Chinese Educators Adoption of Multimedia Tools for Teaching: A Cross-sectional Research on Beijing Population

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Abstract

In the digital age, the landscape of education is continuously evolving with the integration of multimedia tools into teaching practices. China, as a leading technology adopter globally, is now witnessing the massive use of digital media in educational landscapes. In the capital city of Beijing, which is recognized for its advanced technologies, the use of multimedia tools will help to strengthen the effectiveness of teaching and ability of students to get engaged. Consequently, despite the fact that multimedia tools in education can bring many benefits, the degree of their adoption by Chinese educators is not very clear. Thus, this research is aimed to fill the void by examining the factors that underlie the use of multimedia tools for teaching by Chinese educators in Beijing. Through an extension of the UTAUT model by incorporating additional factors like perceived institutional support and perceived student engagement, this study is going to offer a complete perspective of the adoption factors in Chinese educational system. The data were collected from 300 educators using convenience sample technique from public and private colleges and universities that are located in Beijing. The structural equation modeling analysis was performed with IBM SPSS AMOS software. The findings of the study demonstrate that performance expectancy, effort expectancy, social influence, and facilitating conditions are key determinants of behavioral intention (BI), and facilitating conditions also contribute to adoption. Similarly, the results show that perceived institutional support as well as perceived student engagement have direct links with BI. As mediator, the BI is examined among the study's independent variables. This research will help policymakers and educators to devise the strategies which are useful for the effective implementation of multimedia tools into teaching methods.

Keywords

UTAUT, Perceived Institutional Support, Perceived Student Engagement, Multimedia Adoption, Beijing.

1. Introduction

Nowadays, in the era of digital technologies, the education sector is not an exception; it continuously enhances and implements different technologies for effective teaching. The use of multimedia tools for teaching is among them (**Haleem et al.**, 2022). This shift is not restricted to limited world regions. It's a global phenomenon that has gained offshoot due to technological advancements and modification of pedagogical approaches. According to **Collins and Halverson** (2018), China seems to be the leader of this transition, as the country embraces new technologies for revolutionizing education. The digital resources are now more and more applied in educational institutions in Beijing, -the capital city of China, which is well-known for its technological progressiveness. Using multimedia in the classroom not only reveals a new age of the education, but also creates a whole new horizon for teachers to innovate more and make the classes more exciting (**Prosper et al.**, 2023). Multimedia tools can be used in a variety of ways, such as interactive presentations and immersive simulations, to meet different learning styles and enhance student understanding (**Beckem; Watkins**, 2012). Realizing that multimedia tools

can significantly contribute to teaching, educators everywhere are seeking ways to weave this powerful tool into their curricula to create vibrant, engaging learning spaces that the present-day digitally-savvy generation would gladly embrace. The use of multimedia tools is rapidly expanding in Beijing, a place known for its advanced digital infrastructure and speedy technology (**Gao et al.**, 2021). While there is great enthusiasm for using digital devices at institutions, there is also a lack of knowledge in terms of what factors determine educator's acceptance of them. The focus of this study is on giving the environment that is related to multimedia tool usage by the Chinese educators in the context of Beijing city.

The Unified Theory of Acceptance and Use of Technology (UTAUT), a popular theoretical framework for exploring technology use, lays the foundation for this study (**Venkatesh et al.**, 2003). Thus, it suggests that the factors that lead to people's behavior towards technology use may be complex. Therefore, this study extended the UTAUT model with additional factors like perceived institutional support and perceived student engagement. The research aims to find the factors that impact Beijing-based Chinese educators' decision to use multimedia tools in their teaching. The objectives of the research are:

1. Identify the factors influencing the adoption of multimedia tools by Chinese educators
2. To find out any relationship between facilitating conditions and adoption of multimedia tools
3. Explore the impact of perceived institutional support and perceived student engagement on behavioral intention (BI) to adopt multimedia tools.

2. Literature Review

The use of multimedia technologies in education constitutes an important shift in educational technology given the necessity to adapt to the digital era. The current study focuses on the adoption of multimedia tools by the Chinese educators. Digital media includes interactive presentations, movies, simulations, and educational games. A number of multimedia tools fall under this category. Research shows that multimedia tools applied in the education increase learning by stimulating various learning modalities and improving the engagement of students (**Kilag et al.**, 2023). Multimedia tools offer students both the interactive as well as the hands-on learning opportunities to foster their active thinking. Technological tools have streamlined the education sector in China with the government striving to optimize the curriculum by integrating media tools to promote innovation and creativity (**Liu et al.**, 2023). In China, digital devices and the internet have created new opportunities for educators to enhance their teaching medium by using multimedia and increasing efficiency (**Luo; Berson; Berson**, 2021). The study used the UTAUT factors along with perceived institutional support and perceived student engagement.

