International Education Studies; Vol. 11, No. 2; 2018
ISSN 1913-9020 E-ISSN 1913-9039
Published by Canadian Center of Science and Education

A Survey on Chinese Scholars' Adoption of Mixed Methods

Yuchun Zhou[1]

[1] Department of Educational Studies, College of Education, Ohio University, Athens, USA

Correspondence: Yuchun Zhou, Department of Educational Studies, College of Education, Ohio University, Athens, OH45701, USA. Tel: 1-740-597-3370. E-mail: zhouy@ohio.edu

Received: August 18, 2017 Accepted: September 18, 2017 Online Published: January 26, 2018

doi:10.5539/ies.v11n2p27 URL: https://doi.org/10.5539/ies.v11n2p27

Abstract

Since the 1980s when mixed methods emerged as "the third research methodology", it was widely adopted in Western countries. However, inadequate literature revealed how this methodology was accepted by scholars in Asian countries, such as China. Therefore, this paper used a quantitative survey to investigate Chinese scholars' perceptions and adoption of mixed methods in China.

The data of the study were obtained from 247 Chinese scholars in higher education. Structural equation modelling was used to examine the relationship between participants' perceptions and use of mixed methods. The results revealed that Chinese scholars' research expertise of using quantitative and qualitative methods as well as their perceived advantage of using mixed methods has significantly influenced their adoption of mixed methods. This paper advanced the literature of the evolution of mixed methods by investigating the expansion and adaptability of mixed methods in an Asian context.

Keywords: mixed methods, adoption, survey, structural equation modelling, Chinese scholars

1. Introduction

Mixed methods have been called "the third research paradigm" along with traditional quantitative and qualitative methodologies (Johnson & Onwuegbuzie, 2004, p. 14). It was defined as the combination and integration of quantitative and qualitative methods in a single study or in a program of study (Creswell & Plano Clark, 2007; Creswell & Plano Clark, 2011; Greene et al., 1989; Tashakkori & Teddlie, 1998). The development and evolution of mixed methods has experienced several stages in the last 20 years: the formative stage (1980s and before), the paradigm stage (1980s to 1990s), the procedural stage (1980s to present), the advocacy stage (early 2000s to present), the reflective stage (2000s to present), and the expansion stage (2010s to present) (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2009). Although mixed methods have developed for 30 years, only the recent literature discussed its expansion in different countries (Creswell, 2009; Teddlie & Tashakkori, 2009). Most of the articles focused on the adoption of mixed methods in Western countries, whereas little literature discussed its adoption in non-Western cultural contexts such as East Asia (Creswell & Plano Clark, 2011; Teye, 2012). To address the scant literature, this study investigated the expansion of mixed methods in China, an East Asian country.

Expansion, or diffusion, is a special type of communication, in which an innovation is spread among the members of a social system (Rogers, 2003). An innovation was defined as an idea or a practice that is perceived as new by the population of adoption (Rogers, 2003), such as mixed methods being a new methodology to researchers. In this study, mixed methods were assumed to be the innovation that fit in Rogers' (2003) definition of innovation. Such assumption was supported by Johnson and Onwuegbuzie (2004, p. 15), "if one prefers to think categorically, mixed methods research sits in a new third chair, with qualitative research sitting on the left side and quantitative research sitting on the right side"

As Rogers' (2003) diffusion theory of innovations declared, an individual's decision of adopting an innovation was influenced by five intrinsic characteristics of the innovation: the relative advantage, compatibility, simplicity, trialability, and observability. Researchers have developed reliable measures of the five intrinsic attributes, including the *Perceived Usefulness,* the *Compatibility,* the *Perceived Ease of Use*, the *Visibility*, and the *Trialability* (Davis et al., 1989; Moore & Benbast, 1991, 2001). Besides the scales, Davis, Bagozzi, and Warshaw (1989) published the *Technology Acceptance Model* (TAM), which has been widely used in the field of innovation diffusion research (Al-Azawei, 2017; Agag & El-Masry, 2016; Davis, 1993; Hye-Young, 2016; Liaw,

2002; Liaw & Huang, 2003; Tran & Cheng, 2017; Oliveira & Martins, 2011; Venkatesh, Morris, Davis, & Davis, 2003).

