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The Acceptance And Management Of Big Data In Chinese High Schools In Cahngsha

Wang Yuan Bei
Postgraduate Student, INTI International University, Malaysia

Phawani Vijayaratnam
Senior Lecturer, INTI International University

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Abstract

Effectively helping teachers to improve their teaching and learning with big data management is an important component of the education informatics process. In order to explore Changsha teachers' use of big data to manage teaching and learning, this study constructs a model of influencing factors affecting teachers' development at five levels: external factors, perceived ease of use, perceived usefulness, compatibility and behavioural intention with reference to the technology acceptance model. Through data collection and processing,the study found that while perceived ease of use was a significant driver of teachers' use of Big Data management, compatibility was an important factor influencing teachers' acceptance of Big Data management, and the effect of perceived usefulness was not significant.

Keywords

Big Data; Perceived ease of use; Perceived usefulness; Compatibility; Technology acceptance model

Introduction

Wang (2020) defines the acceptance of technology as a multi-faceted procedure consisting of individuals behaviour, feelings behavioural intentions and attitude. The higher the technological development the more is the issue in the acceptance of information. Big data describes hard-to-manage, voluminous data that are both structured or unstructured. According to Yang (2021), big data supports the effective running of educational systems when operated online as it helps provide insights that can provide confidence in decision making especially

when planning and implementing strategic activities. Big data acceptance in high schools of China massively supported effective educational offering during the Covid19 situation as the educational processes plunged suddenly from traditional processes to online platforms. As argued by Zhang (2017), for effective technology acceptance in the development of communication and information technology to take place, school administrators and stakeholders must understand that communication and information technology itself is an important tool in influencing effective school education reforms.

In this research the main experimental variable is technology adaptation. The concept of technology adoption is a term indicating the acceptance, integration, and use of new technology in society. This research has its focus on the acceptance of big data or technological development in the educational teaching and high schools in China. The study focuses on the importance, opportunity, challenges and benefits of accepting big data in the curriculum of Chinese high school (Jiang et al. 2019).

The implementation of the new technologies can complement the curriculum system of the high schools in China. The acceptance of big data will enable the students to achieve core centred and diversified learning Almaiah, M.A et.al. (2019). Technological development will also support students in establishing a mature global outlook of the world. (Li et al. 2019). However, most high school students are inclined towards choosing traditional, physical face-to-face educational teaching even after attending technologically developed online classes. The "Massive Open Online Courses (MOOCs)" are the most significant example of technological development in high school education. As per Jiang et al. (2019) online courses and teacher training have become a significant part of the Chinese high schools' education system. MOOCs which include video and networking of high-quality curriculum resources provide learners with an open educational learning platform. This technological development in high school education although brings benefits, has had its share of challenges in the Chinese education,

The acceptance of big data in the high schools of China has induced the benefits of massive learning for the students with technological developments. As stated by Li and Zhai (2018), the benefit of improved learning and increased knowledge is also to be supported by the acceptance of technological development in the Chinese education system. The major challenge included in the introduction and acceptance of big data in high schools of China is the lack of awareness and resources to operate digital devices. As argued by Fu et al. (2018); Khoa et. al. (2020); Al Qaidoom, H. and Shah, A., 2020, Big data acceptance provides key challenge for the education givers or teaching department in preparing and sharing online notes on a large scale. Maintaining an equal pace of learning for every student through big data acceptance in Chinese high schools is a significant challenge for teachers. While individualised attention can be provided in physical face-to-face classroom sessions, the understanding of students on technological platforms is unpredictable and dissimilar.

However, as summarised from various recent studies, technology acceptance have been studied extensively in the high schools' in China and as per Bragazzi et al. (2020); Valencia-Arias,A.et.al.(2019); Raeisi, S., (2016) the rise of big data technology and MOOCs has opened doors for many opportunities in high school education, and also had a significant impact on the basic education of the students. This research study is more focused on the system and method of acceptance of big data technology and a brief of challenges, benefits, and opportunities of accepting the technological development or big data in the educational system of Chinese high schools.

