under this directive, all teachers were required to remain within proximity of their respective duty stations and to carry out PdPR either from home or from any other suitable location, in a

systematic manner aligned with current conditions (Ministry of Education Malaysia, 2020). Teachers were also given the flexibility to choose from various PdPR delivery approaches, whether through online or offline modes, as stipulated by the Ministry.

Online Home-Based Teaching and Learning (PdPR) is an approach that leverages technology with reliable internet access through screen-based devices such as computers, laptops, tablets, or smartphones, conducted according to a predetermined timetable. This method enables teachers and students to communicate in real-time using audio and video, closely simulating face-to-face learning experiences. A wide range of applications can be utilized to implement PdPR, including educational platforms such as the Digital Educational Learning Initiative Malaysia (DELIMa) or EduWebTV, virtual learning tools like *Google Classroom, Zoom, Google Meet,* or *Microsoft Teams,* as well as quiz-based applications such as *Kahoot, Socrative*, or *Quizizz*. This study adopts an online approach by selecting one such application, namely Flipgrid. The study specifically focuses on the development of a valid and reliable instrument to measure the acceptance of Flipgrid for video-based learning, in light of the current educational environment where teaching and learning have become increasingly dependent on virtual instruction with limited face-to-face interaction.

Purpose of the Study
With the continued spread of COVID-19 and the indefinite enforcement of the Movement Control Order (MCO), the Internet has become a vital tool for reaching users at any time and from any location of their choice. This new mode of communication, with its distinctive characteristics, has been particularly valuable in facilitating the transition from traditional face-to-face teaching and learning (PdP) to Home-Based Teaching and Learning (PdPR). The need for online technology integration is driven by two main factors: access to online platforms (such as internet speed, cost, and efficiency from the perspectives of both users and providers) and the quality of application design, which should facilitate and enhance online user behaviour. This study employs the Technology Acceptance Model (TAM) to examine student behaviour within the online learning context, particularly about the use of the Flipgrid application. The current research also aims to assess the capability of the developed instrument to explain users' acceptance of Flipgrid in an online setting, while simultaneously analysing the appropriateness of the proposed model for future studies.

Flipgrid Application
Flipgrid is an online video discussion platform that has proven highly effective in facilitating student communication and fostering character development (Stoszkowski, 2018). This application is free of charge and accessible to all individuals within the global education system. Flipgrid features an interactive interface compatible with screen-based devices and offers functionalities similar to other video-based platforms such as YouTube. Students can pause and resume recordings as many times as needed before uploading their final videos.

Educators, acting as administrators of the platform, can organize the use of Flipgrid through a "Grid" system, categorizing submissions by subject area or class groups as designated spaces for video exchanges. Each time a student uploads new content, the administrator receives an email notification. To ensure focus and clarity, video submissions are limited to a maximum duration of five minutes. Students are encouraged to replay and

review their video presentations carefully when articulating ideas or conveying academic content.

Administrators can assess the submissions by assigning grades and providing feedback, which is directly communicated to students via email. Peer viewers can also interact with uploaded videos by giving "likes" and leaving both positive and constructive comments. Following this brief overview of Flipgrid's functionality, the researcher utilized the application to develop a research questionnaire instrument based on the Technology Acceptance Model (TAM).

Technology Acceptance Model (TAM)
The Technology Acceptance Model (TAM) is an intention-based model derived from the Theory of Reasoned Action (TRA), but was adapted specifically to address the broader needs of information technology research (Davis, 1989). Since its introduction, TAM has become one of the most widely used models in measuring technology adoption. It has consistently demonstrated its accuracy in predicting users' intention to use information technology as well as their actual acceptance of it. Over the years, TAM has evolved, with numerous researchers testing and extending the model by introducing new variables to enhance its explanatory power.

Empirical findings have shown that TAM and its various adaptations, often referred to as TAM+ remain a leading scientific paradigm and a reliable framework for assessing technology adoption, particularly within educational contexts (Granić & Marangunić, 2019). These adaptations have been crucial in ensuring the model's relevance in line with technological advancements and evolving user expectations. Fundamentally, TAM is built upon two key constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). However, Davis (1989) proposed six major constructs within the extended TAM framework to explain technology acceptance more comprehensively.

Perceived Usefulness (PU)
The construct of Perceived Usefulness (PU) determines an individual's willingness to adopt a specific technology. PU refers to a user's belief that using a particular system will directly enhance their performance. According to TAM, PU is influenced by Perceived Ease of Use (PEOU), along with other mediating factors. Conceptually, the easier a technology is to use, the more likely it is to be adopted (Davis, 1989).

Numerous systematic studies have provided detailed insights into the use of video-based technology to enhance students' oral communication skills (Nuraqilah Nadjwa Miskam, 2020). A meta-analysis by Blut and Wang (2020) also found that individuals who are generally more innovative are better equipped to overcome technological challenges, fully capitalize on the benefits of technology, and are more likely to achieve improved outcomes when using it. Optimistic users tend to perceive the outcomes of technology use more positively, which contributes to higher perceived quality.

