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Review

Comparison Reviews on E-commerce Research Methods: Suggestions for Post-COVID-19

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Abstract: This research aimed to understand the differences in research methods adopted between Chinese and international e-commerce research and provided suggestions and recommendations for further research agenda in e-commerce post-COVID-19. This research studied 4,425 Chinese publications between 2015 and 2019 compared to international reviews in e-commerce research. Twelve findings were discussed:1) Most of China's e-commerce publications (80.24%) did not state any research method. 2) Mixed methods have been well-adopted in China's e-commence research (35.05%), including quantitative-mixed, qualitative-mixed, and quantitative-qualitative mixed methods. They were highly adopted compared to other studies. 3) Survey methods (27.97%) were predominantly single research - purely quantitative method in Chinese research, but they were still behind international research. 4) Case studies (14.05%) were adopted as the second single method in Chinese research. This finding was significantly different from international views. 5) There were different views on whether laboratory experiments should be considered a research method. 6) Document and text analysis methods were reported by Chinese scholars (6.48%), but less and even not be reported internationally. 7) The focus group method was less adopted internationally. 8) The content analysis method (0.84%) was less adopted in Chinese research and was not reported by international scholars. 9) The observation method (0.6%) was less adopted in Chinese research but more adopted in Ain et al. (2019) (2%). Other international studies reported no studies. 10) Interviews (0.36%) were least adopted in Chinese research but highly reported by international scholars. 11) Field study, secondary, and Delphi methods were only adopted in international research, and 12) The correlational research method was not reported in e-commerce research. The main contributions of this study could be stated: Being valuable for researchers interested in Chinese e-commerce research; Adding research value for comparing reviews in e-commerce research methods.

***Keywords*:** e-commerce research, mixed research methods, qualitative methods, survey, case study, treemap

JEL Codes: C18, C80

1. Introduction

COVID-19 pandemic has accelerated digital transformation in 59% of organizations, and 66% say they have completed initiatives that previously encountered resistance (IBM, 2021). Like SARS, which influenced the advent

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of e-commerce in China in 2002 (Reardon, 2019), Forbes reported that e-commerce had been the only retail channel to experience rapid growth in China's fast-moving consumer goods industry since the start of the Covid-19 pandemic (Flannery, 2021). It was predicted that there would be a double-digit boost by 2023. China's e-commerce revenues have raced ahead of the rest of the world, yet hundreds of millions of citizens are yet to spend online (JPMorgan, 2020). Therefore, China's government encouraged businesses to seek more effective methods to promote the growth of e-commerce adoption post-COVID-19.

Research believed that the proper selection and usage of research methods would directly affect the results of scientific research (Snyder, 2019). The fact was that although the study divided research methods into three types: quantitative, qualitative, and mixed methods (Sykes et al., 2018), the researchers still argued for distinguishing between quantitative and qualitative research in different viewpoints, such as discussion between Maxwell (2019) and Morgan (2019). The oldest and most frequently discussed means of differentiating qualitative and quantitative analysis by words in qualitative while produced data were numbers in quantitative (Morgan, 2018). A quantitative approach was used to confirm or disconfirm hypotheses, which involved systematic data collection, fixed time intervals, statistical analyses, and effect sizes over time on the given time scale (Taguchi, 2018). Quantitative research methods might also enable deduction and prediction irrespective of context experiences (Crowe et al., 2015). In quantitative research, reliability and validity of measures, sample size, appropriate statistics, underlying assumptions for the statistical procedures, calculation of effect sizes, and appropriate reporting of findings were important considerations (Taguchi, 2018). A qualitative approach was exploratory (Taguchi, 2018), enabling contextualized understandings of subjective experiences (Crowe et al., 2015). However, studies lacked the research reviews on research methods applied in China's e-commerce research in the literature.

This research aimed to understand the differences in research methods adopted between Chinese and international e-commerce research and provided suggestions and recommendations for further research agenda in e-commerce post-COVID-19. The main contributions of this study could be stated as follows: This research would be valuable for researchers or educators interested in Chinese e-commerce research. The outcomes also added high research value for comparing the differences in research methods between Chinese scholars and international counterparts. The following section studied related works. Section 2 focused on the research design and data collection. Section 3 reviewed the research methods adopted in China's e-commerce research. Section 4 conducted international reviews. Section 5 addressed comparison and summary. Section 6 described conclusions, recommendations, limitations, and further research.

2. Related works

2.1 *Research design*

This research adopted a literature search to review China's e-commerce research methods. Literature reviews do not only play an essential role as a foundation for all types of study but also serve as a basis for knowledge development and create guidelines for policy and practice: providing evidence of an effect to engender new ideas and directions for a particular field (Snyder, 2019).

This research selected articles published in e-commerce indexed in CNKI. CNKI is the largest and most continuously updated Chinese journal database (CNKI, 2019). All selected papers were published in e-commerce between 2015 and 2019. Choosing publications within the latest five years should be that the research methods should be stable within a 5-year investigation period (Hutchinson & Lovell, 2004). This research did not review China's e-commerce publications between 2020 and 2021 due to the COVID19 crisis affecting the regular publications.