The study uses the political management model and the cultural model because they are more suitable for the educational management environment of secondary schools in Changsha, China. The political management model provides a rich description and persuasive analysis of events and behaviors in schools Jian,L and Eryng,X.(2021); Lixian,J and Martin,C.(2006). It clarifies that interest is the motivating factor for action. as a motivating factor for action, which is as valid as the concepts of conflict and power. For many teachers and school leaders in Changsha, China the political management model fits with the everyday reality of their school experience (Li, J.2012). The current management mode of Chinese middle schools and colleges usually has the characteristics of "bringing" and "superior designation". Under the influence of the new crown in the educational environment, the use of political management mode and cultural management mode in online teaching can effectively improve management efficiency. Jian,L and Eryong,X(2021)) argues that in higher education organisational games result in win-win or even multi-win outcomes that ensure the smooth implementation of management decisions. As a theory, the political model provides a good theoretical framework for analysis of educational management activities.

And the cultural model adds some useful elements to school leadership and management. components to school leadership and management. By emphasizing the values and beliefs of the participants, the cultural model reinforces the humanity of management. Its emphasis on the symbolic aspects of organizations is also a valuable contribution to management theory. It is a valuable contribution to management theory (Bush, T. 2003; Bush, T 2019)

Problem statement

Technology adaptation in high school scenario may be an old concept, but the adaptation is slow. As stated by Luo, (2021), traditional face-to-face classroom teaching allows for individualised learning and attention where doubts can be clarified instantly and ambiguities solved with immediacy. However, the opposite may happen in online learning as lack of knowledge and confidence in technological platforms may create a vacuum and result in lack of learning. During the years 2017 and 2018, the Educational Ministry of China issued several certification results of premium national online courses and it was evident that acceptance of big data among the children was recorded to be very poor. (Office of the Ministry of Education,2018)

Research Objective

The key objectives of this research revolve around the acceptance, implementation, and importance of big data in educational institutes of China:

RO1: To identify and analyse the impact of the "Technology Acceptance Model (TAM)" on the acceptance of big data analysis in the high schools of China.

RO2: To understand the perceived usefulness of TAM on the "(MOOC) Massive Open Online Courses" conducted in the high schools of China.

RO3: To evaluate the influence of big data acceptance on the informative decision-making of the students and improved educational effectiveness.

Literature Review

Perceived Usefulness (PU)

Perceived usefulness (PU) can be described as an individual's perception of how one applies a specific technology to improve their job performance. The importance of perceived usefulness (PU) has been acknowledged in the acceptance of TAM in Chinese high schools. Salloum et al. (2019) have stated that perceived usefulness (PU) is the probability of an individual's ability to complete a task by using technology. According to Salloum et al. (2019), the aspects that evaluate the stance of perceived usefulness on technology acceptance of online learning platforms can be deciphered as enhancement in student's learning efficiency, the usefulness of the learning platform in enhancing learning effect on students, the usefulness of the learning platform in easing student's ability to complete the task, and its functionality in solving the student's learning issues.

Perceived Ease of Use (PEOU)

Perceived Ease of Use (PEOU) can be described as the degree to which an individual accepts that using innovation is not difficult to understand and use. According to Doulani (2018), perceived ease of use can be depicted as the extent to which an innovation is perceived by an individual to be better than the alternatives before him PEOU and PU have a positive impact on the acceptance of TAM in Chinese high schools. Perceived ease of use (PEOU) has an impact on the acceptance of technology in Chinese high schools by influencing individuals' decision factors of using online learning platforms.Compatibility

The diffusion of innovation theory states that the compatibility of a new technology on users' values positively correlate with their prior experiences and current needs and usage (Yakubu,M.N.et.al (2020); Putra, D., 2019). This paper uses compatibility to measure the extent to which teachers' use of information technology is compatible with their personal educational philosophy, behavioural habits and usage needs.

Global Perspective

The implication of technology helps in the initiation of various decisions and can provide updated information across many areas and disciplines. (Taherdoost et al. 2018). The implication of advanced technology in schools is helpful in improving the overall structure of the education system. Technology has helped the students collaborate online using various learning platforms and across communities via forums and increased the importance working together to achieve common goals.

China's Perspective

The changing technology has promoted the concept of independent learning and ensures students' active learning by ensuring instant communication with them (Salloum et al. 2019) providingthe adaptation of technology, various new and potential ways for efficient learning have been introduced for the younger generation which plays a significant role in shaping the future of the students. PEOU (Perceived ease of use) is an important aspect of the technology acceptance model and is an essential identification of the behavioral intention of proposing technology. It explores different factors that play an important role in affecting students' acceptance of mobile basic. It is crucial to understand the willingness of the users to adopt technologies in a wide range of areas, including the education sector (Guo, Z. and Shaheen, Z.(2019).