In this study, the authors adapted the above measures of innovation diffusion and technology acceptance model to investigate Chinese scholars' adoption of mixed methods. Before data collection, permission to use the existing measures was obtained from the original authors, Davis, Benbasat, and Venkatesh in November 2012.

1.1 Research Questions

Two research questions are to be answered in this study, including:

1) How likely are Chinese scholars to adopt mixed methods?

2) What factors impacted Chinese scholars' decisions to adopt mixed methods?

1.2 Research Hypotheses

Moreover, three sets of research hypotheses about the relationships between the potential factors and Chinese scholars' decision of adoption were tested. Decision of adoption includes both intention to adopt this methodology and actual use of it. The hypothesized model in the study was demonstrated in Figure 1.

H1. Chinese scholars' intention to use mixed methods is positively predicted by their perceived compatibility, advantage, reasons, and ease of using mixed methods, as well as their expertise of using qualitative and quantitative methods.

H2. Chinese scholars' use of mixed methods is positively predicted by their perceived compatibility, advantage, reasons, and ease of using mixed methods, as well as their expertise of using qualitative and quantitative methods.

H3. Chinese scholars' perceived advantage of using mixed methods has mediation effects on their intention to adopt mixed methods.

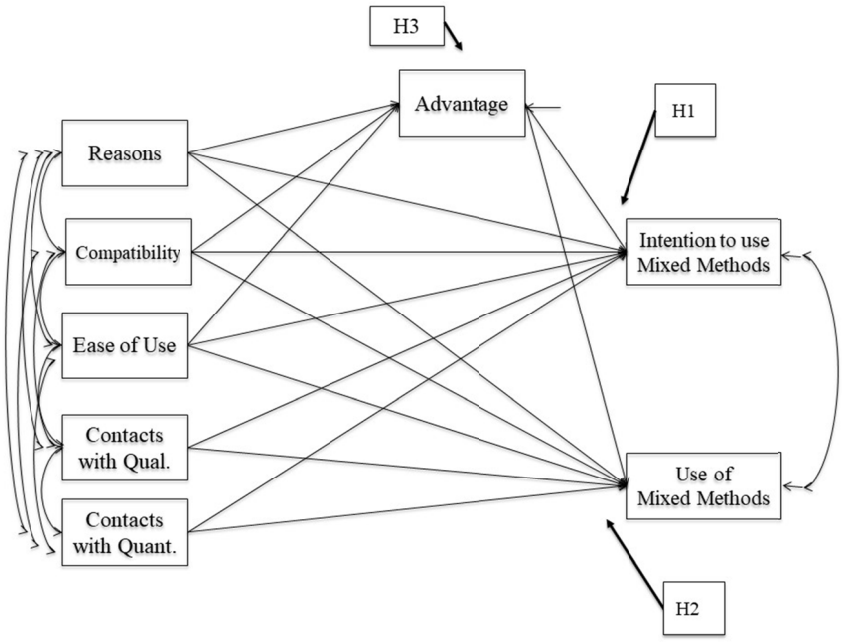

Figure 1. Hypothesized model of mixed methods' adoption

The current study is a quantitative follow-up study of a previous qualitative case study that explored the use of mixed methods in East China with a purposeful sample (Zhou & Creswell, 2012). Followed by the previous qualitative findings, this study quantitatively investigated the same topic at a larger population in China as a representative of non-Western cultural contexts and developing countries. Research on the expansion of mixed methods in a different culture other than Western cultures is necessary to this methodology's development and application. If mixed methods are only applicable in Western cultures, the usefulness of this methodology is limited. This study aimed to provide empirical examples of how widely this method can be used in a different

culture.

Moreover, this study is meaningful to research methodologists who are interested in quality practices of using mixed methods in specific disciplines. Historically, when methodologists drafted the guidelines for using mixed methods in specific disciplines, they mostly considered the situations in developed countries due to lack of relevant literature in other cultures. However, when one discipline adopts a new research method, it requires a complete analysis and best practices for using this method in different situations, either in developed or developing countries, and either in Western cultures or non-Western cultures. Thus, this study intended to provide the needed information of mixed methods' compatibility in a different context. In essence, the current study could contribute to the development of mixed methods in expanding its frontier of application.