2.2 *Data collection*

The first search phrase for example implied all articles that have the keywords "electronic commerce", "e-commerce", "electronic business", "e-business", "Internet +", and "Internet plus". 4,425 articles were initially yielded. After screening by titles and abstracts for relevance and inclusion, 4,215 articles were retained for screening the research methods. 3,382 articles did not state any research methods. After eliminating those articles that did not state any research method, 833 articles were retained for analysis (see Figure 1).

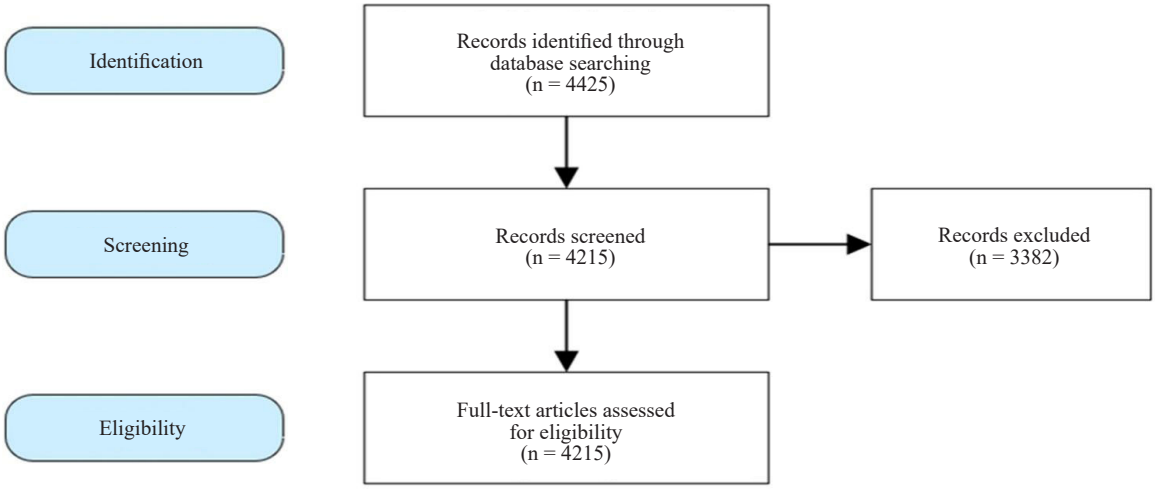

Figure 1. The flowchart of the literature search

3. Reviews

3.1 *Data analysis*

Table 1. Research methods adopted in China

Research Methods				No.	% of Sub-Sum	% of Sum	% of Total
Methods Stated	Quantitative	Single Method	Survey	233	66.38%	27.97%	5.53%
			Experiment	87	24.79%	10.45%	2.06%
		Quantitative-Mixed Methods		31	8.83%	3.72%	0.74%
		Sub-Sum		351	100.00%	42.14%	8.33%
	Qualitative	Single Method	Case Study	117	45.70%	14.05%	2.77%
			Document and Texts Analysis	54	21.09%	6.48%	1.28%
			Focus Group	35	13.67%	4.20%	0.83%
			Content Analysis	7	2.73%	0.84%	0.17%
			Observation	5	1.96%	0.60%	0.12%
			Interview	3	1.17%	0.36%	0.07%
		Qualitative-Mixed Methods		35	13.68%	4.20%	0.83%
		Sub-Sum		256	100.00%	30.73%	6.07%
	Quantitative-Qualitative Mixed			226		27.13%	5.36%
	Sum			833		100.00%	19.76%
No Methods Stated				3382			80.24%
Total				4215			100.00%

Data collection results showed that 19.76% (883 out of 4,215) of China's e-commerce publications adopted at least one research method (see Table 1). They included quantitative methods (8.33%, 351 out of 4,215), qualitative methods (6.07%, 256 out of 4,215), and quantitative-qualitative mixed methods (5.36%, 226 out of 4,215). 80.24% (3,382 out of 4,215) of publications did not state any research method.

Among quantitative methods, 223 publications (5.53%, 233 out of 4,215) adopted surveys. 2.06% (87 out of 4,215) of publications adopted the experiment. 0.74% (31 out of 4,215) of publications adopted quantitative- mixed methods. Quantitative methods included case studies (2.77%, 117 out of 4,215), document and text analysis (1.28%, 54 out of 4,215), focus groups (0.83%, 35 out of 4,215), content analysis (0.17%, 7 out of 4,215), observation (0.12%, 5 out of 4,215), interviews (0.07%, 3 out of 4,215), and qualitative-mixed methods (0.83%, 35 out of 4,215).

3.2 *Findings*

This research found that among 4,215 reviewed papers in China's e-commerce research, only 833 publications clearly stated which single research method or mixed research methods were adopted. They covered quantitative research methods (42.14%, 351 out of 833), qualitative research methods (30.73%, 256 out of 833), and quantitative and qualitative-mixed methods (27.13%, 226 out of 833) (see Table 1).

Nine research methods were included: mixed methods, survey, case study, laboratory experiments, document and text analysis, focus group, content analysis, observation, and interviews. Night findings were briefly highlighted-discussed in the next chapter- as follows (see Figure 2):

• Most of China's e-commerce publications (80.24%, 3382 out of 4215) did not state any research method.