Factors influencing Technology Acceptance

The factors influencing technology acceptance can be depicted as perceived usefulness (PU)、compatibility and perceived ease of use (PEOU) which are responsible for affecting individual handling behavior. The fast pace development taking place all across the globe with the evolution in Information technology (IT) has advanced constant and robust development of online education. The technology acceptance model (TAM) is considered a multifaceted model that depicts the behavior and actions of the individuals who have adopted a new technological innovation. The factors influencing the adoption of the innovation known as massive open online courses (MOOCs) by the individuals of the Chinese high school can be deciphered as the variables of the technology acceptance model namely the perceived ease of use and perceived usefulness (Khoa et al. 2020).

Gaps in the literature

In the reform of the internal management system of secondary schools and colleges in China, the main spin is to 'decentralise', including the expansion of headmasters' authority to run schools, the right to employ their own staff and the autonomy of internal distribution within schools. These 'decentralisation' measures have been a major challenge to the planned economic system, where the

government has too much control over schools, leaving them lacking in vitality and dynamism (Li et. al. 2018) .This is the main problem in the process of reforming the internal management system of schools at this stage.

As argued by Li et al. (2018), strict internal rules and regulations are an effective means of management, and they are constantly being revised in response to changes in the internal and external environment. China is just starting out in the field of education management, and there is still a lot of room for improvement and the need to incorporate advanced management strategies from abroad. However, for a social discipline such as educational management, the guidance from theory to practice is not straightforward; an experimental study or action research is needed as a mediating bridge.

At present, there is not much research on how educational management models are applied in educational institutions, and more experimental or action research is needed to help us judge the currency of these theoretical models. In addition, detailed observation is necessary in the application of educational management theory to guide educational management practice. It is only through observation that the nature of educational management can be fully understood. Based on the application of theory and careful observation, a comprehensive and holistic analysis of educational management is conducted to verify the effectiveness of educational management models. The effectiveness of the model lays the foundation for further innovation and development of the educational management model.

Grounded Theory of the research

To investigate the acceptance and acquisition of technology by individuals, various researchers have put forward many theories on the embracing of Information technology, and the Technology Acceptance Model (TAM) has been used in the research to discuss the individual's behavior using information technology(Salloum et al. 2019; Min, S. et. al 2019).

. The purpose of the grounded or fundamental theory is to explore the acceptance of technological innovations in the form of online learning platforms by individuals studying in Changsha high schools.

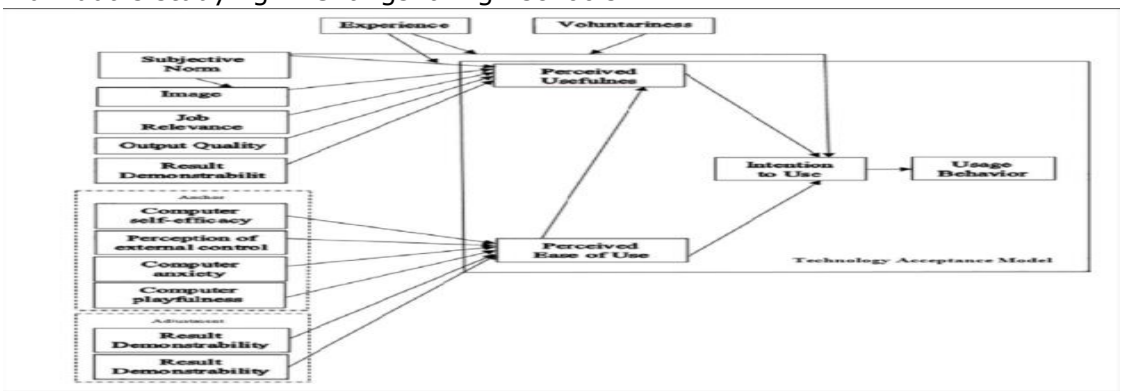

Figure 2.4.1: Technology Acceptance Model (TAM3)
(Source: Raeisi, 2016)