2. Method

2.1 Sampling

The population of the study was defined as Chinese scholars because they are the primary group using or intending to use mixed methods in China. A sample of 247 faculty members and senior graduate students were recruited from the top 300 comprehensive universities of 2012 in China. Multiple sampling strategies were used, including random sampling and criteria sampling. Firstly, three Chinese universities among the top 300 comprehensive universities of 2012 in China were randomly selected. Secondly, criteria sampling strategies were employed. Faculty members and senior graduate students were invited to participate in the survey if they had learned about research methodologies, qualitative and or quantitative approaches. Consequently, a total sample of 247 participants was recruited, averaging 80 at each research site. The sample information was reported in Table 1.

Table 1. Sample size and information of three selected Chinese Universities

Name & Sample Size	Characteristics	Geographic Area	Rank of Chinese Universities
Henan Technology University (n=91)	Comprehensive; sciences and technology focused	Central China	225th
West China School of Medicine (n=82)	Medicine focused; highly research focused	Western China	12th
Sichuan Normal University (n=74)	Comprehensive; teacher education focused	Southwestern China	195th

2.2 Measures

The authors adapted three existing scales from Moore and Benbast (1991, 2001): *Perceived Ease of Use* (4 items; α= 0.84), *Relative Advantage* (5 items; α= 0.90), and *Compatibility* (3 items; α= 0.86), and one from Venkatesh et al. (2003): *Intention to Use* (3 items; α= 0.81). All measures used a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The reliability generalization of these measures were largely used and examined in varies studies (Hess, McNab & Basoglu, 2014; Mallya, 2017; Powell & Wimmer, 2017).

In addition to the four existing scales, another four scales were generated based on literature review and a previous qualitative study (Zhou & Creswell, 2012). The scale of *Reasons to Use Mixed Methods* (3 items; α= 0.88) was developed to measure participants' perception of the reasons to use mixed methods on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). This scale consisted of the following three items:

1) The weaknesses of one research method can be offset by the strengths of the other research method.
2) Using mixed methods can solve complex research problems.
3) Using mixed methods can provide a complete understanding of research problems.

Another three scales meant to measure participants' expertise of using different research methods, namely *Expertise of Using Qualitative Methods* (6 items; α= 0.78), *Expertise of Using Quantitative Methods* (6 items; α= 0.79), and *Use of Mixed Methods* (6 items; α= 0.79). Participants were asked to give numeric response to the following six questions about their experience of using specific methods. The raw responses were then converted to the data within a range of 1 to 7, with higher score indicating higher-level expertise with the specific research methodology. Each of the three scales included the following six questions, such as:

1) How many courses did you take to learn about this methodology?

2) How many training occasions (including conferences, workshops, lectures, and seminars) did you attend to learn about this methodology?
3) How many studies did you participate in using this methodology?
4) How many times did you present this type of research (including publishing papers, presenting at conferences, and speaking at lectures)?
5) How many articles (including book chapters) did you read about this methodology?
6) How many times did you talk with others about using this methodology?

2.3 Data Collection

The survey questionnaire was originally worded in English and then was translated into Chinese for the participants of the study. The accuracy of translation was discussed by a panel of Chinese scholars (including five Chinese graduate students in the United States and five Chinese faculty in China). The Chinese versions of the questionnaire and the informed consent were approved by the Institutional Review Board of the PI's institute.

The survey was conducted in several sessions at each site. The procedure of data collection was the same for every session. First, the university administrators gathered the participants. Second, the PI briefly introduced the study to participants. For instance, the PI clarified the terms used in the questionnaire to make sure participants' understanding of these terms was accurate and consistent. The overall response rate was 91%, as the authors received 247 complete surveys out of 270. The average time for completing the survey was approximately 10 minutes.

2.4 Data Analysis

Data were analysed using descriptive statistics and structural equation modelling techniques. Data analysis was conducted in Mplus 7, which provided the maximum likelihood estimation with robust standard errors (MLR) for non-normal continuous variables with missing data. For all variables in the study, there was less than 4% missing data at the assumption of missing at random. To evaluate model fit, multiple model fit indices were used, including model chi-square (χ^2), Bentler comparative fit index (CFI; Bentler, 1990), standardized root mean square residual (SRMR), and Steiger-Lind root mean square error of approximation (RMSEA; Steiger, 1990).