• The mixed research methods were identified as having a critical role in Chinese research. It was distinctly that mixed-methods (35.05%, 292 out of 833) have been well-adopted in China's e-commence research, including quantitative-qualitative mixed methods (27.13%, 226 out of 833), quantitative-mixed methods (3.72%, 31 out of 833), and qualitative-mixed methods (4.2%, 35 out of 833).

• Survey methods predominantly. Survey methods (27.97%, 233 out of 833) were predominantly as single research-purely quantitative method.

• Case Study as the second method adopted. Case studies (14.05%, 117 out of 833) were adopted as the second single method in China's e-commerce research.

• Laboratory experiments as the third-used method widely. Laboratory experiment (10.45%, 87 out of 833) was the third adopted method. The main benefit of the laboratory was its transformation ability.

• Document and text analysis was the fourth-used method. Document and texts analysis (6.48%, 54 out of 833) was the fourth wide-adopted method in China's e-commerce research.

• Focus Group was the fifth-used method. Focus group studies (4.2%, 35 out of 833) were the fifth wide-used method in China.

• Content analysis (0.84%, 7 out of 833) and observation methods (0.6%, 5 out of 833) were less adopted in China's e-commerce research.

• Interviews were identified as the least-used method. Only 0.36% (3 out of 833) of China's articles used interviews. Interviews were least adopted in China's e-commerce research.

4. International reviews

Several international studies have examined research methods in e-commerce research between 2000 and 2020, including Fisher et al. (2007), Khoo et al. (2016), Ain et al. (2019), and Kolotylo-Kulkarni et al. (2021) (see Table 2).

Fisher et al. (2007) discussed research methods used in e-commerce studies by Australian researchers from 2000 to 2005. They highlighted that case studies (40.14%) and surveys (28.17%) were predominantly used in Australian e-commerce research. Interviews (15.49%) were also widely used. Other research methods were also reported, including experiment (9.86%), field study (2.82%), focus group (2.11%), and Delphi (1.41%). No mixed-method was reviewed.

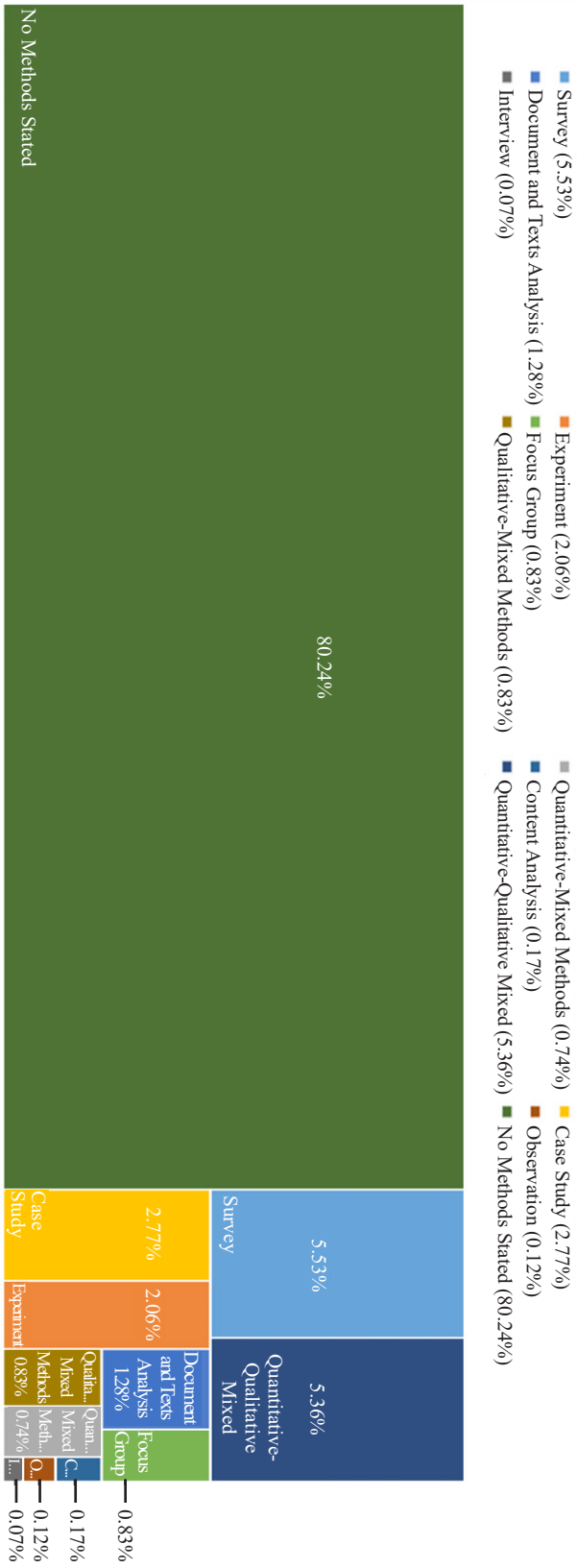

Figure 2. A treemap for visualizing research methods adopted in China's e-commerce research

Khoo et al. (2016) searched Elsevier's Scopus database and found 73 e-commerce adoption studies carried out between 2011-2016. They discovered that surveys (69.86%) were the dominant instrument employed. Few qualitative methods were reviewed, including case study (9.59%), interview (2.74%), document and text analysis (1.37%), and focus group (1.37%). They also found that mixed research methods (15.07%) were also wide-used, including quantitative-mixed (1.37%), qualitative-mixed (2.74%), and quantitative-qualitative mixed methods (10.96%).

