

Comparative Analysis of Quantitative Analysis and Case Study in Chinese Management

Zhihui Xie & Wei Gong

Abstract

This paper systematically listed out the theoretical background, core elements and research paradigm of quantitative analysis and case study, composed comparative analysis of two research methods from sixteen key elements. Summarized three principles and six structural steps of quantitative analysis and case study writing, and deduced the development of Chinese management research methods, which provides more choices of research methods and paradigms for grasping the future fusion trend of quantitative analysis and case study. This also provides a solid foundation for helping beginners and researchers in the field of management to improve the comprehensive application ability of quantitative analysis and case study, and provides a useful reference for future management research rooted in Chinese situation to develop in the direction of local theory and leading management practice.



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1. Introduction

The modern term “Xue Shu” (学术) in Chinese has not been used by Chinese scholars until the beginning of the 20th century. As in Chinese, “Xue (学)” and “Shu (术)” are two separate word and have their own meanings. Previously most scholars only studied these two words separately and gave them different meanings. For example: In Yan Fu’s view, “Covering the difference between learning and art, scholars test the principles of nature and set an inevitable example; According to the known theory, the performer seeks the merits that can be sought. Learned from the master, and the master will do it (Yan, 1981).” Cai Yuanpei said: “Learning is about academic theory, and art is about application. Apply the art based on what you learned, learning and art go hand in hand (Cai, 1991).” Liang Qichao said: “The body of the scholar's skill is used by the practitioner.” In summary, scientific research is the discovery of laws, which is “Xue (学)”, the academic theory; applied research is the application of laws, which is “Shu (术)”, the application. Therefore, the integration of “Xue (学)” and “Shu (术)” is vital to combine the academic theory with application. Undoubtedly, scientific research paradigm is the key to bridge the gap between “management” and “practice”. In the discussion of management science, it is significant to have a comprehensive analysis in article writing framework, analysis results and guiding information research (Gephard, 2004; Sarker et al., 2013). In addition, the analysis gap should be reflected (Corley, 2012), and the implicit argument dedication should be included (Gephard, 2004), as well as the value of application and popularization in practice. An analyst should be able to apply scientific method properly on a novel topic to compose a rigorously structured analysis and thus both theoretical contribution and practical significance are the comprehensive standards to measure the academic value of management research. Quantitative Analysis and Qualitative Analysis are the two commonly used methods by researchers in management science research, have different applicability to different management science disciplines (Hong, 2013). How to improve the comprehensive applicability of Quantitative Analysis and Qualitative Research? First of all, the scientist should be able to identify the two research methods scientifically and systematically and make clear their differences and connections. This helps to combine the strengths and weaknesses and the results of the organic combination of the two research methods as a powerful tool to explore edge cutting theoretical content. The Quantitative Analysis method aims at using the mathematical research method on the discussion of social related problems within the scope of possibility. This represents the improvement of scientific thinking ability, and also a key step to realize the integration of social and natural science suggested by Marx. Case study being an important factor in qualitative research, it is not only one of the important methods to explore edge cutting research content, but also be used to explore and discover the unique changing relationship between situational factors or constructions, extract the general law of Chinese enterprises’ development, and summarize the local theories suitable for their own characteristics (Feng & Dong, 2011). In this regard, this study collected valuable viewpoints of domestic and foreign scholars on Quantitative Analysis and Case Study and combined into a comparative analysis from the research background, core elements, research paradigm, structural steps and defect. The author argues that the method of comprehensive case study should be adopted in the study of Chinese management, that is, to use Case Study as the leading method and supported by Quantitative Analysis. In addition, this paper also prospects the development of the management research in China, in order to make a useful reference for promoting the research of Chinese localization management theory.