In this study, the research instrument under development includes elements related to the usefulness of technology that enable seamless communication, specifically, systems that are stable, effective, and efficient. Moreover, Flipgrid is expected to facilitate large-capacity data

storage, ease of upload, fast and accessible retrieval, protection from security breaches, as well as time and cost savings, while enhancing overall performance and evaluation.

The significance of a sustainable technological system lies in its ability to prevent technical barriers such as frequent downtimes, inefficiency, and ineffectiveness, all of which may lower students' acceptance of the technology. Technical issues are a major concern and often cause frustration for both students and lecturers, as they disrupt the teaching and learning process. Without adequate technical support and continuous system improvements, users, both students and instructors, may be unable or unwilling to utilize the system effectively (Yang & Wang, 2012).

Additionally, previous meta-analytical studies have emphasized the critical role of both perceived usefulness and ease of use in shaping users' attitudes and behavioral intentions. The findings indicate that perceived usefulness tends to have a stronger association with these outcomes than ease of use, as demonstrated in prior research (Granić & Marangunić, 2019; Tao et al., 2020).

Perceived Ease of Use (PEOU)
Perceived Ease of Use (PEOU) refers to the degree of effort required to use a system. In other words, the greater the perception of ease and simplicity in using a technology, the more likely it is to influence an individual's willingness to adopt it. Davis (1989) defined ease of use as "the degree to which a person believes that using a particular system would be free of effort." To foster this perception, the Flipgrid system must be user-friendly, equipped with intuitive menus that are easy to access and monitor, thus aligning with the task requirements.

Generally, students who are frequent users of technology are more likely to benefit from technology-enhanced learning environments. Therefore, the integration of Information and Communication Technology (ICT) in schools, especially within classrooms, is crucial. The incorporation of technology into education contributes to various pedagogical dimensions, ultimately supporting more effective learning through the aid and functionality of ICT elements and components (Jamieson-Proctor et al., 2013). Furthermore, video-based technology offers accessibility, convenience, and flexibility attributes that are particularly beneficial when integrated into courses such as Oral Presentations (Nuraqilah Nadjwa Miskam, 2020).

Feasibility is inherently linked to ease of use, particularly when viewed from the perspective of the effort required to operate a system. A technology that is easy to use is also likely to be feasible to implement. Moreover, the study by Mohammad Hafiz Zaini and Saedah Siraj (2016) on the feasibility of technology integration suggests that reforming the learning process does not necessarily require high costs; rather, it involves the strategic use of technology as a medium to simplify learning, combined with a genuine interest in adopting tools that are simple and appropriate for the learning context.

Interactive Acceptance
In this study, interactive acceptance is also referred to as technological readiness. Technological readiness is a construct that reflects individual differences, specifically general psychographic traits concerning one's attitude toward adopting new technologies. The

developed instrument incorporates the concept of respondents' readiness in terms of responsiveness, flexibility, manipulability, real-time interaction, adaptability, facilitation of communication, and an attractive, high-quality user interface.

Interactive acceptance has an indirect influence on users' behavioral engagement with technology. This perspective is supported by Al-Qeisi (2009), who emphasized that the initial stage of successful technology implementation lies in ensuring that lecturers and students can utilize the technology effectively. Therefore, technology-based teaching and learning must begin with proper implementation and institutional support. Based on this view, researchers aiming to measure technology acceptance are encouraged to distinguish between two dimensions in their models: whether technology use functions as a motivator or a barrier (Blut & Wang, 2020).

Furthermore, Lin (2015) noted that multimedia features based on oral communication offer opportunities to establish socially interactive contexts with greater flexibility than is typically possible in face-to-face environments (p. 262). Hence, applications that allow flexible usage and foster communication between lecturers and students, or among peers, can enhance interactive acceptance as conceptualized in the TAM framework.

Regarding technological readiness, findings from Donnie Adams et al. (2018) revealed a moderate level of e-learning readiness among students from diverse backgrounds in Malaysian higher education institutions. This underscores the importance of raising student awareness of the role of technology in e-learning, as well as ensuring adequate technological infrastructure to support their engagement. Despite differences in educational backgrounds, a study by Rasouli et al., (2016) found that postgraduate students demonstrated higher levels of readiness compared to undergraduate students.

Attitude
Attitude exerts both direct and indirect effects on an individual's behavior and develops through either multi-dimensional or unidimensional factors (Siti Fatimah Abd Rahman et al., 2019). In the context of technology acceptance, students are expected to demonstrate attitudes characterized by enjoyment, interest, satisfaction, and motivation, qualities that can be developed through self-directed engagement with new technological applications. Şenay Şen (2013) supports this view, highlighting that university students' learning attitudes are shaped by three overarching factors comprising four subdimensions: learning traits, anxiety, expectations, and openness, along with gender and academic achievement.

From a skills-based perspective, Teo and Koh (2010) assert that individuals with higher levels of computer self-efficacy are more capable of completing tasks productively. This is consistent with the Flipgrid application, which utilizes existing systems and standard mobile phone cameras. Therefore, students' digital skills and technological competence should not present significant obstacles in this study and are appropriate for inclusion as key elements in the instrument being developed.