According to research, perceived institutional support, which is manifested in administrative policies and effective resource allocation, is instrumental in promoting technology integration in education (**Seifu**, 2020). Additionally, educator attitudes toward student engagement and multimedia tools' alignment with goals also significantly impact the decision-making process (**Trust; Maloy; Edwards**, 2023). Specifically, research indicates that educators are more willing to adopt multimedia tools if they believe that it will lead to the improvement of outcomes and encourage active student involvement. While the currently available findings present valuable information regarding multimedia tool adoption, several research gaps need to be addressed (**Balreira et al.**, 2021). There are several reasons why this research is novel and, at least to the best of the author's knowledge, innovative. Firstly, most of the technology adoption studies in the field of education have been conducted in the context of Western countries. As a result, there is a lack of literature studying the factors influencing adoption behavior in Chinese educators (**Zhao et al.**, 2021). Secondly, little science has examined multimedia tools' adoption in a socio-cultural setting such as Beijing. Additionally, none of the previous works have considered perceived student engagement and perceived institutional support affecting educators' adoption behavior; however, their importance has been visible in the studies examining the adoption of technologies. The research framework is shown in Figure 1.

3. Research Hypothesis

3.1. Performance Expectancy

Performance expectancy refers to the extent to which an individual believes that adopting the system will assist them in achieving improvements in job performance (**Venkatesh et al.**, 2003). In the area of education, performance expectancy relates to the perceived advantages and benefits in using multimedia for teaching. This includes the impact of using multimedia on student engagement and motivation, learning efficiency, and supporting various learning styles (**Chen**, 2011). It also relates to one's ability to present and share information with learners in a more dynamic and interactive manner. Conversely, the BI describes an individual's ability or willingness to perform a behavior (**Lin et al.**, 2020; **Ho**, 2021).

The intentions to adopt multimedia tools by educators increases when they accept multimedia enhances their teaching methodology and encourage student to engage more in the class (**Alfalah**, 2018). This inclination will be further strengthened when they get their expected results in the form of student satisfaction and improving academic performance. Moreover, educators need to be adopt multimedia tools in their teaching to survive in the technological advanced country of China (**Liu et al.**, 2023). This contemplation will reinforce the impact of performance expectancy on BI.

H1: Performance expectancy has significant impact on BI.

3.2. Effort Expectancy

Effort expectancy, is defined as "the degree of ease associated with the use of the system" (**Venkatesh *et al.***, 2003). In the educational context, effort expectancy is the easiness to use the multimedia tools for teaching (**Aljazzaf**, 2020). This idea is dependent on several factors, including the type of technology, the likelihood to achieve necessary training and assistance, and tradition training and teaching techniques whether the multimedia tools will be compatible with it. Considering the nature of Beijing's academic environment, influenced by rapid technological progress and an increasing focus on the novelty and originality of pedagogical approaches, educators are frequently introduced to a broad range of multimedia software created to boost their efficiency and creativity (**Wang; Wang**, 2022). According to **Al-Abdullatif** (2023), this component provides a foundation for educators to weigh the perceived simplicity of incorporating multimedia tools into their teaching. If the tools are perceived as notably user-friendly, easily navigable, and accessible to implement alongside existing methods, this would result in positive attitudes. Therefore, the target is more likely to think that implementing these tools will be less time-consuming, less work, or less technical expertise. Instead, they see themselves as mere enablers who make teaching simpler and instructional delivery more effective. The more the educator feels that using multimedia tools will be perceived as easy, the more likely they are to express a BI regarding their use (**Al-Maroof *et al.***, 2022).

The target is also motivated by the perception that doing more with these tools will not pose an additional burden or complexity to their work. Instead, the more the target expects that using multimedia tools will help ease content delivery and make students more engaging. In addition, the Chinese educational environment is oriented towards an efficiency and effectiveness of teaching and learning approaches. Notably, educators are more likely to utilize instruments and resources that possess a low level of cognitive load and facilitate the instruction and learning process (**Hennessy *et al.***, 2022). Under these conditions, individuals are more accessible to technologies that can ease their efforts in the perception and application of technological innovations in the pedagogical process. Overall, therefor, effort expectancy is an essential determinant of educators' acceptance for the introduction of new technologies.

H2: Effort expectancy has a significant impact on BI.