2. The research background of Quantitative Analysis and Case Study

Quantitative Analysis is an analysis method which often systematically examines social problems by using calculating techniques, mathematics, statistics and other means. The methodology of Quantitative Analysis can be put forward based on the thought of Practical

Verifications to develop and benefit from three aspects (Bryant, 1985). The first aspect is Comte's methodological concept and philosophy of Practical Verifications. The second aspect is Logical Positivism. The last aspect is the Practical Practice Positivism put forward by the United States which can also be classified into the Instrumental Positivism according to the viewpoint put forward by expert Bryant. In basic criterion of Quantitative Analysis, inductive method is the prerequisite for discovering knowledge, and the views or assumptions formed during analysis should be verified through the logical process required in the form of "hypothesis deductive" (Wo, 2005). The theoretical hypothesis is based on the existing theory, and the research process is a verification of the existing theory, emphasizing the objectivity and neutrality of research process. Case Study is field study in which analyst selects single or multiple different scenes as research objects, systematically integrate relevant information and conduct in depth analysis in order to study a specific phenomenon in real life atmosphere. Management Case Study is a research method to explore management rules and build management theory through the standardized study of cases. In the early stage of management research, Case Study was a widely used research method however most of it were based on the researcher's "memory". Later on, it was gradually evolved into extracting information from interviews and this lasted until the 1950s. In 1960, the management scholars criticized insufficient scientific basis in such research method and called for caution to the information produced. As a result, Quantitative Analysis based on statistical research has gradually become more and more popular and marginalizing Case Study (Mao, 2020). Quantitative Analysis and Case Study rooted in different philosophical backgrounds. Quantitative Analysis paradigm has evolved from Positivism to Post-Positivism and two paradigms in Case Study: Positivism Case Study and Interpretivism Case Study. The Positivism Case Study paradigm advocated by Brown and Eisenhardt is to use Variance models to deduce the causal relations of research problems in management cases (Brown & Eisenhardt, 1997). On the other hand, the Interpretivism Case Study paradigm advocated by Feldman is to use Process models to induce the causal mechanisms of research problems in management cases (Feldman & Martha, 2000). Quantitative Analysis uses statistical quantitative data to objectively reflect the research facts, but it is difficult to completely reflect the truth due to the limitations of data samples. Case researcher uses the method of "studying the dynamics with dynamic methods" to reflect truth in reality but it is often interfered by subjective factors. Therefore, whether it is Quantitative Analysis or Case Study, it is to reveal the intrinsic nature and mechanism of the research object by describing and explaining various management events and phenomena. Due to the interdependence nature between practice and theory, Quantitative Analysis and Case Study need to be combined.

3. Comparison of Core Elements and Research Paradigms between Quantitative Analysis and Case Study

3.1 Comparison of core elements between Quantitative Analysis and Case Study

Quantitative Analysis helps people to understand the society in a thorough and accurate way. Mathematical models describe social phenomena which enables research work to be carried out in laboratories, create new mathematical systems and establish new mathematical concepts, it is a progress for management science went from descriptive science to precise science. While in Quantitative Analysis, terms such as Mean, Mode, Variance, Correlation Coefficient, Standard Deviation, Covariance and Standard Error are commonly used. Zhang Wei-hao, a Taiwan scholar in China, summarized the two cores of Quantitative Analysis on statistical analysis into influence and difference. The influence includes two aspects: multiple regression analysis and the transformation of virtual variables; Difference includes seven aspects: single sample T-test, paired sample T-test, independent sample T-test, Variance analysis, difference analysis (after-the-fact comparison), two-factor Variance analysis and