According to Kline (2011), the combination of chi-square values accompanying p values greater than .05, CFI values greater than .95, RMSEA values less than .05, and SRMR values less than .08 indicated a good model fit. Other researchers discussed that CFI values between .90 and .95 are acceptable fit (Browne & Cudeck, 1992). The sample size (N > 200) in the quantitative survey decreased the concerns of power in the study. The effect size of the model and coefficients estimates were evaluated and reported using the R^2s.

3. Results and Discussion

The total sample size was 247, with 185 females (75%) and 62 males (25%). The demographic information of all the participants was summarized in Table 2. In summary, the average age of the participants was 27.35 with a standard deviation of 7.32. The youngest participant was 22 and the oldest was 66. Approximately 72% (n=179) of the participants were graduate students (about half of them being senior master students and the second half being senior doctoral students), and 28% (n=68) of the participants were university faculty members (50% of them being assistant professors, 26% being professors and associate professors, as well as 24% being research faculty). Participants came from a variety of disciplines, including public health (n=51, 20%), nursing (n=48, 19%), psychology (n=47, 19%), management (n=41, 17%), education (n=36, 15%), and arts and sciences (n=24, 10%).

Table 2. Table of participants' demographic information

Sample Size	Gender	Status	Disciplines
n=247	Female 75% Male 25%	Doctoral students 36% Master students 36% Assistant professor 14% Professors 7% Research faculty 7%	Public health 20% Nursing 19% Psychology 19% Management 14% Education 15% Other Arts/Sciences 10%

In the study, the hypothesized model was used to examine the influential factors on Chinese scholars' use of

mixed methods. It consisted of eight variables. The descriptive statistics of all the variables were reported in Table 3.

Table 3. Means, SDs, Ns and bivariate correlations of variables in the model

	1	2	3	4	5	6	7	8
1. Contact with Qual	1.00							
2. Contact with Quan	.55*	1.00						
3. Contact with MM	.65*	.72*	1.00					
4. Intention	.10	.02	.19*	1.00				
5. Advantage	.11	-.00	.15*	.74*	1.00			
6. Ease of Use	.00	.02	.07	.36*	.45*	1.00		
7. Compatibility	.11	.08	.21*	.74*	.74*	.39*	1.00	
8. Reasons	-.01	-.09	.08	.56*	.60*	.33*	.51*	1.00
Means	3.24	3.58	1.83	5.18	4.88	4.47	4.68	5.65
SDs	1.43	1.62	1.20	1.07	1.00	1.64	1.14	1.05
Ns	241	241	239	243	244	245	244	241

Note. * p<. 05.

3.1 Chinese Scholars' Likelihood of Adoption

As the results indicated, the mean response to the scale of *Intention to Use* was high at 5.18 on a 7-point scale, with higher scores indicating a higher level of intention to use mixed methods in research. The results also indicate that participants' intention to use mixed methods were moderately correlated with their perceptions of adopting mixed methods, including perceived advantage, compatibility, reasons, and ease of using mixed methods (all *r*s > .36*), which were all reported with means higher than 4.5 on a 7-point scale. The above results provide us with the answers to the first research question of the study. That said, it is very likely that Chinese scholars will adopt mixed methods as a new methodology in their research. Meanwhile, Chinese scholars also have very positive perceptions toward using mixed methods.

Though Chinese scholars reported that they strongly intended to adopt mixed methods, their current use of it was less than frequent. According to the results, the mean of using mixed methods was 1.83 on a 7-point scale, with the standard deviation of 1.20. Such conflicting results were explained by Roger (2003) that people' intention to adopt an innovation and their actual adoption were two different issues. The above results implied that there were issues hindering the actual adoption of mixed methods in China. A question lingers as besides the intention to use, what other factors could influence Chinese scholars' adoption of mixed methods?

3.2 Influential Factors on Adoption of Mixed Methods

To investigate the significant factors of participants' intention to use mixed methods, the hypothesized model of the study (Figure 1) was examined. The model fit the data well, $\chi^2_{(2)}$=3.04, p=. 22; CFI=1. 00; RMSEA =. 05, 90% CI = [.00, .10], SRMR = .01. To improve the statistic power in testing the significant predictions, the model was modified through fixing the non-significant paths at 0. The finalized model (Figure 2; the scaling correction factor for MLR: 1.34) was not significantly worse than the hypothesized one through the MLR chi-square difference testing ($\Delta\chi^2$ =15.43, Δdf= 11, *p*=. 22). The final model fit the data well, $\chi^2_{(13)}$=17.39, p=. 18; CFI=1.00; RMSEA = .04, 90% CI = [.00, .08]; SRMR = .06.