3.3. Social Influence

Social influence denotes to the individual believes to adopt and utilise a new system (**Venkatesh *et al.***, 2003). Based on the parameters of this study, social influence will involve the directives from colleagues, high administration, educational policy makers, and professional external networks pertinent to the educators' choice to adopt multimedia tools in their teaching practices (**Orji; Ojadi; Okwara**, 2022). Given the collectivist culture of Chinese society, where the group takes precedence over the individual, Chinese people tend to focus on relationships and group harmony (**Chen *et al.***, 2021). That is why educators always consult their peers and superiors to seek validation and get advice before trying a new technology or teaching practice. The perceptions of colleagues and institutional leaders on multimedia tool adoption can significantly affect educators' BIs. There are several ways these mechanisms are triggered: Firstly, the social pressure factor signifies that educators either have positive or negative attitudes toward the surrounding norms and expectations promoted within one's professional network or educational establishment (**Bervell; Arkorful**, 2020). Precisely, support and enthusiasm displayed by the influential people in the life of an educator such as colleagues and administration may positively influence the educator's confidence and a BI to use multimedia (**Bower; DeWitt; Lai**, 2020). Negative attitudes toward new technologies and resistance to changes conducted either by one's peers or accomplished educators and educational managers may largely impede the integration of technological novelty into one's professional activities. The social pressure variable also includes such influences as formal training, informal discussions with colleagues, educational events, and social media and online communities (**Heidari; Salimi; Mehrvarz**, 2023). The inclination towards the adoption of technology is enhanced by the acceptance of large number of people (**Aldahdouh; Nokelainen; Korhonen**, 2020).

H3: Social influence has significant impact on BI.

3.4. Facilitating Conditions

Facilitating conditions is the degree to which an individual believes about support from organization (**Venkatesh *et al.***, 2003). The technical support services are essential in supporting educators in diagnosing technical issues, comprehending software usage, and removing any barriers that impede the use of multimedia tools (**Koumpouros**, 2024; **Yuan *et al.***, 2023). As a result of the availability of resources, educator views on the sufficiency and accessibility of outlets for technical support influence their intentions to use the system. Professional development and training are resources needed by educators to learn the tools, learn how to use them to teach the best way, and learn the proper pedagogy to use them to their utmost potential's (**Van Driel; Berry**, 2012). Education institutions that offer well-designed training courses and continue to support the trainers are more inclined to form positive intention towards technology adoption and support the implementation of innovative teaching. Administrative measures and other support systems are fundamental parts of the facilitating conditions factor. Written policies, organizational incentives and rewards for using multimedia teaching aid can help the educators build their confidence in using these methods (**Rivaldo; Nabella**, 2023). In addition, when the administration demonstrates a clear commitment to supporting the education technology program, it shows educators how important the use of multimedia tools is.

H4: Facilitating conditions has a significant impact on BI.

At the same time, the present of facilitating conditions in Beijing – city of technological advancement – is of utmost importance for educators that ensure multimedia in teaching to be adopted appropriately. If educators feel that there is a technical support, access to necessary facilities and resources, and encouragement from the overall institutional affairs, the adoption of multimedia by educators increases (**Habibu**, 2012). For example, if universities and colleges in Beijing deliver thorough programs of training on how to use multimedia, provide its educators with updated versions of software and hardware, and have supportive policies that encourage technology integration in teaching then educators are likely to be highly confident and much motivated to use the multimedia tools (**Guo; Huang**, 2021). Additionally, the hypothesis presented seems to insist that maintaining the facilitating conditions does not only enable educators to reveal a significant BI to use multimedia but also have considerable effect on directly adopting the multimedia tools. Thus, the inability to maintain the facilitation may result in a low adoption of the multimedia tools utilization. The hypothesis implies that, although educators may have good intentions of utilizing the multimedia tools, they may fail to adopt them if the environment is unfavorable.

H5: Facilitating conditions has a significant impact on adoption of multimedia tools.

3.5. Perceived Institutional Support

Perceived institutional support is a measure that assesses educators' perceptions of the level of support, encouragement, and resources that their educational institutions will provide for the integration of multimedia tools in teaching practices (**Wang; Zhao**, 2021). The educational technology is a field of education that is developing too rapidly, and the role of educational institutions' support in promoting and developing new innovative teaching technologies is significant. Beijing is the frontrunner in technological achievements in China and in a rapidly growing city the situation of the need to improve teaching effectiveness and student engagement also rapidly changes. Such perceived support from educational institutions is likely to influence educators' attitudes and intention towards adoption of the multimedia tools (**Qashou**, 2021). Perceived institutional support touches on the support offered by educational institutions such as financial resources used to develop the necessary technology infrastructure, implementing policies to encourage the use of multimedia tools, providing the educators with professional development opportunities, and administrative support to encourage educators to effectively integrate technology in the curriculum and teaching methodologies. Perception of institutional support will influence the level of confidence of educators on their ability to effectively use multimedia and how committed they are to investing in the adoption effort (**Utomo *et al.***, 2023). Educators cannot achieve their teaching objectives or they feel burdensome without institutional support which ultimately affects their adoption of multimedia tools (**Alyoussef; Omer**, 2023).

H6: Perceived institutional support has significant impact on BI.