Ajzen and Fishbein (1980) further posited that an individual's attitude toward any object can be accurately predicted based on their beliefs and knowledge about the object, and how they evaluate it. More specifically, attitude is seen as a value-laden belief that

evolves with one's evaluative judgments. In the TAM framework, attitude is directly influenced by perceived usefulness and perceived ease of use, as discussed in earlier sections.

Conceptually, students should not develop unjustified negative attitudes, such as anxiety towards using technology. Although no universally accepted definition exists for technology-related anxiety, terms such as fear, discomfort, uneasiness, and technophobia are frequently used interchangeably to describe such states (Sangi & Bagheri, 2016). Students experiencing higher levels of anxiety tend to exhibit more negative attitudes compared to their less anxious peers (Kim et al., 2009). Therefore, it is crucial to ensure that students not only feel confident but also enjoy and are motivated to use such applications in their learning process. Differentiated instructional methods and support strategies should be implemented to meet expectations and reduce learners' apprehension (Şenay Şen, 2013).

Positive attitudes are also evident in today's generation, who have been exposed to technology from an early age compared to previous generations. This is supported by Chien et al. (2014), who found that school students exhibit high expectations for the integration of technology into classrooms, as they are part of the "digital native" generation. The younger the students, the greater their expectations for classroom technology integration. This reinforces the notion that technology integration is largely influenced by personal factors, particularly students' perceptions of technology. This finding is further corroborated by Donnie Adams et al. (2018), whose study revealed that while both postgraduate and undergraduate students infrequently engaged in online learning, undergraduate students did so more frequently than their postgraduate counterparts.

Additionally, the study by Ayuni Akhiar et al. (2017) found that language teachers who incorporated social media platforms into their teaching created more conducive learning environments, which in turn enhanced students' motivation in language learning. Therefore, this element will be included in the development of the research instrument to assess the extent to which such attitudes influence students' acceptance of the Flipgrid application.

Behavioural Intention
Human behaviour has long been the subject of scientific inquiry, dating back to the period between 1918 and 1970, particularly about the influence of individual attitudes (Al-Qeisi, 2009). As previously discussed under the concept of interactive acceptance, behavioural intention exerts an indirect influence on the degree of interactive acceptance. To positively enhance a user's behavioural intention, the application in use must possess characteristics such as high user-friendliness and accessibility, allowing individuals to complete assigned tasks with ease. The application should also be of high quality, include intuitive multimedia guidance, and feature user-friendly menus that align with teaching and learning processes, thereby encouraging students to willingly engage and submit tasks using the platform introduced.

Thus, if the process of technological integration in schools is implemented effectively from the outset, with adequate technical maintenance and support, it has the potential to yield significant benefits for both teachers and students. The use of technology in education is inherently more practical than theoretical in nature. Therefore, teachers must be given the time and opportunity to explore and experiment with technological tools, undergoing a "trial-

and-error" phase before they become fully comfortable and proficient in using such tools for instructional purposes (Ghavifekr & Wan Athiran Wan Rosdy, 2015). Hence, cultivating behavioural intention must begin from the earliest stages of implementation.

Furthermore, to encourage students' behavioural intention to use a particular application, the platform must be engaging and interactive, increasing the likelihood of students accepting it within the teaching and learning context. This aligns with research findings that show technology-based teaching and learning environments are more effective and engaging than traditional classroom settings. The integration of technological tools and equipment tends to create a more active, engaging, and effective learning environment for both teachers and students (Ghavifekr & Wan Athiran Wan Rosdy, 2015).

Actual Use
Actual use is commonly measured through indicators such as duration of usage, frequency of use, total usage, and the diversity of usage (Davis, 1989). This study focuses on the diversity of use, particularly on the various functions of the Flipgrid application. Within the concept of actual use, technology should serve as a medium that students actively seek out to acquire knowledge, skills and information relevant to their learning. The instrument developed in this study is designed to encourage students to use Flipgrid for submitting assignments, in preference to traditional submission methods. Through the use of this technology, students can also generate and express their ideas. Furthermore, Flipgrid enables submitted videos to be accessed by peers, providing opportunities for observing individual creativity and fostering interaction and communication.

This notion is supported by Ghavifekr and Wan Athiran Wan Rosdy (2015), who emphasized that the most effective approach occurs when students can gather information, relate it to prior knowledge, and engage in discussions with teachers and peers, thereby helping them identify new connections and address current issues, ultimately supporting meaningful learning. The existing shortcomings in students' oral communication suggest that they often lack opportunities to practice their speaking skills and receive feedback on their performance. Time constraints due to lectures and assignments in other subjects also limit peer interaction and discussion. Therefore, it is essential to integrate video-based technology into Oral Presentation courses to improve students' oral communication skills (Nuraqilah Nadjwa Miskam, 2020). Video-assisted oral communication not only increases the amount of spoken practice but also enhances language quality by offering more opportunities for speaking and greater learner awareness. Although online oral activities may adopt similar approaches as face-to-face sessions, online environments often prove to be more effective and, in some cases, more practical (Young & West, 2018).