The final model was estimated to identify the influential factors of participants' intention to use mixed methods and their actual use of mixed methods. The model results with the standardized path coefficients are reported in Figure 2.

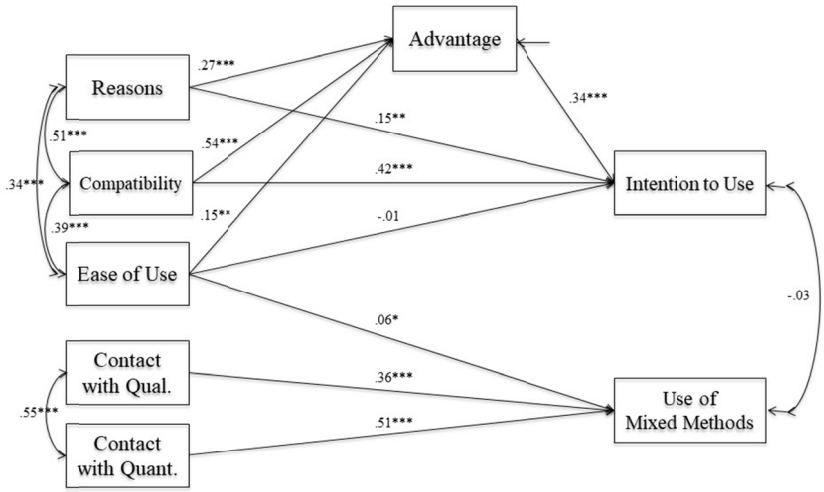

Figure 2. Final model of mixed methods' adoption

According to the results, hypothesis 2 of the study was partially supported (Table 4). That is, participants' use of mixed methods was significantly predicted by their expertise of using qualitative methods (std. $\beta = .36$, $p < .001$) and quantitative methods (std. $\beta = .51$, $p < .001$), as well as the perceived ease of using mixed methods (std. $\beta = .06$, $p < .05$), after controlling for the other predictors in the model. The model significantly explained 60.2% of the variances of participants' use of mixed methods.

According to the results, those who have had adequate knowledge with qualitative and quantitative research are more likely to adopt mixed methods, including reading about or conducting mixed methods research. According to the survey questions in this study, knowledge with qualitative and quantitative methods originates from course taking, training (e.g., conferences, workshops), presenting (e.g., publications, lecture speaking), literature reading (e.g., methodology books and journal articles), research investing, and discussing about quantitative and qualitative methods with others.

The above result corresponds with previous research, which discussed researchers' insufficient expertise in qualitative and quantitative methods as one of the critical problems in the expansion of mixed methods (Bazeley, 2004; Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2010). For instance, Bazeley (2004) mentioned, "good mixed methods research requires a good working knowledge of the multiple methods being used," but "researchers brought up in the traditions of a particular discipline often do not have knowledge of other methodologies" (p. 8). Furthermore, Creswell and Plano Clark (2011) also described researchers' skills as a practical challenge of using mixed methods. They recommended that "the researchers first gain experience with both quantitative research and qualitative research separately before undertaking a mixed methods study." (p. 13)

Different from the previous findings, the current study empirically and quantitatively confirms such relationship between research expertise in multiple methods and the adoption of mixed methods. Moreover, the scale items in the study specified what kinds of qualitative and quantitative expertise were critical to the adoption of mixed methods.

Another variable related to Chinese scholars' adoption of mixed methods in the model was *Intention to Use.* The results indicated that participants' intention to use mixed methods was predicted by their perceived advantage of using mixed methods (std. $\beta = .34$, $p <. 001$), the compatibility of mixed methods to their current work situations (std. $\beta = .42$, $p <. 001$), and the perceived reasons to use mixed methods (std. $\beta = .15$, $p < .01$), after controlling for their current research experience. Among the three predictors, mixed methods' compatibility was more influential to participants' decisions of adoption, compared with the perceived advantage and reasons of using mixed methods (contrast = .08 and .27, ps < .01). The model significantly explained 64.5% of the variances of participants' intention to use mixed methods. According to the results, hypothesis 1 of the study was partially

supported (Table 4).