3.6. Perceived Student Engagement

Perceived student engagement has been considered as the extent to which multimedia tools can help students participate and interact effectually and comprehend material taught in the classroom (**Manu *et al.***, 2021). In the modern age, student engagement is a critical component of educational practice and has been recognized as a key determinant with regard to encouraging active learning, motivation, and academic excellence. Beijing, as a technological hub for innovation in China's capital, has seen a rise in the use of multimedia tools in increasing teaching efficacy and student involvement (**Feijóo *et al.***, 2021). Therefore, it is important to know the effect of perceived student engagement on educators' intentions to adopt the multimedia tools. Educators' perception of student engagement covers their attitudes towards the view that media tools and other technologies bring educational benefits to the students and allow them to partake actively in the learning process. (**Egielewa *et al.***, 2022).

Perceived student engagement impacts the BI (**Asim *et al.***, 2020; **Nepal; Rogerson**, 2020). The student perceptions of engagement may depend on teachers' observations of students' responses and reactions to the multimedia-driven teaching methods (**Khasawneh; Khasawneh**, 2023). The positive feedback of students including how their knowledge and learning experience are enhanced by the multimedia tools are helpful to the educators' beliefs on technology adoption and increase the probability of them using the multimedia tools in the in years to come.

H7: Perceived student engagement has significant impact on BI.

3.7. behavioral intention (BI)

BI denotes the level of commitment and preparedness of an individual for a certain behavior of the choice, which is using multimedia tools for teaching (**Yadegaridehkordi *et al.***, 2020). In contrast, adoption is about the proper use of multimedia tools in a context of education. In this regard, the relationship between BI and adoption is essential for decrypting the drivers of multimedia tools use among Chinese educators. The BI as suggested in the model of UTAUT can be seen as a direct indicator of the actual usage behavior (**Venkatesh *et al.***, 2003). As per the theory, individuals' behavioral intents are largely shaped by how they think the technology will perform, how easy it is to use and even how other people think about the technology. Several factors influence BI. Firstly, the educators will be more inclined to adopt multimedia tools if it improves learning outcomes (**Abdulrahaman *et al.***, 2020). Secondly, effort expectancy, which is the easiness to use multimedia tools. If they find this technology easy to use they will be more inclined to adopt it. In contrast, the presence

of perceived complexity or difficulty in using multimedia instruments can make educators not to intend to use them, even if they recognize the benefits that they could give (**Pellas; Mystakidis; Kazanidis**, 2021).

Social influence based on peer effects, organizational norms, and professional contacts, is prominent in forming the behavior intention. The positive responses from colleagues or even institutional leaders can increase educators' confidence in making a switch to multimedia techniques, which makes for a very strong BI (**Leow; Phua; Teh**, 2021). In addition, facilitating conditions, such as the provision of technical support, resources access, and institutional policies supporting technology integration, might influence teachers' intention to integrate multimedia technologies. Educators who view the institutions' support around technology adoption are more likely to express that they are willing to adopt new technologies. BI and adoption are not only one way, but the relationship between them is mutual. The BI may lead to adoption of the technology but at the same time the actual experience someone has with the technology may also shape and reinforce BI (**Unal; Uzun**, 2021). Positive experiences with multimedia tools, like improved teaching effectiveness and students' engagement, will make educators feel good and continue to use them in the future. Therefore, the following hypothesis is developed.

H8: BI has significant impact on adoption of multimedia tools.

3.8. behavioral intention (BI) as a Mediator

Educators who consider multimedia as a helpful way of expanding teaching effectiveness plan to adopt these tools with positive intentions. This positive intention, which results in the use of multimedia in teaching, gives rise to the adoption of multimedia as educators find them more motivating and so will be keen to explore and implement them in their teaching practices (**Yang**, 2022). Educators who view multimedia tools as easy-to-use and effortless to embed into their educational practice will have a good motivation to adopt them. This intention mediates the relationship between effort expectancy and adoption of multimedia tools. Educators, who see favorable attitudes and the norms of multimedia usage among their peers, show more agreement to also adopt these tools. This intention creates a strong bond between social influence and adoption. Educators who will have support for the integrating multimedia tools in their teaching practices will be more likely to develop positive intention in adopting these tools (**Ifinedo; Rikala; Hämäläinen**, 2020). Therefore, this intention mediates the relationship between facilitating conditions and adoption. In addition, perceived institutional support and perceived student engagement are both found to influence BI, which subsequently mediates the relationships between these factors and the adoption of multimedia tools for teaching.