Ain et al. (2019) reviewed research on business intelligence system adoption, utilization, and success published between 2000 and 2019. They discovered surveys (62%) as the dominant research method. Case study (12%), quantitative-qualitative mixed (11%), and interview methods (9%) were followed. Their research also covered secondary data (3%), observation (2%), and Delphi (1%). They also reported quantitative-qualitative mixed methods (11%). But they found that no research used quantitative-mixed or qualitative-mixed methods.

Kolotylo-Kulkarni et al. (2021) studied the literature on information disclosure in e-commerce published from 1998 to June 2020. They summarized that experiments (50%) and surveys (40.32%) were the most-used research methods. Interviews (1.61%) and secondary data research methods (1.61%) were reported. Their research also stated quantitative-qualitative mixed methods (6.46%), including quantitative-mixed (3.23%) and quantitative-qualitative mixed methods (3.23%). But they found that no research used qualitative-mixed methods.

Table 2. Comparison of research methods in e-commerce

Research Methods			Fisher et al. 2005	Khoo et al. 2016	Ain et al. 2019	Kolotylo-Kulkarni et al. 2020	This research
Quantitative	Single Method	Survey	28.17%	69.86%	62.00%	40.32%	27.97%
		Laboratory Experiment	9.86%			50%	10.45%
	Quantitative-mixed Methods			1.37%		3.23%	3.72%
	Sub-Sum		38.03%	71.23%	62.00%	93.55%	42.14%
Qualitative	Single Method	Case Study	40.14%	9.59%	12.00%		14.05%
		Document and Text Analysis		1.37%			6.48%
		Focus Group	2.11%	1.37%			4.20%
		Content Analysis					0.84%
		Observation			2%		0.60%
		Interview	15.49%	2.74%	9.00%	1.61%	0.36%
		Field Study	2.82%				
		Secondary Data			3%	1.61%	
		Dephi	1.41%		1.00%		
	Qualitative-mixed Methods			2.74%			4.20%
	Sub-Sum		61.97%	17.81%	27.00%	3.22%	30.73%
Quantitative-Qualitative Mixed				10.96%	11.00%	3.23%	27.13%
Sum			100.00%	100.00%	100.00%	100.00%	100.00%

5. Comparison and summary

Based on Table 1 and Table 2, it might be summarized that there were different views compared to Chinese scholars and international studies such as Fisher et al. (2007), Khoo et al. (2016), Ain et al. (2019), Kolotylo-Kulkarni et al. (2021). Twelve findings were discussed in this section to compare the differences in research methods between Chinses and international studies.