In addition, technology empowers students with greater autonomy in managing their learning according to their individual capabilities and attitudes toward technology. The entire process of recording, editing, and submitting videos to instructors is conducted independently. This view is supported by Driscoll and Petty (2013), who noted that technology facilitates autonomous learning practices among students. In conclusion, several researchers have emphasized the importance of examining both behavioural intention and actual use concurrently to determine significant positive relationships. These studies indicate that TAM should not separate present intent to use technology from future intent. Anticipated future

use is particularly important, as it reflects the likelihood of continued and repeated usage. Thus, actual usage serves as a critical metric for assessing the sustainability of technology adoption (Mohd Sobhi Ishak, 2014). Moreover, findings from a meta-analysis by Tao et al. (2020) affirm that TAM remains a robust theoretical framework for investigating the factors influencing user acceptance of technology.

Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) is a multivariate analysis technique that allows researchers to examine complex relationships among variables (Hair et al., 2021). The primary aim of SEM is to determine whether a proposed model demonstrates a good fit to the data or appears plausible based on empirical data. In other words, SEM enables researchers to assess the validity of a conceptual model using multiple statistical indicators. Furthermore, it serves as a robust tool for testing hypotheses derived from established theoretical frameworks.

Methodology

The study population comprised Bachelor's degree students from various faculties who were enrolled in this course at a public university. A purposive sampling method was employed, resulting in a sample size of 279 students. Questionnaires were distributed to the students via Google Forms based on the current enrolment of 305 students, but only 279 responses were deemed suitable for analysis. Nevertheless, the sample size was sufficient to represent the entire population and adequate for conducting Structural Equation Modelling (SEM) analysis. This is supported by Hair et al. (2010), who recommend that a sample size exceeding 200 respondents is sufficient for confirmatory factor analysis. Of the 279 respondents, 114 were male students (40.9%) and 165 were female students (59.1%). Most respondents were Malay, comprising 221 students (79.2%), followed by Chinese 18 (6.5%), Indian 14 (5.0%), and others 26 (9.3%).

The study utilised a questionnaire instrument consisting of two sections: Section A and Section B. Section A collected demographic information, while Section B contained 44 items measuring Flipgrid application acceptance, assessing students' perceptions of Flipgrid use when presenting assignments via simulated video presentations based on seven constructs.

The TAM model was adopted and modified by adding an additional construct, Feasibility, identified through Exploratory Factor Analysis (EFA), which separated the usability construct into two factors (Norzalina Noor et al., 2021). This indicated that some factors measured different constructs. As a result, seven constructs of Flipgrid application acceptance were tested for model fit in Confirmatory Factor Analysis (CFA):

- Interactive Acceptance
- Ease of Use
- Usability
- Feasibility
- Attitude
- Behavioural Intention
- Actual Acceptance

The questionnaire items were adapted from scholarly opinions in previous studies and detailed within the six constructs of the original model. Three subject-matter experts were appointed to review the content validity of all developed items. Modifications and improvements were made accordingly based on their suggestions (see Appendix for the Questionnaire).

For reliability and construct validity, Cronbach's alpha reliability testing and Exploratory Factor Analysis (EFA) were conducted. After the constructs were identified, Pooled-CFA was performed on the measurement model based on hypothesised factors using IBM SPSS Analysis of Moment Structures (AMOS) version 24. To strengthen the hypothesised constructs, convergent and discriminant validity analyses were conducted as the final stage of CFA.

Findings

Before conducting data analysis, the researcher used IBM SPSS software to test for normality to determine whether all collected data met the assumptions of normal distribution. In the review of 279 questionnaires, outliers were identified in the boxplot analysis. After removing 18 outliers, the data distribution was found to be normal, resulting in 261 valid responses for analysis. This confirmed that there were no multivariate outlier issues in the dataset, and the data were suitable for reliability testing using Cronbach's alpha. The findings are presented in detail, covering Cronbach's alpha reliability, Confirmatory Factor Analysis (CFA), convergent validity analysis, and discriminant validity analysis, as follows:

Cronbach's Alpha Reliability

Cronbach's alpha reliability analysis was conducted to determine the internal consistency of the variables used in the study. For an instrument to achieve internal consistency, all variables must have values above 0.70. Specifically, Cronbach's alpha can be classified into four categories: 0.90–1.00 (very high), 0.70–0.89 (high), 0.30–0.69 (moderate), and 0.00–0.30 (low) (Babbie, 1992; Sekaran & Bougie, 2016).

As shown in Table 1, the analysis revealed that Cronbach's alpha values for all variables (constructs) at the sub-construct level were very high, ranging from 0.905 to 0.929. The overall Cronbach's alpha (α) for all constructs was 0.974, and no items were removed from the analysis.

Table 1

Cronbach's Alpha Reliability Values for the Study Variables

Construct	Number of items	*Cronbach Alpha Sub- Construct*	*Cronbach's Alpha (α)*
Interactive Acceptance	7	.929	.974
Ease of Use	5	.927	
Usability	8	.916	
Feasibility	5	.905	
Attitude	6	.917	
Behavioural Intention	6	.921	
Actual acceptance	7	.923	

Confirmatory Factor Analysis (CFA)
CFA was conducted to validate the Flipgrid application acceptance instrument based on the seven factors hypothesised from the results of a prior Exploratory Factor Analysis (EFA). The Confirmatory Factor Analysis of the seven constructs measuring Flipgrid application acceptance found that the hypothesised model demonstrated compatibility with the data collected. Each construct was represented by more than three items, following the recommendation by Hair et al. (2010), who stated that each construct should be represented by at least three items. A key consideration in CFA is to ensure that the analysis yields acceptable goodness-of-fit indices and that the model aligns with the sample data. If this condition is not met, it indicates that the dataset is unsuitable for subsequent regression analysis using Structural Equation Modelling (SEM). In such cases, researchers are advised to adopt alternative analysis methods such as the Statistical Package for the Social Sciences (SPSS), Partial Least Squares Path Modelling (PLS-PM), or Partial Least Squares Structural Equation Modelling (PLS-SEM).