H9: BI mediates the relationship between performance expectancy and adoption of multimedia tools.
H10: BI mediates the relationship between effort expectancy and adoption of multimedia tools.
H11: BI mediates the relationship between social influence and adoption of multimedia tools.
H12: BI mediates the relationship between facilitating conditions and adoption of multimedia tools.
H13: BI mediates the relationship between perceived institutional support and adoption of multimedia tools.
H14: BI mediates the relationship between perceived student engagement and adoption of multimedia tools.
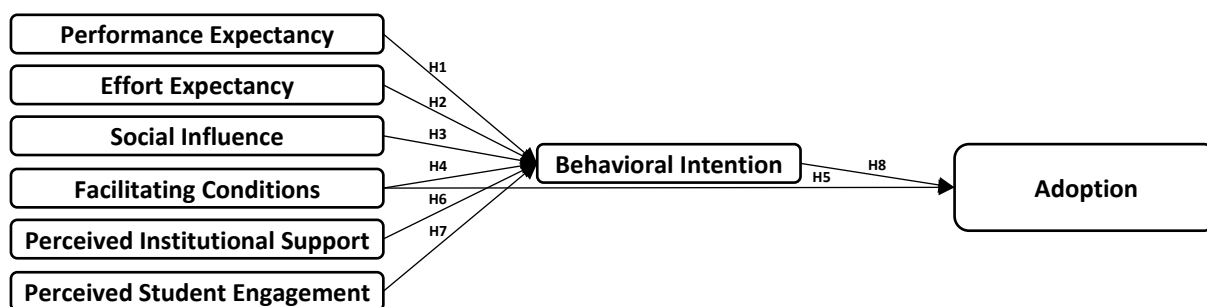

Figure 1: Research Framework.

4. Methodology

The study employed a cross-sectional design to examine the determinants of Chinese educators' adoption of multimedia tools for teaching in Beijing. Cross-sectional research provides an opportunity for data collection at a certain point in time, which uncovers the current status and dynamics of the pertinent phenomenon. The research population of the study were educators employed by public and private education institutions in Beijing, China. A convenience sampling technique was used to collect data from 300 educators. Data were gathered through a structured questionnaire that was delivered to participants. The questionnaire was developed based on the UTAUT model, with perceived institutional support and perceived student engagement being incorporated to provide a holistic understanding of adoption dynamics. Responses were measured using Likert-type scales, so that the participants to identify their agreement or disagreement with particular item on a numerical scale.

To carry out analysis, the study utilized the IBM SPSS AMOS software, with specific structural equation modeling (SEM) as the data analysis technique. SEM lets the researcher probe into the complex relationships among variables and help test

hypothesized theoretical models. **Hair; Gabriel, and Patel** (2014) stated that CB-SEM has several advantages to obtain results from a complex model. The research guidelines were strictly abided during the research process. The participants were explained the aim of the study, their voluntarily participation, and the confidentiality of their answers.

5. Data Analysis and Results

The study tested the measurement model and determined if the variables represented the theoretical components or not through these metrics. Additionally, the hypotheses were evaluated (the structural model) by means of fitting the designed research model.

5.1. Assessment of the measurement model

The confirmatory factor analysis (CFA) with the AMOS software was performed to testify to the validity of measurement model. Table 2 displays that all the factor loadings are higher than the cutoff value of 0.6 (**Hair *et al.*, 2016). CMIN/DF, CFI, NFI, GFI, RMR, SRMR, and RMSEA were used to assess the model's goodness-of-fit. All the values of these metrics were in the recommended range (**Bentler**, 1990; **Hu; Bentler**, 1998). All the model-fit measures are displayed in Table 1. The measurement model is shown in Figure 2.
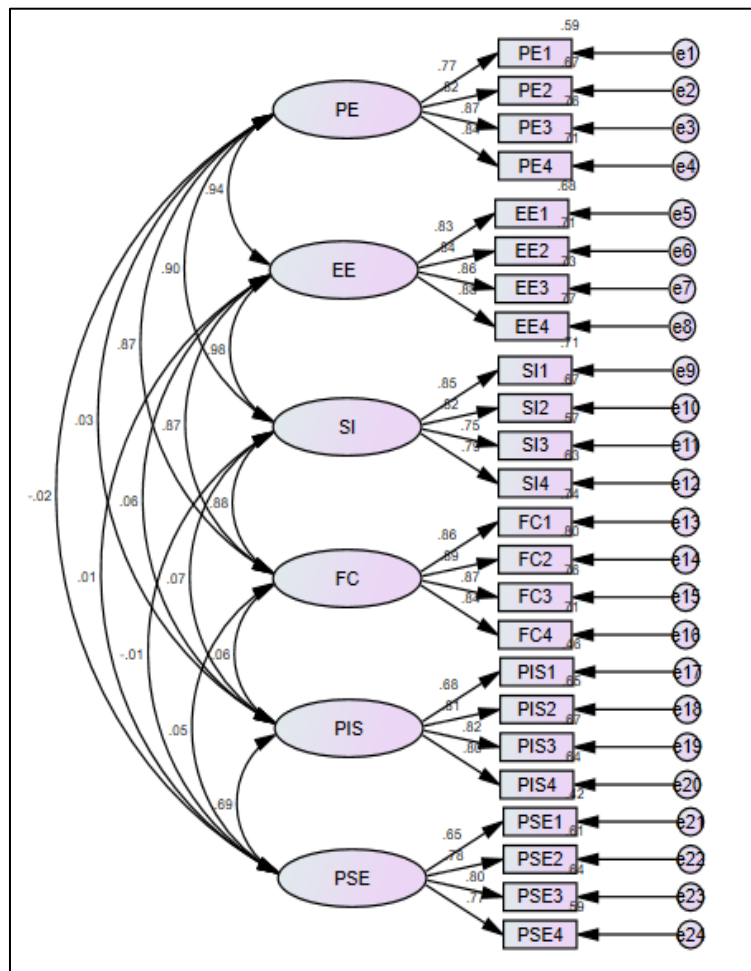

Figure 2: Confirmatory Factor Analysis.