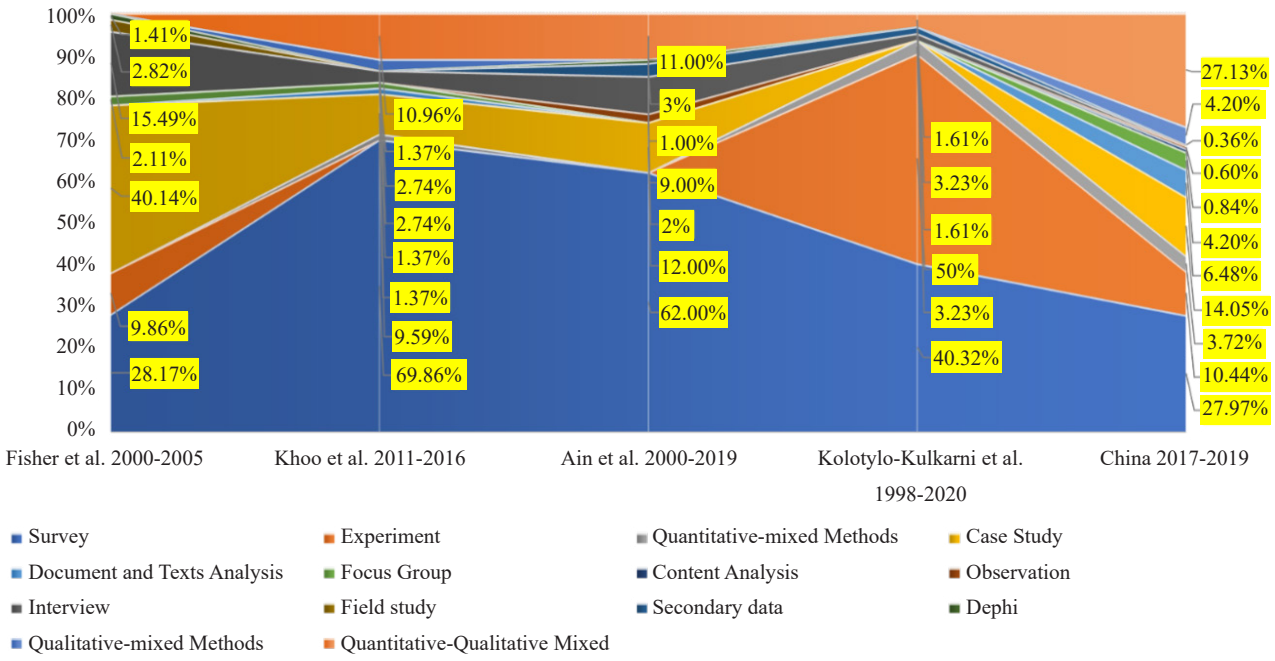

Figure 3. Comparison of reviews on e-commerce research methods

5.1 *No methods in most of the Chinese publications*

Most of China's e-commerce publications (80.24%) did not state any research method (see Figure 2). Two reasons might at least be justified. The main reason was that China's universities offered e-commerce programs in 2001 as one of the international pioneers in e-commerce development globally (Wu et al., 2016). E-commerce courses were also offered to students to prepare to be further global professionals and face business requirements since 2010 (Gide & Wu, 2010). Until 2019, 39.47% (328 of 831) universities offered e-commerce programs among 831 public universities were established in China (Hou et al., 2020). However, after reviewing these e-commerce programs, most of these programs did not deliver any research method course. It led to a lack of research method skills or training offered for research students. The recommendation was to provide workshops on research methodology to research students.

Another reason was that most of China's scientific journals did not state a compulsory requirement for the research methodology section on manuscript submission. The submission requirements lead the authors to ignore the importance of research methods in their manuscripts. The recommendation was that China's journal editor's office should invite more international scholars to join the editor's team.

5.2 *Mixed-method adopted highly in Chinese publications*

The term mixed research method refers to combining quantitative and qualitative approaches, which gained traction after 2001 and gained recognition among social scientists rapidly after 2006 (Timans et al., 2019). Mixed methods have been well-adopted in China's e-commence research (35.05%), including quantitative-qualitative mixed methods

(27.13%), quantitative-mixed methods (3.72%), and qualitative-mixed methods (4.2%). They were highly adopted compared to other studies, such as Khoo et al. (2016) (15.07%) comprising quantitative-qualitative mixed methods (10.96%), quantitative-mixed methods (1.37%), and qualitative-mixed methods (2.74%). Ain et al. (2019) analyzed quantitative-qualitative mixed methods (11%), but they did not report quantitative-mixed methods and qualitative-mixed methods. Kolotylo-Kulkarni et al. (2021) reviewed quantitative-qualitative mixed methods (3.23%), but they did not report qualitative-mixed methods. Fisher et al. (2007) did not analyze any mixed methods.

Due to several benefits of mixed methods research, diverse research methods have been around in social science research for quite a while to designate using different forms of data analysis in empirical studies (Timans et al., 2019). The growing complexity of research problems should be the main reason for the emergence of mixed methods: the increasing need qualitative researchers felt for generalizing their findings (Timans et al., 2019). Mixed methods might also help researchers comprehensively understand a complex phenomenon and produce more robust inferences by drawing conclusions based on the data - more evidence, i.e., data, and more vital to the decision (Taguchi, 2018).

However, mixed methods were faced with taking much more seriously in recent years (Timans et al., 2019). Matters were challenging in transforming qualitative into quantitative data in qualitative comparative analysis (De Block & Vis, 2019). If qualitative research was not internally valid or consistent through reproducibility, quantitative research drawing on qualitative insights was not externally valid due to nonprobability-based samples to test theoretical processes and mechanisms included in statistical models (Sykes et al., 2018).

Although Bacon-Shone (2015, p. 40) suggested adopting mixed methods by using qualitative first for identifying the issues and then quantitative for measuring responses to the problems identified. There was, however, a need to have an entire course dedicated to the training of mixed-method research since mixed-method research had its epistemology and design principles that were different from other methods (Taguchi, 2018).

5.3 *Survey methods predominantly but behind international research*

Survey methods (27.97%) were predominantly single research- purely quantitative method in Chinese research. They were also the most important research methods for e-commerce research over two decades since 2000 (see Figure 3), such as 28.17% by Fisher et al. (2007), 40.32% by Kolotylo-Kulkarni et al. (2021), 62% by Ain et al. (2019), and 69.86% by Khoo et al. (2016). It was clear that the survey method adopted in China's e-commerce research was still behind international research.

Many pieces of literature have well-discussed the advantages of surveys. For example, surveys might be descriptive, collecting information about the sampled subjects or evaluating intervention outcomes involving open-ended or closed questions, rating questions, or ranking questions (Bargagliotti et al., 2021). On the other side of the discussion, opponents of Internet-based survey data questioned the quality of such data, response rate, or insufficient time to complete the survey (Smyk et al., 2021). Another limitation was that most large-scale survey programs could not consider specific requirements of subgroups of respondents by adapting questions or survey procedures (Schanze, 2021).

5.4 *Case study as second method in Chinese research*

Case studies (14.05%) were adopted as the second single method in Chinese e-commerce research. This finding was significantly less than the research by Fisher et al. (2007) (40.14%) but higher than reviews by Khoo et al. (2016) (9.58%) and Ain et al. (2019) (12%). Kolotylo-Kulkarni et al. (2021) did not report this method.