CFA examines the proposed model in terms of the Goodness-of-Fit between the hypothesised model and the sample data, as well as the validity and reliability of the constructs. To evaluate the fit of the measurement model, which comprised 44 items following item reduction during EFA, several fit indices were applied: (i) the minimum value of the Chi-Square statistic divided by degrees of freedom (ChiSq/df), (ii) the Comparative Fit Index (CFI), (iii) the Tucker-Lewis Index (TLI), and (iv) the Root Mean Square Error of Approximation (RMSEA).

The threshold values for these indices indicate that a model achieves acceptable fit when: (i) the ChiSq/df value falls between 1 and 5, which is considered acceptable; (ii) CFI and TLI values approach 1.00, indicating a strong model fit; and (iii) RMSEA values of 0.08 or lower reflect a reasonable and acceptable level of approximation error (Arbuckle, 1997; Hair et al., 2010; Arbuckle & Wothke, 1999).

Figure 1 presents the pooled measurement model for the seven constructs used to assess Flipgrid application acceptance, namely, interactive acceptance, ease of use, usability, feasibility, attitude, behavioural intention, and actual acceptance based on data collected from student samples (n = 261) using the 44 items included in the questionnaire. All these items are latent variables representing each construct. The results of the overall model fit analysis for Flipgrid application acceptance indicated that the model is compatible and acceptable, as supported by the fit indices listed in Table 2. These indices meet the cutoff values recommended by statistical scholars such as Arbuckle (1997), Arbuckle and Wothke (1999), and Hair et al. (2010). The goodness-of-fit indices for the Confirmatory Factor Analysis of the Flipgrid Acceptance Model are as follows:

Table 2

Goodness-of-Fit Indices for the Confirmatory Factor Analysis of Flipgrid Application Acceptance

Index	*Cut off Value*	Analysis Result	Model Evaluation
RMSEA	<.08	.071	Excellent
TLI *	>.85	.889	Acceptable
CFI *	>.85	.880	Acceptable
Chi-Square/df	<0.3	2.310	Ideal

*Note: *> 0.85 are acceptable for complex models (Zainuddin et al., 2018)*

Table 2 shows that the confirmatory factor measurement model for Flipgrid application acceptance is a good fit for the study data. The results obtained were RMSEA = 0.071, TLI = 0.889, CFI = 0.880, and ChiSq/df = 2.31.
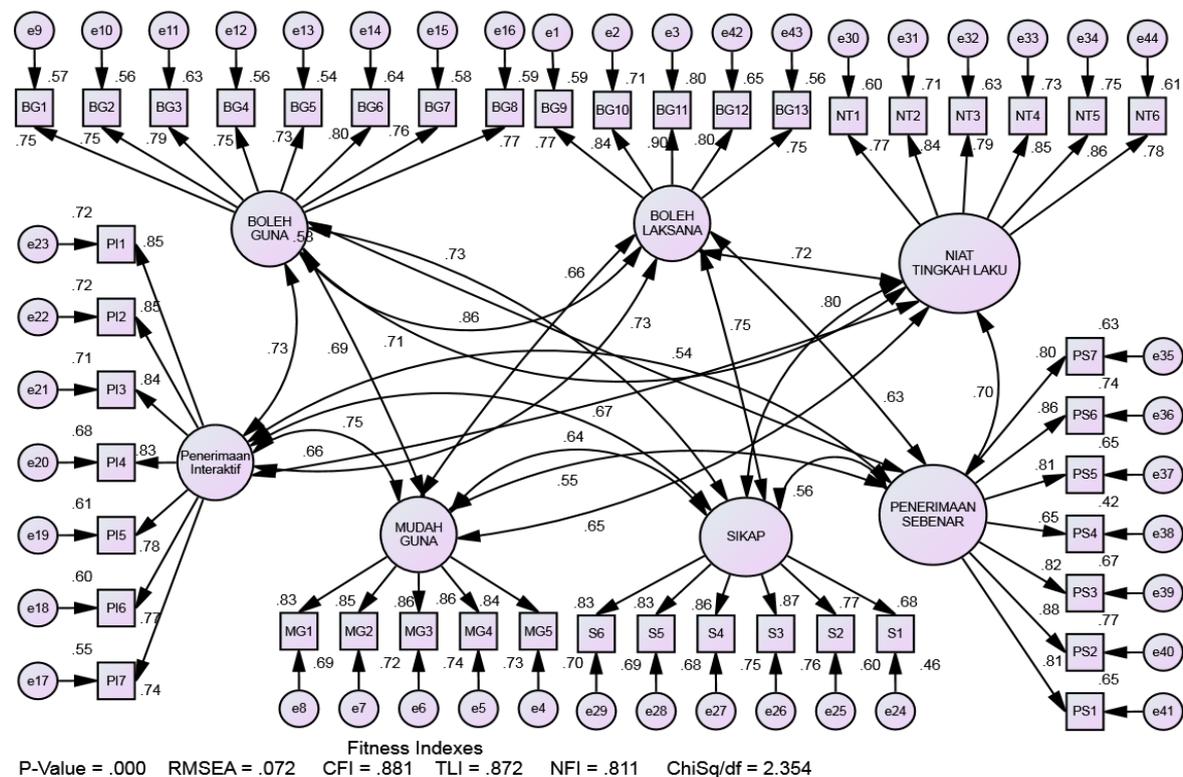