Table 1: CFA Model Fit Indices.

Measure	Recommended Values	Scores
X^2/df	< 3.0 *	1.553
CFI	> 0.90 *	0.960
NFI	> 0.90 *	0.912
GFI	> 0.90 *	0.901
RMR	< 0.08 *	0.043
SRMR	< 0.08 *	0.039
RMSEA	< 0.08 *	0.043

5.2. Reliability

Cronbach's alpha (α) and composite reliability (CR) were used as the tools to estimate the reliability of the constructs. As it can be seen from Table 2, all α values of all the study constructs are higher than the recommended value of 0.70

(**Bernstein; Nunnally**, 1994). The CR values, show a range of 0.840 to 0.913, were higher than the level of 0.70 recommended (**Hair et al.**, 2010). These items were considered as valid and accurate measures of constructs because

5.2.1. Convergent Validity

The average variance extracted (AVE) as a criterion was used to assess the convergent validity of the scale items. Table 2 shows that the AVE values were all greater than 0.50 cutoff value (**Fornell; Larcker**, 1981). Consequently, the current research confirms the convergent validity.

5.2.2. Discriminant Validity

The Fornell and Larcker Criterion (FLC) (**Fornell; Larcker**, 1981) and the Heterotrait-Monotrait (HTMT) Ratio (**Henseler; Ringle; Sarstedt**, 2015) were selected as methods of establishing discriminant validity. The outcomes have evidence that the FLC is built for all constructs. Recent critics of the Fornell and Larcker view have created a debate and thereby increasing the usage of the HTMT. The results of the study indicate that all the HTMT values are in the suggested range of 0.90 (**Gold; Malhotra; Segars**, 2001). Thus, HTMT is established for each construct. The HTMT matrix is shown in Table 3.

Table 2: Loadings, AVE, CR.

Constructs	Items	Loadings	AVE (> 0.5)	CR (> 0.7)
Performance Expectancy (PE) (α = 0.801)	"I would find the system useful in my job"	0.830	0.623	0.868
	"Using the system enables me to accomplish tasks more quickly"	0.843		
	"Using the system increases my productivity"	0.771		
	"If I use the system, I will increase my chances of getting a raise"	0.707		
Effort Expectancy (EE) (α = 0.782)	"My interaction with the system would be clear and understandable"	0.793	0.580	0.846
	"It would be easy for me to become skillful at using the system"	0.804		
	"I would find the system easy to use"	0.775		
	"Learning to operate the system is easy for me"	0.668		
Social Influence (SI) (α = 0.791)	"People who influence my behavior think that I should use the system"	0.735	0.569	0.840
	"People who are important to me think that I should use the system"	0.824		
	"The senior management of this business has been helpful in the use of the system"	0.823		
	"In general, the organization has supported the use of the system"	0.619		
Facilitating Conditions (FC) (α = 0.824)	"I have the resources necessary to use the system"	0.777	0.641	0.877
	"I have the knowledge necessary to use the system"	0.84		
	"The system is not compatible with other systems I use"	0.804		
	"A specific person (or group) is available for assistance with system difficulties"	0.782		
Perceived Institutional Support (PIS) (α = 0.761)	My institution provides adequate resources and funding to support the integration of multimedia tools in teaching practices	0.823	0.599	0.856
	I feel supported by my institution through professional development opportunities specifically tailored to enhance my skills in using multimedia tools for teaching	0.769		
	Administrative policies and guidelines at my institution encourage and facilitate the adoption of multimedia tools in the classroom	0.716		
	I perceive a strong commitment from my institution's leadership to prioritize and invest in the effective use of technology for educational purposes	0.784		
Perceived Student Engagement (PSE) (α = 0.734)	I observe increased levels of student participation and interaction when using multimedia tools in my teaching	0.789	0.618	0.866
	Students demonstrate higher levels of motivation and enthusiasm in learning activities facilitated by multimedia tools	0.826		
	Multimedia tools effectively cater to diverse learning styles and preferences, leading to enhanced student engagement	0.769		
	I receive positive feedback from students indicating that multimedia-enhanced lessons contribute to their overall learning experience	0.761		
Behavioral Intention (BI) (α = 0.734)	I intend to continue using multimedia in the future	0.760	0.681	0.895
	I will always try to use multimedia in classroom	0.823		
	I plan to continue to use multimedia frequently	0.871		
	I predict I would use multimedia in the future	0.844		
Adoption (AD) (α = 0.734)	I rarely use multimedia	0.839	0.724	0.913
	I regularly use multimedia	0.849		
	I always use multimedia	0.856		
	I occasionally use multimedia	0.861		

Table 3: HTMT.