The above-mentioned figure depicts the modification in the original Technology Acceptance Model (TAM) as TAM3. According to Hamutoglu, (2020), TAM3 is considered a more comprehensive model, and an enhancement over the original technology acceptance model. The TAM3 was developed by various authors and the new variables or determinants of perceived ease of use and perceived usefulness can be depicted as social influence, easing conditions, system attributes, and individual differences. The perceived ease of use is not exorbitantly explored in the TAM2, while perceived usefulness has been explored and explained around 40-60%. The TAM3 is a more elaborate evaluation and discussion of perceived use of ease and perceived usefulness, and also depicts that PEOU does not affect the PU (Scherer et al. 2019; Bendary, N. and Al-Sahouly, I., 2018).

Research Methodology

Nature of Research

The non-probability sampling method was used in the study and the respondents have been selected purposefully. A total of 230 questionnaires were distributed to undergraduate teacher training students and in-service secondary school teachers. 213 questionnaires were returned, with a return rate of 92.6%, of which 206 were validly returned, with an effective rate of 96.7%.

Types of investigation

In this study, the descriptive correlation design was to ascertain the relationship between TAM and technology acceptance. TAM is the independent variable of the study and includes the dimensions of perceived usefulness and perceived ease of use. The dependent variable of the study is technology acceptance.

Questionnaire Design and Instrument

In this study, based on the collation and categorization of previous related studies, the original scales of Davis.F.D's.(1989) ' description of perceived ease of use and perceived usefulness, Moon, J.W. and Kim, Y.G's., (2001)description of attitudes towards use and behavioural intentions, and Moore measure of compatibility (Karahanna,E. 2006) were used to develop the questionnaire from the five elements of the model. The questionnaire uses a 7-point Richter scale of judgement and respondents are asked to choose according to their level of agreement with the content of each question statement.

Pilot Test

Cronbach's alpha coefficient was used to assess the questionnaire's reliability for both internal consistency and corrected item-total correlations Based

on the 20 responses gathered through the pre-test, the internal consistency of the items has been measured.

Table 3.3.2 Reliability analysis

Measurement dimensions	Perceived ease of use	Perceived usefulness	Compatibility	External factors	Behavioural Intentions
Topic items	6	6	4	4	3
Alpha Confidence coefficient	0.83	0.89	0.83	0.86	0.88

Correlation Analysis

In this study, internal consistency of the questionnaire was counted using SPSS 18.0 for reliability analysis. This is shown in Table 3.3.2. The Alpha coefficient for the total questionnaire was 0.94, and the Alpha coefficients for perceived ease of use, perceived usefulness, compatibility, external factors and behavioural intentions all exceeded 0.80, indicating that the questionnaire used in this study had high reliability and high internal consistency for all dimensional questions.

Regression analysis

Parameter Estimates (n=200)

	Unstandardized Coefficients		Standardized Coefficients							
	B	Std. Error	*Beta*	*t*	*p*	VIF	R^2	Adj R^2	*F*
Constant	1.396	0.371	-	3.764	0.000**	-			
Perceived ease of use感知易用性	0.121	0.089	0.104	1.355	0.177	1.329			
Perceived usefulness 感知有用性	0.206	0.084	0.190	2.454	0.015*	1.356	0.134	0.116	$F(4,195)=7.526, p=0.000$
External factors 外部因素	0.096	0.070	0.094	1.374	0.171	1.059			
Compatibility 兼容性	0.156	0.106	0.124	1.467	0.144	1.604			

Dependent Variable: Behaviour Intentions 行为意图

D-W: 1.873

* $p<0.05$ ** $p<0.01$

Table 3.4.3 Regression analysis

From the above table, it can be seen that Perceived ease of use, Perceived usefulness ,External factors ,Compatibility were used as independent variables and Behaviour Intentions were used as dependent variables for linear regression analysis, from the above table, it can be seen that the model equation is Behaviour Intentions = 1.396 + 0.121*Perceived ease of use + 0.206*Perceived usefulness + 0.096*External factors + 0.156*Compatibility, the model R-squared value is 0.134 This means that Perceived ease of use, Perceived usefulness, External factors, and Compatibility can explain 13.4% of the variation in Behaviour Intentions. An F-test of the model revealed that the model passed the F-test (F=7.526, p=0.000<0.05), which means that at least one of Perceived ease of use, Perceived usefulness, External factors, Compatibility would have an effect on Behaviour

Intentions. In addition, the multiple covariance of the model was tested and found that the VIF values were all less than 5, meaning that there was no covariance in the model; and the D-W values were around the number 2, thus indicating that there was no autocorrelation in the model and that there was no correlation between the sample data and the model was good (Frossard, J. and Renaud, O., 2021).