Figure 1: Measurement Model of the Pooled Confirmatory Factor Analysis (Pooled-CFA) for Flipgrid Application Acceptance

Unidimensionality

Unidimensionality is achieved when all items measuring a construct exhibit high factor loadings. For newly developed items, each item's factor loading must exceed 0.50 (Zainudin Awang et al., 2018), while Hair et al. (2014) suggest that, to determine significance at the 0.05 level, the sample size should exceed 250 respondents and each item should have a minimum factor loading of 0.35. This criterion is crucial in determining the strength of each item in measuring a construct or latent variable within CFA. Figure 1 illustrates the results of the measurement model in the Confirmatory Factor Analysis (CFA), involving all 44 items retained

from the Exploratory Factor Analysis (EFA) model to measure the seven constructs in the Flipgrid application acceptance framework. It is clearly shown that the factor loadings for all items exceeded the minimum threshold of 0.50, as the researcher had developed and introduced new items. This finding demonstrates that all 44 items successfully passed the fit index threshold and are valid in measuring the seven identified constructs.

Multicollinearity
In the Pooled-CFA, all constructs were combined and linked with bidirectional arrows as illustrated in Figure 1. Based on the analysis, it was found that two constructs, Ease of Use and Feasibility, exhibited multicollinearity. These constructs had a high correlation value of 0.86, which exceeds the acceptable threshold for discriminant validity, where the correlation between exogenous constructs should not surpass 0.85. This indicates that the two constructs are redundant (overlapping) and that the measurement model faces multicollinearity issues.

Convergent Validity and Discriminant Validity Analysis
Construct validity is determined through both convergent validity and discriminant validity. Convergent validity analysis is carried out to reinforce the placement and theoretical significance of the constructs. This involves evaluating the composite reliability and convergent validity values of each latent variable (Anderson & Gerbing, 1988; Fornell & Larcker, 1981). A construct is considered to have good convergent validity when its composite reliability (CR) exceeds the value of 0.70 (Fornell & Larcker, 1981; Hair et al., 2014).

In summary, convergent validity is determined through three key indicators: (i) factor loadings greater than 0.50, (ii) Average Variance Extracted (AVE) greater than 0.50, and (iii) composite reliability (CR) greater than 0.70. The AVE is calculated using the formula $AVE = \Sigma\lambda^2 / n$, while the composite reliability (CR) is calculated using the formula $CR = (\Sigma\lambda)^2 / ((\Sigma\lambda)^2 + \Sigma\delta)$. Meanwhile, discriminant validity is assessed by comparing the squared correlation between two constructs with the AVE of each construct. If the AVE value is greater than the squared correlation, then discriminant validity is said to be achieved (Fornell & Larcker, 1981). In other words, discriminant validity is established when the AVE of a construct exceeds the squared correlation value (r^2) between that construct and another (Hair et al., 2010).

Table 3 shows that the composite reliability values for all constructs exceeded 0.70, with the lowest value being 0.82. Similarly, the AVE values for convergent validity exceeded 0.50, with the lowest recorded value being 0.58. Referring to the same table, the factor loadings for all items across the seven constructs ranged from 0.65 to 0.90, exceeding the minimum acceptable threshold of 0.60. According to Zainudin Awang et al. (2018), for newly developed items, a factor loading of above 0.50 is already considered acceptable. In conclusion, the findings indicate that convergent validity was successfully achieved for all seven constructs developed in the study.

Table 3

CFA Results for Convergent Validity Testing

Construct	Item	Factor	Convergent Validity (AVE)	Composite Reliability (CR)
Interactive Acceptance	PI1	.85	.655	.930
	PI2	.85		
	PI3	.84		
	PI4	.83		
	PI5	.78		
	PI6	.77		
	PI7	.74		
Ease of Use	MG1	.83	.719	928
	MG2	.85		
	MG3	.86		
	MG4	.86		
	MG5	.84		
Usability	BG1	.75	.584	.918
	BG2	.75		
	BG3	.79		
	BG4	.75		
	BG5	.74		
	BG6	.80		
	BG7	.76		
	BG8	.77		
Feasibility	BG9	.77	.662	.907
	BG10	.84		
	BG11	.90		
	BG12	.80		
	BG13	.75		
Attitude	S1	.68	.655	.919
	S2	.77		
	S3	.87		
	S4	.86		
	S5	.83		
	S6	.83		
Behavioural Intention	NT1	.77	.666	.923
	NT2	.84		
	NT3	.79		
	NT4	.85		
	NT5	.86		
	NT6	.78		
Actual Acceptance	PS1	.80	.652	.929
	PS2	.86		
	PS3	.81		
	PS4	.65		
	PS5	.82		
	PS6	.88		
	PS7	.81		