The case study research used multiple data sources to develop a contextualized understanding of the phenomenon to confront theory by comparing it with empirical data (Piekkari et al., 2009; Hoorani et al., 2019). Literature showed three facts in current case studies. The first fact was case study research based on a small number of cases. Case selection and the reasons and rationales behind the choice of the case became the 'foundational stone' for ensuring the rigor of a qualitative case study (Hoorani et al., 2019). The second fact was that almost most case studies used two levels of analysis to enhance the generalizability of conclusions drawn from cases, including within-case and across-case analysis (Moghadam et al., 2021). The third fact was that many studies adopt a single case study approach rather than a multiple case study approach (Çakar & Aykol, 2021).

The main advantage of a case study was that researchers might use case studies for mainly unexplored or

underexamined topics for which little or scarce empirical evidence existed (Çakar & Aykol, 2021). Another advantage was that researchers and implementors might engage with the complex implementation process and inform data collection by tracking changes over time (Van Tiem et al., 2021).

5.5 *Different views of laboratory experiment*

There were different views on whether laboratory Experiments should be regarded as a research method. Laboratory experiment (10.45%) was the third wide-adopted method in Chinese research, but less reported by Fisher et al. (2007) (9.86%). However, Kolotylo-Kulkarni et al. (2021) found that this method was higher adapted up to 50%. Khoo et al. (2016) and Ain et al. (2019) did not discuss laboratory experiments.

The main benefit of the laboratory was its transformation ability. It might transform unobservable variables into observables through elicitation (Schotter & Trevino, 2014). The second advantage was that the laboratory could experimentally manipulate the type and magnitude of distractions and control other factors that potentially affect measurement (Wenz, 2021). One more advantage was the minor issue of privacy protection. The experiment on giving access to private data was carried out at the computer laboratory using a specially designed application (Babula et al., 2017).

The main limitation of the laboratory experiment method was that distractions and multitasking activities are challenging to simulate in a laboratory setting because they were initiated by the respondent and cannot be manipulated externally, such as browsing websites and surfing social media networking (Wenz, 2021).

5.6 *Document and text analysis adopted highly in Chinese research*

Document and text analysis methods were reported as the fourth wide-adopted method in Chinese research (6.48%). But it was less adopted in reviews by Khoo et al. (2016) (1.37%). Fisher et al. (2007), Ain et al. (2019), and Kolotylo-Kulkarni et al. (2021) did not report it.

Quantitative document and text analysis was a systematic procedure for reviewing or evaluating printed and electronic material (Bowen, 2009). The interchange of terms document and texts analysis, document analysis, and text analysis were used in the literature. This research adopted the terms document and text analysis to cover document and texts analysis, document analysis, and text analysis methods. Walter Weintraub pioneered the first genuinely transparent document and text analysis method in 1981 (Tausczik & Pennebaker, 2010). The remarkable potential of document and text analysis was stumbled upon in the early 1990s (Tausczik & Pennebaker, 2010). Many social scientists recently recognized it as a useful research methodology (Watanabe, 2021).

The main benefit of the document and text analysis was its ability to analyze documents reflecting various levels of analysis (McKenny et al., 2013). Compared to other research methods, the document and text analyses were less time-consuming and less costly as the data - contained in documents - had already been gathered (Bowen, 2009). Another advantage of the document and text analysis was that it might be preferable to surveys when measuring elevated constructs across multiple organizations and has proven particularly useful in its ability to measure constructs directly at the organizational level by analyzing administrative texts (McKenny et al., 2013). More analysis tools were developed to document and text analysis with increasing research. For example, Welber et al. (2017) delivered a guide to using the R programming language in text analysis.

The main limitation was that documentation was not always retrievable (Bowen, 2009). The limit to the utility for social scientists was another shortage. Social scientists should invest many resources for dictionary analysis supervised machine learning models or surrendered the consistency of results with the existing theoretical framework for unsupervised machine learning models (Watanabe, 2021).

5.7 *Focus group less adopted in e-commerce research*

As a qualitative research method, focus group studies could bring various experts' perspectives together with shared interests (Throuvala et al., 2019; Pöge et al., 2020; Kim et al., 2020; Nord et al., 2020; Shim & Sim, 2020). Peer-led focus groups might facilitate a space to identify ways to transform talk into action (Djohari et al., 2020). Therefore, the focus group method has widely been used in social science and marketing research. However, the focus group

method was less adopted by both this review and international scholars, such as this review (4.2%, 35 out of 833), Fisher et al. (2007) (2.11%), and Khoo et al. (2016) (1.37%). Ain et al. (2019) and Kolotylo-Kulkarni et al. (2021) did not discuss any focus group studies.

Recent literature also showed that the focus group method preference several features over other research methods. The focus group method allowed a better opportunity to encourage interactive discussions between the participants (Nord et al., 2020; Heuer & Zimmermann, 2020), while it was conducted using a semi-structured discussion guide developed through an iterative process (Sanchez, 2019). When participants were comfortable talking (Olsson Möller et al., 2020), the interaction among the participants would help to explore and clarify the participants' experiences and views concerning the study aims (Nybergh et al., 2020). This method might help gather wealth materials from the interaction between participants (Nord et al., 2020; Varpula et al., 2020) and generate rich research data from the discussion (Djohari et al., 2020; Nord et al., 2020; Varpula et al., 2020).