Findings And Discussion

Participants Characteristics

A total of 250 questionnaires in Secondary Schools in Changsha, 233 questionnaires were returned and 20 of these questionnaires were used for the pre-testing. Reliability Analysis, Hypotheses Testing, Pearson Correlation, Regression Analysis and Result of Hypotheses Testing were all performed in this research.

Descriptive Information of Respondents

The demographics of the respondents are shown in the table below. Descriptive analysis was used to examine demographic characteristics.

Table 4.1 The demographics of the respondents

Demographic	Categories	Frequency	Percentage(%)
Gender	Male	88	37.76%
	Female	145	62.24%
Age Group	22-25	32	13.73%
	26-28	124	53.21%
	30 and above	77	33.04%
Teaching Major	Liberal Arts Subjects	136	58.36%
	Science Subjects	97	41.63%
grade	Freshman	81	34.76%
	sophomore	72	30.90%
	Junior	80	34.33%

Based on Table 4.1, from the 233 responses received, 37.76%(n=88) of the respondents were male, while the remaining 62.24% (n=145) of the respondentswere female.

Most of the respondents in the study were in the age group of 26-28 years old (53.21%, n=124), followed by respondents aged 30 and above (33.04%, n=77), 22-25 years old (13.73%, n=32).

The grades most respondents are teaching (34.76%, n=81), and Junior (30.90%, n=72), followed by respondents with sophomore (39.8%, n=154).

Participants who teaches Liberal Arts Subjects in the study (58.36%, n=136) and Science Subjects (41.63%, n=97).

Descriptive Information of the Variables

KMO and Bartlett test		
	KMO	0.976
Bartlett test	Approx. Chi-Square	2441.211
	df	120
	p value	0.000

Table 4.3 KMO and Barlett's Test

Using factor analysis for information enrichment research, the study data was first analysed for suitability for factor analysis, as can be seen from Table 4.3 above: the KMO was 0.976, which is greater than 0.6 and meets the prerequisite requirements for factor analysis, meaning that the data can be used for factor analysis research. As well as the data passed the Bartlett's sphericity test ($p<0.05$), which indicates that the data is suitable for factor analysis.

Reliability Analysis

Measurement dimensions	Perceived ease of use	Perceived usefulness	Compatibility	External factors	Behavioural Intentions
Topic items	6	6	4	4	3
Alpha Confidence coefficient	0.935	0.839	0.861	0.862	0.782

Table 4.3.2 Reliability Analysis

According to Table 4.3.2, the Cronbach's Alpha values for both independent anddependent variables meet the minimum requirements for reliability analysis (>0.7). Therefore, all variables and items in the questionnaire of this study were accepted and reserved for further study.

Hypotheses Testing

Based on the literature review conducted in Chapter 2, the following hypotheses were established. Multiple linear regression was used to test these hypotheses.

H1: Perceived Usefulness (PU) as an aspect of the Technology Acceptance Model (TAM) has a significant impact on the acceptance of MOOCs in Changsha.

H2: Perceived Ease of Use (PEOU) as an aspect of TAM has a significant impact on

the acceptance of massive open online courses in Changsha.

H3: Compatibility of TAM has significant influence on teacher online learning management effectiveness in higher education in Changsha.

R	R^2	Adj. R^2	模型误差RMSE	D-W	AIC	BIC
0.896	0.803	0.795	0.365	1.801	91.997	105.023

Table 4.4.1 Multiple Regression Model summary

The R-square value of the model is 0.803, which means that Perceived usefulness, Perceived ease of use, External factors, and Compatibility can explain 80.3% of the variation in Behaviour Intentions (teacher's management effectiveness using big data).