Covariance analysis. These manifested that Quantitative Analysis is highly dependent on auxiliary disciplines such as Statistics, Investigation, and Computer Science. and is composed of normative and operational means of multiple links. Therefore, the judgment of the advantages and disadvantages of different application methods depend on the impact of comparison between various technical means (Yang, 2009). Quantitative Analysis is a process of using statistical tools to test and refine existing theories and its basic function is to answer the question of how a certain society exists from the overall level. In the aspect of data presentation, data size is used to explain the relationship between variables. In the aspect of data source, the information is extracted from survey with large samples. The type of information is cross-sectional data and the use of mathematical models and statistical measurement tools are prominent in writing characteristics. Except for the independent variables to be investigated, other variables that interfere with dependent variables are set as control variables (control variables include adjustment variables, intermediary variables, demographic variables, etc.). In the data collection stage, Quantitative Analysis is to collect data in the form of numbers; Case Study is to collect data in the form of words or pictures. Quantitative Analysis is characterized by its instrumentality and methodology. Once the methods and skills are mastered, the unified survey results could be analyzed and verified from different aspects, and the number of published articles would be controlled easily. Case study being an important qualitative research method is also widely used in Management Science. Eisenhardt believes that Case Study uses holistic and often long-term case studies to develop hypotheses and ideas to illustrate the arguments on which they are based. Case Study also comprehensively applied grounded theory, stereotyped data analysis methods and triangular evidence methods to construct the theory to enrich the organization and strategic management theories. On the other hand, case study is also widely used in professional research (Eisenhardt, 1989), it brings enlightenment and novel insights to scholars. It is a good way to create theories by extracting theoretical ideas from management cases. According to the current management analysis in China, qualitative analysis method (represented by grounded viewpoint and case analysis) is gradually recognized by a large number of scholars (Li & Xi, 2019). Although Case Study is criticized for its lack of comprehensiveness, the success of a representative Case Study is attributed to the excellent analytical means of researchers, and to the luck in the early development of Case Study. Classical Case Studies are also based on theoretical sampling, a priori measure of concepts, clear research questions, multiple interviewees and existing literatures (Eisenhardt, 1991). Two watershed Case Study paradigms was developed later on with interesting, reliable and insightful, correct methods, Positivism (Brown & Eisenhardt, 1997) and Interpretivism Case Study (Feldman & Martha, 2000). Case Study was originated from rooted thought, and guide people into the study with an interesting story. A new theory is constructed by qualitative analysis, induction of essence and insight of transaction context. This study emphasizes the importance of cultural background and organizational situation, and integrates the collected data by manual coding. There are other practical and convenient methods and tools, such as Nvivo and Pyhton, which greatly improved the reliability and efficiency of Case Study. Below is the comparison between Quantitative Analysis and Case Study which is classified into 16 key factors.

Figure 1. Comparison of the elements between Quantitative Analysis and Case Study (summarized according to the data)

Element NO.	Categories	Quantitative Analysis	Case Study
1	Philosophical background	Positivism	Humanitarianism
2	Number of articles	Can be mass-produced	Less output
3	Solution Mode	How many?	What is it and why?

4	Data presentation	The size of the data can be used to explain the strength-weakness relationship between variables	Insights into qualitative analysis, inductive essence and transaction context
5	Data source	Questionnaire (cross-sectional data) and Experimental design	In-depth interviews or fieldwork
6	Sample size	Large sample survey	Small sample of single case or multiple cases
7	Theoretical goal	Examine and refine the theory	Construction theory
8	Canonical analysis	Multiple regression analysis	Qualitative comparative analysis
9	Writing Characteristics	Data inference; Mathematical model	Tell "stories"; Text description
10	Logical reasoning mode	Deductive	Deduction (Positivism) ; Induction(Interpretivism)
11	Operating Tool	Using statistical techniques to get objective analysis results and interpretation (SPSS, HLM, STATA, etc.)	Manual data coding, layers of abstraction, induction, iteration (ATLAS.ti, NVIVO, PYTHON, etc.)
12	Sampling method	Random sampling	Unique case
13	Background considerations	Cross-sectional data and situational factors are mostly set as control variables	Emphasis on cultural background and organizational context
14	Conclusion	Objective neutrality	Subjective analysis
15	Sources	Middle range theory	Put down Roots
16	Target	Application Extension; theoretical verification	Solving practical problems; theoretical contributions to development