	Performance Expectancy	Effort Expectancy	Social Influence	Facilitating Conditions	Perceived Institutional Support	Perceived Student Engagement	BI	Adoption
Performance Expectancy								
Effort Expectancy	0.24							
Social Influence	0.39	0.37						
Facilitating Conditions	0.31	0.21	0.24					
Perceived Institutional Support	0.49	0.26	0.39	0.27				
Perceived Student Engagement	0.29	0.30	0.23	0.31	0.19			
BI	0.34	0.22	0.32	0.38	0.34	0.43		
Adoption	0.42	0.20	0.41	0.32	0.24	0.33	0.25	

5.3. Assessment of the Structural Model

The AMOS structural model was employed to test the study hypotheses. **Hair *et al.*** (2010) argues that the structural model is a good fit for data if the measures of model fit—CMIN/DF, CFI, NFI, GFI, RMR, SRMR and RMSEA—are in the acceptable range. Each metric value is within the specified range as indicated in Table 4. The R^2 values were 61% for BI and 65% for adoption of the multimedia tools for teaching.

Table 4: Structural Model Fit Indices.

Measure	Recommended Values	Scores
X^2/df	< 3.0 *	1.537
CFI	> 0.90 *	0.961
NFI	> 0.90 *	0.913
GFI	> 0.90 *	0.902
RMR	< 0.08 *	0.044
SRMR	< 0.08 *	0.054
RMSEA	< 0.08 *	0.045

All the hypotheses of the study were assessed using structural equation modeling in AMOS. The results shown in Table 5 indicates that performance expectancy has positive relationship with BI (b=0.827, t = 6.778, p < 0.001), therefore H1 is supported. Effort expectancy positively influences the BI (b=0.452, t = 6.457, p < 0.001), thus H2 is supported. The results indicate that social influence has significant impact on BI (b=0.344, t = 5.548, p < 0.001), consequently H3 is accepted. The findings show that H4 is accepted as there is a positive relationship between facilitating conditions and BI (b=0.325, t = 7.558, p < 0.001). The results also reveal that facilitating conditions has positive and significant impact on adoption of multimedia tools (b=0.557, t = 3.841, p < 0.001), therefore H5 is supported. As shown in Table 5, the perceived institutional support positively influences the BI (b=0.324, t = 7.714, p < 0.001), resulted in the acceptance of H6. H7 is also supported because the perceived student engagement has significant impact on BI (b=0.811, t = 7.650, p < 0.001). The last hypothesis H8 was also accepted as the findings show that BI leads to the adoption of multimedia tools for teaching (b=0.431, t = 3.475, p < 0.001).

The study also examines how BI mediates the relationship among performance expectancy, effort expectancy, social influence, facilitating conditions, perceived institutional support, perceived student engagement and adoption. The results show that BI has positive mediation effect between performance expectancy and adoption (β = 0.119; p < 0.05), therefore H9 is accepted. The findings also reveal that BI positively mediates the relationship between effort expectancy and adoption (β = 0.124; p < 0.05), social influence and adoption (β = 0.131; p < 0.05), facilitating conditions and adoption (β = 0.129; p < 0.05), perceived institutional support and adoption (β = 0.142; p < 0.05), perceived student engagement and adoption (β = 0.117; p < 0.05), therefore H10, H11, H12, H13, and H14 are supported.

Table 5: Hypothesis Results.

Hypothesis	Estimate	S.E.	C.R.	P
PE → BI	.827	.122	6.778	***
EE → BI	.452	.070	6.457	***
SI → BI	.344	.062	5.548	***
FC → BI	.325	.043	7.558	***
FC → AD	.557	.145	3.841	***
PIS → BI	.324	.042	7.714	***
PSE → BI	.811	.106	7.650	***
BI → AD	.431	.124	3.475	***
*** p<0.001				

6. Discussion and Conclusion

This research study reveals the factors affecting the adoption of multimedia tools by Chinese educators in Beijing. The results of the study have been beneficial to education policy makers at different institutional levels and the educators themselves. The results demonstrate that performance expectancy, effort expectancy, social influence, and facilitating conditions all play a major role in determining BI as stipulated in the extended UTAUT model. Educators who think that multimedia tools are effective, easy to use, socially acceptable and supported with proper facilitating conditions are most likely to have a positive attitude about using them in their teaching methods (**Khechine; Raymond; Augier**, 2020). This implies that prompting educators' understanding of these aspects would raise the rate of adoption of multimedia tools in educational settings. In addition, facilitating conditions is recognized as the main driver not only of BI but also of actual adoption. Supportive educational environment, resource providers, and organizational guidelines make it easy for teachers to incorporate multimedia tools into their teaching (**Haleem *et al.***, 2022). Therefore, such efforts as to evolve facilitating conditions, like providing access to the needed hardware and software, technical support, and institutionally initiated training programs, are pivotal towards the adoption of multimedia tools among the educators of China (**Wang; Chu**, 2023).