Note: a) Composite Reliability (CR) = (Σ Factor Loadings)² / [(Σ Factor Loadings)² + Σ (1 – Factor Loading²)]

b) Convergent Validity (AVE) = Σ (Factor Loading² for each item) / (Number of items)

Discriminant Validity Analysis

Discriminant validity analysis was conducted to determine whether the measurement model of a construct is free from overlapping or redundant items. Discriminant validity for all constructs is considered achieved when the values along the diagonal are higher than the values in their respective rows and columns. If this condition is not met, the model is said to exhibit serious multicollinearity issues (Zainudin Awang et al., 2018).

Based on Table 4, it is evident that the value of 0.76 for the Usability construct is lower than the correlation value of 0.086 between Feasibility and Usability. Therefore, discriminant validity for the Feasibility construct was not achieved, and as a result, it was excluded from the model before proceeding with Structural Equation Modelling (SEM) analysis to examine the regression relationships between constructs.

Table 4
CFA Results for Discriminant Validity Testing

Construct	PI	MG	BG	BL	S	(NT)	(PS)
Interactive Acceptance	**.81**						
Ease of Use	.75	**.85**					
Usability	.73	.70	**.76**				
Feasibility	.73	.66	.86	**.81**			
Attitude	.67	.63	.73	.75	**.81**		
Behavioutal Intention	.66	.65	.71	.72	.80	**.82**	
Actual Acceptance	.54	.55	.58	.63	.56	.70	**.81**

Note: The diagonal values represent the square root of the convergent validity (AVE), while the other values indicate correlations between constructs.

The findings clearly indicate that the developed measurement model failed to achieve discriminant validity for the constructs of Ease of Use and Feasibility. As a result, the researcher chose to remove one of the constructs—Feasibility. The discriminant validity analysis was then repeated. Figure 2 presents the modified model after the Feasibility construct was removed. It was found that the revised Flipgrid application acceptance measurement model fulfilled all criteria for validity and reliability. In other words, the measurement model was validated through Confirmatory Factor Analysis and deemed suitable for progression to Structural Equation Modelling (SEM).

Table 5
Goodness-of-Fit Indices for the Confirmatory Factor Analysis of Flipgrid Application Acceptance

Index	Cut off Value	Analysis Result	Model Evaluation
RMSEA	<.08	.072	Excellent
TLI *	>.85	.884	Acceptable
CFI *	>.85	.893	Acceptable
Chi-Square/df	<0.3	2.348	Ideal

*Note: *> 0.85 is acceptable for complex models (Zainuddin et al., 2018)*

Table 5 indicates that the goodness-of-fit indices for the measurement model were successfully achieved and exceeded the minimum thresholds. RMSEA = 0.072, TLI = 0.884, CFI

= 0.893, and ChiSq/df = 2.348 were obtained based on the analysis of six constructs only. Therefore, the model is considered a good fit with the study data.
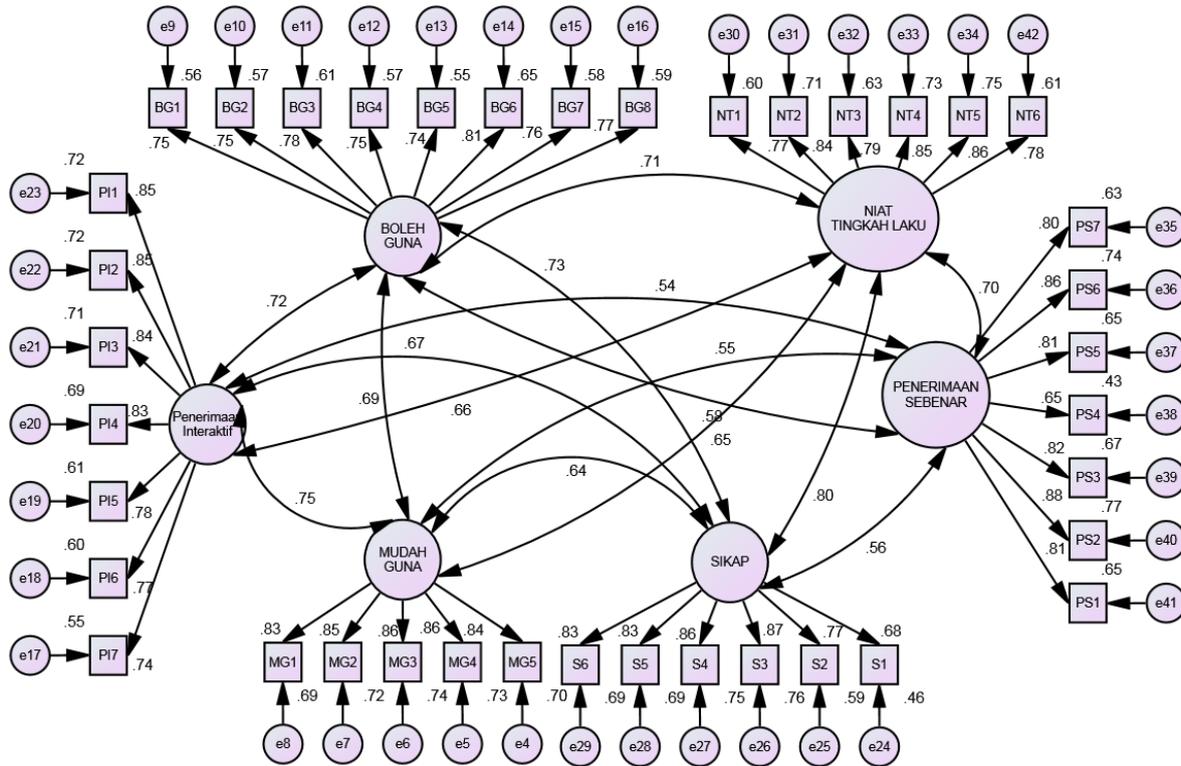
Figure 2: Pooled Confirmatory Factor Analysis (CFA) of the Flipgrid Application Acceptance Constructs after Modification