The above findings are consistent with the adoption research in many other fields, where researchers found that perceived compatibility and advantage of innovation are two significant predictors to people's innovation adoption (Al-Azawei, 2017; Chang & Tung, 2008; Hardgrave, Davis, & Riemenschneider, 2003; Hye-Young, 2016; Lala, 2014; Lee, Hsieh, & Hsu, 2011; Powell & Wimmer, 2017; Wu & Wang, 2005).

One original finding of the study is that Chinese scholars' perceived reasons to use mixed methods is a significant predictor of their intention to adopt this method. This result implies that researchers are more likely to adopt mixed methods when they are fully aware of the needs and contexts to use this method in practice. That said, if researchers could read examples of using mixed methods in various cases, they might gain a better understanding of why mixed methods is needed in specific fields and inquiries. This finding delivers useful suggestions to methodologists who are drafting mixed methods research guides and trainings for practitioners.

Lastly, according to hypothesis 3, the possible mediation effects in the model were tested. The results indicated that Chinese scholars' perceived advantage of using mixed methods was a significant mediator on Chinese scholars' intention to adopt mixed methods. Therefore, hypothesis 3 of the study was supported (Table 4). Specifically, participants' perceived advantage partially mediated the relationship between perceived compatibility and intention to use (std. $\beta^* \beta$=. 19, p<. 001). The 95% confidence interval of such mediation is [.10, .26] using the Monte Carlo resampling method (replication = 20,000). In addition, participants' perceived advantage also partially mediated the relationship between perceived reasons and intention to use (std. $\beta^* \beta$=. 09, p<. 01). The 95% confidence interval of such mediation is [.05, .16] using the Monte Carlo resampling method (replication = 20,000). Additionally, participants' perceived advantage fully mediated the relationship between perceived ease of use and intention to use mixed methods (std. $\beta^* \beta$=.05, p<.05). The 95% confidence interval of such mediation is [.01, .07] using the Monte Carlo resampling method (replication = 20,000).

In brief, the Relative Advantage is a unique factor predicting Chinese scholars' adoption of mixed methods. It has both direct effects and mediation effects on people's decision of adoption. The mediation effects exist between several predictors and the outcome of adoption so they cannot be ignored. This finding is new to the literature of diffusion of innovations. It suggests that such mediation effects should be examined in other innovation adoption studies in the future.

Table 4. Hypotheses of Chinese scholars' adoption of mixed methods

Hypotheses in the study	Supported Hypotheses	Results
H1. Chinese scholars' intention to use mixed methods is positively predicted by their perceived compatibility, advantage, reasons, and ease of using mixed methods, as well as their expertise of using qualitative and quantitative methods.	Partially supported because not all the predictors were significant.	Significant factors: compatibility, advantage, and reasons of using mixed methods.
H2. Chinese scholars' use of mixed methods is positively predicted by their perceived compatibility, advantage, reasons, and ease of using mixed methods, as well as their expertise of using qualitative and quantitative methods.	Partially supported because not all the predictors were significant.	Significant factors: expertise with qualitative methods, expertise with quantitative methods, and perceived ease of use.
H3. Chinese scholars' perceived advantage of using mixed methods has mediation effects on their intention to adopt mixed methods.	Supported.	Significant mediation effects of perceived reasons, compatibility, ease of use on intention to use mixed methods.

4. Conclusion

The study makes original contribution to the literature of the evolution of mixed methods by quantitatively examining the expansion of mixed methods in an East Asian country. According to the results of the study, Chinese scholars' positive perceptions of using mixed methods have greatly helped with this methodology's expansion in China. However, though Chinese scholars have high level of intention to adopt mixed methods, they have not widely used this methodology in practice. The major challenges that have hindered mixed methods' adoption are due to researchers' insufficient expertise in using quantitative and qualitative methods. Moreover, people's perceived advantage of using mixed methods has significant mediation effects between perceptions and adoption of this method. That said, if researchers are not cognizant of the advantages of using mixed methods, they may not adopt this method despite their positive perceptions. Extra attention should be placed on this

mediator in order to enhance the adoption of mixed methods in China. Another point of emphasis is that Chinese scholars' research expertise of both quantitative and qualitative methods should be improved, so that their strong intention of using mixed methods could be sustained. All these efforts would feed into the incremental expansion of mixed methods use in research in China.