ANOVA

	Sum of Squares	*df*	Mean Square	*F*	*p* value
Regression	54.279	4	13.570	96.976	0.000
Residual	13.293	95	0.140		
Total	67.572	99			

Table 4.4.2 Multiple Regression ANOVA

From the table 4.4.2 above, the model was found to pass the F-test (F=96.976, p=0.000<0.05) when the model was tested, which means that the model construction is meaningful.

Parameter Estimates (*n*=100)

	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*	VIF	R^2	Adj R^2	*F*
	B	Std. Error	*Beta*						
Constant	0.490	0.189	-	2.600	0.011*	-			
Perceived usefulness感知有用性	0.123	0.108	0.127	1.140	0.257	6.010			
Perceived ease of use感知易用性	0.454	0.094	0.500	4.828	0.000**	5.175	0.803	0.795	*F*(4,95)=96.976,*p*=0.000
External factors 外部因素	0.147	0.085	0.160	1.726	0.088	4.148			
Compatibility 兼容性	0.157	0.071	0.170	2.228	0.028*	2.816			

Dependent Variable: Behaviour Intentions 行为意图

D-W: 1.801

* *p*<0.05 ** *p*<0.01

Table 4.4.3 Parameter Estimates

The final concrete analysis shows that:

The regression coefficient of Perceived usefulness was 0.123 (t=1.140, p=0.257>0.05)

The regression coefficient value for Perceived ease of use was 0.454 (t=4.828, p=0.000<0.01)

The regression coefficient value for External factors was 0.147 (t=1.726, p=0.088>0.05)

The regression coefficient for Compatibility was 0.157 (t=2.228, p=0.028<0.05)

To conclude the analysis, it can be seen that Perceived ease of use, Compatibility has a significant positive effect on Behaviour Intentions. However, Perceived usefulness, External factors did not have a significant influence on Behaviour Intentions.

Conclusion

Based on the hypothesis results, perceived ease of use and compatibility were found to have a positive impact on the acceptance and management of big data by Chinese high school teachers in Changsha City. The perceived usefulness has no positive impact.

Recommendations

Need to provide opportunities for teachers to come and learn about technology.

In this study, teacher trainees who had studied educational technology courses and had experience in educational internships scored higher on perceived ease of use, with higher scores for males than females and significant differences in scores between majors. This suggests that we need to provide more opportunities for them to learn and apply technology in the teacher training process, so that they can overcome their unfamiliarity and fear of technology and improve their perceived ease of use in integrating IT in their teaching.

Create a good external environment for teachers to learn about technology.

The results of the data analysis in this study show that compatibility is influenced by external factors and this will in turn influence the perceived usefulness and behavioural intentions. To promote effective compatibility and to build the bridge between teacher educators' existing value judgments, ideas and habits with the new technologies, the creation of a conducive external environment together with improvement of the technology are simultaneously needed. This is because when both teachers and peers adopt an integrated Information Technology approach to teaching and learning, they will actively explore and apply technology and slowly include this as a necessity for effective teaching and learning. With this confidence is built and diffused among the teaching fraternity and over time will reduce teacher inhibitions on technology use.

In view of the fact that theories of educational management have started more from classical administrative theories, this has led to educational

management theories relying more on administrative theories and less on educational colours, which has denigrated the educational character of educational management. In the Western academic world, educational administration, educational leadership and educational management are being discussed in separate fields, but China's educational management community has failed to grasp this dynamic in time, resulting in the confusion between theories of educational administrative organisation and school management, which has affected the construction and improvement of the discipline of educational management in China. In terms of practice, for any country or nation's education, the field of educational leadership and management is not only a field of academic research, but also a field of practice, but also a field of ideology that leads and maintains the scientific and rational operation of educational organisations. As we move forward with educational reform in China to ensure sustainable educational advancement, it is not only the duty of theorists to identify the assumptions, characteristics, strengths and weaknesses of different Western educational management theories, but also has far-reaching significance in guiding our reform practice, especially in the current context of furthering the diversified development of general high schools. At the same time, it is also a potential opportunity for China to improve the level of educational management research and theoretical standards by combining the strengths of different theories and exploring an integrated management model that can be "used by me".

Contributions to Future Research

Due to the difference between big data management and traditional education management models, further research is needed to explore the challenges faced in the transition from traditional teaching to online teaching. The TAM variable deserves a deeper exploration, including external factors, to help teachers use technology to improve their ability to manage big data by using perceived usefulness and perceived ease of use.

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