In addition, perceived institutional support, and perceived student engagement are positively found to be associated with behavior intention, which suggests the importance of the backing of institutions and engagement of students in

the formation of educators' intentions to utilize multimedia tools. Educational policy makers and institutions should concentrate on the creation of an environment that supports and calls for innovation and experimentation with new media tools and involve students in the adoption process to ensure that their concerns and needs are considered. The mediation analysis indicates that BI plays a critical mediating role across all independent factors, thus revealing its prominent role in shaping educators' adoption decisions. Educator's decisions to be engaged in the use of multimedia are connected to their views on performance expectancy, effort expectancy, social influence, facilitating conditions, perceived institutional support, and perceived student engagement, which then create actual adoption behaviors. It shows that there is an urgency to address the beliefs, attitudes, and perceptions of teachers towards multimedia tools to create an enabling environment that favors the adoption of these tools (**Chan; Lee**, 2023).

In general, the study proposes new findings regarding the dynamics of multimedia tool adoption by Chinese educators working in Beijing. The research pinpoints the vital factors impacting adoption and brings to focus the role of BI as a mediator, thus providing invaluable information to the stakeholders in shaping strategies to ensure the optimal use of multimedia tools in class, consequently leading to improvement in teaching and educational outcomes in the age of digitization. The efforts to increase facilitating conditions, institutional support, and student engagement remain principal for extensive usage of multimedia tools in academic setting (**Bedenlier** *et al.*, 2020).

6.1. Implications

6.1.1. Theoretical Implications

This study gives contributions to the existing studies on technology adoption in education including the Chinese context. This study seeks to expand the UTAUT model by incorporating additional factors like perceived institutional support and perceived student engagement in order to make a theoretical contribution in explaining the dynamics of the adoption of multimedia tools among educators in Beijing, China. Firstly, PE, EE, SI, and FC are established as major predictors of BI which conforms to research outcomes indicating technology adoption. This study, however, elicits a specific empirical consequence within Beijing, which proves the universality of such factors that shape the decision making of educators to adopt multimedia technology. The mediation role of BI among all independent variables reflects the significance of mental processes in the decision-making of adoption. This research unfolds the notion that educators' perceptions and attitudes ultimately lead to the actual adoption behaviors which broadens the theoretical underpinnings of the adoption process and suggests a refined framework for use in the studies of the technology adoption in future (**Sutunyarak**, 2024). Furthermore, the link between perceived institutional support, perceived student engagement, and BI stresses that contextual factors are vital, and they can shape educators' adoption decisions. This emphasizes that theoretical frameworks consider organizational and environmental factors affecting technology adoption, thus depicting the relationship between individual perspectives and an external support system.

6.1.2. Practical Implications

The findings of this study have certain implications for educational policymakers, universities, and teachers that are looking to incorporate multimedia tools in teaching practice in Beijing. Primarily, educational policy makers and organizations should give priority to the investment in the creation of facilitative circumstances that would include the infrastructure, resources, and support systems for the technology adoption. Equipping educators with the needed hardware, software, technical support, and training can lower any existing hurdles and cultivate an environment where multimedia tools are used on a regular basis in a creative, innovative, and experimental way. Moreover, educational institutions should acknowledge the role of institutional support perceived by educators and incorporate educators in the decision-making processes which relate to technology adoption. Educators' attitude towards multimedia use in education can be enhanced if institutions create a favorable organizational culture and pay attention to both educators' concerns and choices (**Bruggeman** *et al.*, 2021). In addition to that, teachers must actively involve the students in the adoption of these practices and effectively use multimedia tools to boost their engagement and performance. Students' feedback and preferences can be a critical resource for teachers as they can use them to align multimedia tools with students' needs and preferences and thus, maximize the efficacy of their methods in the classroom. In general, the application of these findings captures the significant role of both individual and organizational factors in the adoption of multimedia tools in teaching for this area. By choosing a holistic approach that considers teachers' beliefs, institutional support, and students' engagement, the stakeholders can develop a culture of technological innovation and improve the quality of education delivery in the digital era.

6.2. Limitations

Although the study offers a lot of information, there are also a few limitations that need to be specified. Primarily, the convenience sampling technique might narrow down the ability of study findings to apply to the whole group of Chinese educators in Beijing. Another challenge is the overreliance on self-report measures which may lead to response bias and social desirability effects. On the other hand, the cross-sectional nature of the study limits causal inference and temporal relationships between the variables. Future studies might overcome these impediments by employing

representative sampling methods, objective measures of technology diffusion, and longitudinal or experimental designs to demonstrate causality and time precedence.

6.3. Acknowledgement

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