Due to the limited time span for data collection and insufficient funding of the study, the researcher could not examine the topic in a wider geographic range of China and for a longer time. Data should be collected every other five years to update the results. Another limitation lies in that the participants were not randomly selected at each research site. Their research experience varied that could make the results biased. The above limitations should be considered when generalizing the results of the study.

Despite the limitations, the study investigated the expansion of mixed methods in China, a non-Western developing country. The study quantitatively confirmed the relationship between researchers' perceptions of using mixed methods and adoption, which is a new finding to the literature. In all, this study presents valuable information and suggestions on the expansion of mixed methods in a non-Western culture, thus contributing to the formation of international mixed methods community. More future research is necessary to examine the adoption of mixed methods in other non-Western contexts.

References

Agag, G., & El-Masry, A. A. (2016). Understanding consumer intention to participate in online travel community and effects on consumer intention to purchase travel oline and WOM: An integration of innovation diffusion theory and TAM with trust. *Computers in Human Behavior, 60*, 97-111. https://doi.org/10.1016/j.chb.2016.02.038

Al-Azawei, A. (2017). Investigating the effect of learning styles in a blended e-learning system: An extension of the technonology acceptance model (TAM). *Australasian Journal of Educational Technology, 33*(2), 1-23.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238-246. https://doi.org/10.1037/0033-2909.107.2.238

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods and Research, 21*, 230-258. https://doi.org/10.1177/0049124192021002005

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research* (1st ed.). Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage.

Davis, F. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *Int. J. Man-Machine Studies, 38*, 475-487. https://doi.org/10.1006/imms.1993.1022

Davis, F., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretic models. *Management Science, 35*(8), 982-1003. https://doi.org/10.1287/mnsc.35.8.982

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*, 255-274. https://doi.org/10.3102/01623737011003255

Hess, T., McNab, A., & Basoglu, K. (2014). Reliability generalization of perceived ease of use, perceived usefulness, and behaviorl intentions. *MIS Quarterly, 38*(1), 1-57. https://doi.org/10.25300/MISQ/2014/38.1.01

Hye-Young, Y. (2016). User acceptance of mobile library applications in academic libraries: An application of the technology acceptance model. *Journal of Academic Librarianship, 42*(6), 687-693. https://doi.org/10.1016/j.acalib.2016.08.003

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26. https://doi.org/10.3102/0013189X033007014

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Lala, G. (2014). The Emergence and Development of the Technology Acceptance Model (TAM). *Proceedings of The International Conference Marketing - From Information to Decision, 7*, 149-160.

Liaw, S. (2002). Understanding user perceptions of world-wide web environments. *Journal of Computer Assisted Learning, 18*, 137-148. https://doi.org/10.1046/j.0266-4909.2001.00221.x

Liaw, S., & Huang, H. (2003). An investigation of user attitudes toward search engines as an information retrieval tool. *Computers in Human Behavior, 19*, 751-765. https://doi.org/10.1016/S0747-5632(03)00009-8

Mallya, J. (2017). Factors influencing usage of internet for academic purposes using technology acceptance model. *Journal of Library & Information Technology, 37*(2), 119-124.

Moore, G., & Benbasat, I. (2001). Development of an instrument to measure the perceptions of adoption an information technology innovation. *Information Systems Research, 2*(3), 192-222. https://doi.org/10.1287/isre.2.3.192

Morse, J. M., & Niehaus, L. (2009). *Mixed method design: Principles and procedures*. CA: Walnut Creek.

Oliveira, T., & Martins, M. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation, 14*(1), 110-121.

Powell, L., & Wimmer, H. (2017). Parental perceptions and recommendations of computing majors: A Technology Acceptance Model Approach. *Information Systems Education Journal, 15*(4), 29-37.

Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New York: A Division of Simon & Schuster, Inc.

Steiger, M. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research, 25*(2), 173-180. https://doi.org/10.1207/s15327906mbr2502_4

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *Sage handbook of mixed methods in social & behavioral research* (2nd ed.). CA: SAGE Publications, Inc. https://doi.org/10.4135/9781506335193

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.