Conclusion
Based on the findings discussed, it can be concluded that from the 279 survey responses collected, only 261 respondents were deemed acceptable for normality estimation. The internal reliability of the questionnaire items was tested using Cronbach's alpha coefficient, which yielded a value of 0.94. This result indicates that the reliability of each item is justifiable. The study findings further reveal that the factor loadings for all 44 items were high, ranging from 0.65 to 0.90, confirming that all items effectively measured the seven constructs that were developed.

The strength of the Flipgrid application acceptance instrument demonstrates that each listed item has a strong influence on the measurement of its corresponding construct. All six constructs remaining in the final model after one construct was removed for failing to meet discriminant validity showed high construct validity, as evidenced by their achievement of the four key model fit indices: RMSEA ≤ 0.08, CFI and TLI values approaching or ≥ 0.85, and a ChiSq/df value < 5, all of which indicate the acceptability of the items in determining construct validity. These fit indices confirm that the Flipgrid acceptance instrument is sufficiently robust for measurement purposes. This clearly demonstrates the capability of the instrument to be used reliably for the same or similar sample characteristics in future

applications over time. Consequently, the researcher may proceed with further analysis using Structural Equation Modelling (SEM) based on the validated questionnaire.

The implications of this study directly support the development of an instrument to measure the acceptance of the Flipgrid application for video-assisted oral communication, with demonstrated validity and reliability based on the CFA measurement model. As a result of multicollinearity and failure to achieve discriminant validity, one construct, Feasibility, was removed. Accordingly, the refined instrument now consists of 39 items (after the removal of the 5 items from the Feasibility construct), resulting in a measurement model with strong validity and reliability, suitable for assessment purposes. The findings of this study can serve as a reference for other researchers in educational institutions seeking to implement similar programs aimed at assessing student acceptance of technology integration.

Theoretical and Contextual Contributions of the Research

This study's primary theoretical contribution is the validation of a comprehensive instrument to measure Flipgrid application acceptance through Confirmatory Factor Analysis (CFA). While the Technology Acceptance Model (TAM) is a well-established framework for technology adoption, this research extends it by applying it to a specific video-aided communication tool, Flipgrid, and confirming its suitability for this context. Furthermore, through rigorous CFA, it identified multicollinearity issues between 'Ease of Use' and 'Feasibility'. This refinement provides valuable insights into the interrelationships of TAM constructs in the context of video-aided communication tools, suggesting that 'Feasibility' might be redundant or highly correlated with 'Ease of Use' in such applications. The refined instrument now consists of 39 items across six constructs, demonstrating strong validity and reliability. Finally, it confirms that the developed measurement model for Flipgrid acceptance is robust that providing a reliable theoretical foundation for future studies investigating technology acceptance in similar educational settings.

From the contribution of the context aspect, it's highly significant in the current educational landscape, particularly in the context of the global shift to online and home-based learning accelerated by events like the COVID-19 pandemic. It directly addresses the need for valid instruments to assess the acceptance of digital tools like Flipgrid, which have become crucial for maintaining communication and learning in virtual environments. This validated instrument can be directly used by educators to assess the factors influencing students' acceptance and actual use of Flipgrid in video-aided oral communication, which provides a practical tool for understanding and promoting effective technology integration in teaching and learning processes, especially for improving students' oral communication skills. The research supports the broader goal of integrating educational technologies effectively. It highlights that technology integration is unavoidable and essential, especially during times when face-to-face interaction is limited. The findings can serve as a reference for other educational institutions planning to implement similar technology integration programs. It sheds light on the key drivers of technology adoption among students, which is crucial for designing effective digital learning experiences

In summary, this research not only advances the theoretical understanding of technology acceptance by refining and validating a TAM-based instrument for a specific educational tool but also offers a highly practical and timely contribution by providing

educators with a reliable means to assess and foster the adoption of video-aided communication technologies in the evolving digital learning environment.

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