There was a need to explore practical strategies to encourage more Chinese and international scholars to adopt the focus group method for further e-commerce research.

5.8 *Content analysis methods less discussed*

The content analysis method (0.84%) was less adopted in Chinese research. It did not be reported by Fisher et al. (2007), Khoo et al. (2016), Ain et al. (2019), and Kolotylo-Kulkarni et al. (2021).

In the literature, the document and text analysis method and content analysis method were recognized as the same research method by different studies. For example, McKenny et al. (2013) argued that document and text analysis was a form of content analysis. Bowen (2009) highlighted that the iterative process of document and text analysis included skimming (superficial examination), reading (thorough examination), and interpretation, which involved content analysis.

Content analysis began to use computer assistance as early as the 1960s (Tausczik & Pennebaker, 2010; Pollach, 2012), which was defined as systematic and detailed analysis of different types of data to identify latent meanings, themes, and assumptions (Seyyedamiri et al., 2021). In social sciences, the content analysis produced a valid and reliable measurement of the frequency (and, sometimes, intensity) with which a concept occurred (Budak et al., 2021). It provided a strategy for organizing and interpreting qualitative data to create a narrative understanding that brought together the commonalities and differences in participants' descriptions of their subjective experiences (Crowe et al., 2015). An advantage of content analysis was that large volumes of textual data and different textual sources could be dealt with and used in corroborating evidence (Elo & Kyngäs, 2008). More recently, computer scientists have embraced the method as a tool for building models that might characterize content in ways and not rely on counts (e.g., sentiment analysis) (Budak et al., 2021).

The main limitation of content analysis might be regarded as reasonably superficial (Crowe et al., 2015). Another disadvantage was that content analysis related to research questions was ambiguous or too extensive (Elo & Kyngäs, 2008).

5.9 *Observation methods less discussed*

The observation method (0.6%) was less adopted in Chinese research and more adopted in Ain et al. (2019) (2%). No studies were reported by Fisher et al. (2007), Khoo et al. (2016), and Kolotylo-Kulkarni et al. (2021).

The processes of systematic observation made up the analysis of interpersonal communication, which has been deepened and enriched in the last 50 years (Izquierdo & Anguera, 2021). The systematic observation was a positive scientific methodology in the strict sense, with an application protocol covering all the scientific method components, regulating the methodological process's conduct, and promoting commitment to quality controls and good research practice (Izquierdo & Anguera, 2021).

Observation accuracy and bias might be the main limitation of the observation method. The error-prone observations might be caused primarily by manifesting themselves in the form of variability among researchers (West & Li, 2019). The observation accuracy and bias were due to personal bias by different observers. It was worthy of being investigated further in distinctive ways.

5.10 *Interviews less adopted in China but highly in international research*

Interviews were least adopted in China's e-commerce research (0.36%, 3 out of 833). But they were highly reported by Fisher et al. (2007) (15.49%) and also reviewed by Khoo et al. (2016) (2.74%), Ain et al. (2019) (9%), Kolotylo-Kulkarni et al. (2021) (1.61%). It was valuable for conducting further research on any issues or difficulties with the interview research method adopted in China.

In-depth interviews had unique and well-documented strengths, including the capacity - at least in theory - to uncover motives that the researcher had not thought of and to capture the full array of ways a given motivation may manifest itself (Small & Cook, 2021). Semi-structured interview data provided researchers a view into the complex cognitive links that humans might draw in their minds when processing the social worlds (Price & Smith, 2021). Qualitative methodologists rarely stated a hard cutoff for the required interviews, but the number of interviews ranged from 30 to 208 (Deterding & Waters, 2021). Recently, Researchers debated the scientific value of in-depth interviews - particularly, it has probed whether they should be used to capture anything other than people's subjective accounts of their lives and circumstances (Small & Cook, 2021).

This research found three concerns involved in this method. The first concern was to validate the reliability of data analysis. Qualitative data analysis software might not be worth fully indexing transcripts for projects with a small number- fewer than 30 interviews (Deterding & Waters, 2021). The second concern was the reliability of the data. Researchers have proposed that, since what people say could not be trusted, interviews were unreliable sources for studying much more than people's words and what they meant to them (Small & Cook, 2021). The third concern was bias. Bias could come from various sources. They included interview content, the process itself, rater subjectivity, deceptive lies, recall errors, reasonableness bias, intentionality bias, or single-motive bias (Bégin et al., 2021; Small & Cook, 2021).

5.11 *Few methods adopted in international only*

A few research methods were not adopted in Chinese research, such as field study, secondary, and Delphi methods. They were reported by international research, such as by Fisher et al. (2007) (field study with 2.82% and Delphi with 1.41%), and Ain et al. (2019) (secondary data with 3% and Delphi with 1%), and Kolotylo-Kulkarni et al. (2021) (secondary data with 1.61%). There was a need to conduct further research on any issues or difficulties that these methods were not adopted in Chinese research and less adopted in international studies.

5.12 *No correlational research method reported*

This research found that the correlational research method was not reported in Chinese and international studies. As a quantitative research method, the correlational research method was adopted to measure two variables and assess the statistical relationship (i.e., the correlation) between them with little or no effort to control extraneous variables (Price et al., 2017).