Tashakkori, A., & Teddlie, C. (Eds.). (2003). *Sage handbook of mixed methods in social and behavioral research* (1st ed.). CA: SAGE Publications, Inc.

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research*. Thousand Oaks, CA: Sage.

Teye, J. (2012). Benefits, challenges, and dynamism of positionalities associated with mixed methods research in developing countries: Evidence from Ghana. *Journal of Mixed Methods Research, 6*(4), 379-391. https://doi.org/10.1177/1558689812453332

Tran, T. C. T., & Cheng, M. S. (2017). Adding innovation diffusion theory to technology acceptance model: understanding consumers' intention to use biofuels in Viet Nam. *International Review of Management and Business Research, 6*(2), 595-609.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Zhou, Y., & Creswell, J. (2012). The use of mixed methods by Chinese scholars in East China: A case study. *International Journal of Multiple Research Approaches, 6*(1), 73-87. https://doi.org/10.5172/mra.2012.6.1.73

Appendix A

Instrument of Adoption of Mixed Methods (English & Chinese Version)

Intentions to Use Mixed Methods (α=. 81)

1. I intend to use mixed methods in the future.

我决定今后使用混合方法。

2. I predict I would use mixed methods in the future.

我预测我今后会使用混合方法。

3. I plan to use mixed methods in the future.

我想要使用混合方法。

Contact with Qualitative/Quantitative/Mixed Methods (α=. 80)

1. How many courses did you take to learn about this methodology?

你学过多少门与以下研究方法相关的课程？

2. How many training occasions (including conferences, workshops, lectures, and seminars) did you attend to

learn about this methodology?
除课程外，你还参加过多少次与以下研究方法相关的课外学习（包括：学术会议，短期培训班， 讲座，研讨会）？

3. How many studies did you participate in using this methodology?
你参加过多少项以下类型的研究？

4. How many times did you present this type of research (including publishing papers, presenting at conferences, and speaking at lectures)?
你曾多少次展示过以下类型的研究结果（展示的方式包括：发表期刊文章，撰写研究报告，进行会议讲演，进行小组汇报，和开办学术讲座）？

5. How many articles (including book chapters) did you read about this methodology?
你阅读过多少与以下研究方法相关的文章和书籍？

6. How many times did you talk with others about using this methodology?
你曾多少次和他人讨论过使用以下的研究方法？

Relative Advantage of Using Mixed Methods (α=. 85)

1. Using mixed methods enables me to accomplish tasks more quickly.
使用混合方法能使我更快地完成研究的任务。

2. Using mixed methods makes it easier to do my job.
使用混合方法让我的研究变得简单。

3. Using mixed methods gives me greater control over my research process.
使用混合方法让我能更好地掌控我的研究过程。

4. Using mixed methods improves the quality of work I do.
使用混合方法能提高我的工作／研究质量。

5. Using mixed methods enhances my effectiveness on the job.
使用混合方法能提高我的工作／研究成效。

Compatibility of Using Mixed Methods (α=. 80)

1. I think that using mixed methods fits well with the way I like to work.
我觉得使用混合方法十分符合我所喜欢的研究方式。

2. Using mixed methods is completely compatible with my current situation.
对我而言，使用混合方法非常适合我现有的情况。

3. Using mixed methods fits into my work style.
使用混合方法很符合我做科研的风格。

Ease of Use of Mixed Methods (α=. 73)

1. Overall, I believe that mixed methods is easy to use.
总的来说，我认为混合方法很容易用。

2. Learning to use mixed methods is easy for me.
学会使用混合方法对我来说很简单。

3. The use of mixed methods is clear and understandable to me.
对我而言，混合方法的使用简单易懂。

4. I believe that it is easy to use mixed methods to get my research questions answered.
我相信使用混合方法能很容易地解决我的研究问题。

Reasons to Use Mixed Methods (α=. 88)

1. The weaknesses of one research method can be offset by the strengths of the other research method.
在一项研究中，同时使用量化和质性方法能让他们互补不足。

2. Using mixed methods can solve complex research problems.
使用混合方法有助于解决很复杂的研究问题。
3. Using mixed methods can provide a complete understanding of research problems.
使用混合方法能让我们对所研究的问题有一个更全面的认识。