The correlation analysis might confirm a strong relationship between the data (Wu et al., 2022). Such as correlation analysis could find a linear relationship between linear-dependent variables; if it existed: it might give a solid indicator to interpret a robust nonlinear relationship between nonlinear-dependent variables (AL-Rousan et al., 2021). Correlational research studies could also provide invaluable information about what future research might be required to investigate the variables correlated with the outcomes or attributes previously studied (Curtis et al., 2016). Recent research identified that the correlational research method might be a more effective practical approach than a machine learning method to developing a warning system (Wu et al., 2021).

The main limitation was that correlational research did not allow for identifying causal relationships between variables (Luft, 2018). The correlational research method was encouraged to be used further in Chinese and international e-commerce research.

6. Conclusions

6.1 *Conclusions*

This research aimed to understand the differences in research methods adopted between Chinese and international e-commerce research and provided suggestions and recommendations for further research agenda in e-commerce post-COVID-19. This research studied Chinese e-commerce research for five years between 2015 and 2019. 4,425 articles were initially yielded (see Figure 1).

This research discussed nine methods, including mixed methods, survey, case study, laboratory experiments, document and text analysis, focus group, content analysis, observation, and interviews. Night findings on Chinese research methods were briefly highlighted as:

• Most of China's e-commerce publications (80.24%, 3382 out of 4215) did not state any research method.

• The mixed research method was identified as a critical role. It was distinctly that mixed-methods (35.05%, 292 out of 833) have been well-adopted in China's e-commence research, including quantitative-qualitative mixed methods (27.13%, 226 out of 833), quantitative-mixed methods (3.72%, 31 out of 833), and qualitative-mixed methods (4.2%, 35 out of 833).

• Survey methods predominantly. Survey methods (27.97%, 233 out of 833) were predominantly as single research-purely quantitative method.

• Case Study as the second method adopted. Case studies (14.05%, 117 out of 833) were adopted as the second single method in China's e-commerce research.

• Laboratory experiments were the third-used method widely. Laboratory experiment (10.45%, 87 out of 833) was the third adopted method. The main benefit of the laboratory was its transformation ability.

• Document and text analysis was the fourth-used method. Document and texts analysis (6.48%, 54 out of 833) was the fourth wide-adopted method in China's e-commerce research.

• Focus Group was the fifth-used method. Focus group studies (4.2%, 35 out of 833) were the fifth wide-used method in China.

• Content analysis (0.84%, 7 out of 833) and observation methods (0.6%, 5 out of 833) were less adopted in China's e-commerce research.

• Interviews were identified as the least-used method. Only 0.36% (3 out of 833) of China's articles used interviews. Interviews were least adopted in China's e-commerce research.

Based on comparisons of the different reviews in research methods between Chinses and international scholars in e-commerce research, twelve findings were discussed:

• Most of China's e-commerce publications (80.24%) did not state any research method (see Figure 2).

• Mixed methods have been well-adopted in China's e-commence research (35.05%), including quantitative-mixed, qualitative-mixed, and quantitative-qualitative mixed methods. They were highly adopted compared to other studies.

• Survey methods (27.97%) were predominantly single research-purely quantitative method in Chinese research, but they were still behind international research.

• Case studies (14.05%) were adopted as the second single method in Chinese e-commerce research. This finding was significantly less than the research by Fisher et al. (2007) (40.14%) but higher than others.

• There were different views on whether laboratory experiments should be considered a research method.

• Document and text analysis methods were reported by Chinese scholars (6.48%), but less and even not be reported by international researchers.

• The focus group method was less adopted internationally.

• The content analysis method (0.84%) was less adopted in Chinese research and did not be reported by international scholars.

• The observation method (0.6%) was less adopted in Chinese research but more adopted in Ain et al. (2019) (2%). Other international studies reported no studies.

• Interviews (0.36%) were least adopted in Chinese research but highly reported by international scholars.

• A few research methods were only adopted in international research, such as field study, secondary, and Delphi methods

• The correlational research method was not reported in e-commerce research.

6.2 *Contributions, recommendations, limitations, and further research*

The main contributions of this study could be stated as:

• This research would be valuable for researchers or educators interested in Chinese e-commerce research.

• Review outcomes would also add research value for comparing the differences in research methods between Chinese scholars and international counterparts.

Four recommendations were made:

• offering workshops on research methodology to Chinese research students.

• inviting more international scholars to join the editor's team of Chinese scientific journals.

• Having an entire course dedicated to the training of mixed-method research was different from other methods.

• Exploring practical strategies to encourage more scholars to adopt the focus group method for further e-commerce research, and

• Promoting correlational research into e-commerce research internationally.

The main limitation of this research mainly overviewed the current status of research methods adopted in Chinese e-commerce research and did not conduct an in-depth systematic analysis. Another limitation was that this research did not review e-commerce publications between 2020 and 2021 due to the COVID-19 crisis affecting the regular publications. Further research topics were also provided as the suggestions:

• Understanding issues or difficulties with the interview research method adopted in China,

• Investigating distinctive ways to avoid bias in the observation research method, and

• Explore any issues or difficulties on why few research methods were not adopted internationally, such as field study, secondary data, and Delphi methods.

Conflict of interest

The authors declare no conflicts of interest.

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