3.2 Comparison of research paradigms between Quantitative Analysis and Case Study

3.2.1 The degree of their contribution to the theory

Theoretical contribution is one of the most important criteria to measure research value and it is also a necessary condition for high quality Case Studies. Moreover, solid theoretical contribution is the primary criteria to measure the quality of a case studies (Pratt, 2008). Zapata-Phelan and Colquitt (2011) proposed to evaluate theoretical contribution of empirical research from two dimensions: theoretical construction and theoretical test. The Quantitative Analysis is for the theoretical test and the aim of Case Study is to construct the theory (Welch et al., 2011). Quantitative Analysis helps analysts to confirm biased opinion of the problem and verify the credibility of the arguments put forward (Wo, 2005). In addition to testing the existing theories, Quantitative Analysis can be used to develop and verify the measurement scale in management, and set up questionnaires to divide new theoretical dimensions under various specific situations, which also plays a deepening meticulous and complementary role in the original theories. Most of the editors-in-chief of AMJ (Academy of Management Journal), an international journal, emphasizes that attentions should be put into theoretical contribution of present research achievements in organization and management (Zapata & Colquitt, 2011). Many theories with different functions can be used in Case Study papers (Sarker et al., 2013) which can not only guide research design and data collection in advance, but also explain and analyze data by introducing new theories into data analysis. Case Study is a qualitative research method which is proved to be an effective method to construct theory (Li & Cao, 2012).

3.2.2 Three principles and six writing steps of Quantitative Analysis and Case Study

Quantitative Analysis is a process from discovering problems to solving problems by sizing, calculating and analyzing quantifiable elements and their relations. Quantitative Analysis is a research process from problem discovery, data collection, data analysis to problem solving. The three principles which are generally followed are first, select representative samples, but do not extend to a larger field; Second, confirm two or more variables and predict their correlation; Third, choose an appropriate statistical method to analyze the differences (mean values) among variables. Quantitative Analysis should include the following six aspects: introduction, theoretical support, sample selection, variable measurement, analysis (result) and conclusion. In which the fifth part "analysis (result)" refers to the analysis result after scientific analysis of data. Each aspect leads to another so all six aspects should be included in

sequence. (Figure 2. for Comparison between quantitative paper structure and case paper structure). Compared with Quantitative Analysis, the advantage of Case Study lies in building a thorough understanding and explanation of management phenomena. The paper structure of Case Study can also be divided into six aspects: introduction, literature review, research methods, case description, case analysis and conclusion. The research methods in Case Study use mainly literature analysis, interview and observation. For that Case Study generally takes the integration logic of interesting situations as the premise in order to avoid discussion on the matter, it is vital to carry out theoretical innovation on the basis of summarizing the experience of predecessors. Therefore, the case paper structure takes literature review as a separate step (Figure 2 for Comparison between quantitative paper structure and case paper structure).

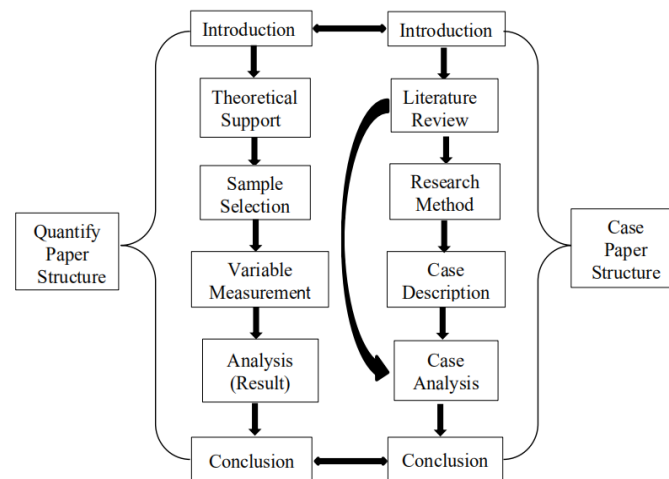


Figure 2. Comparison between quantitative paper structure and case paper structure (summarized according to the data)

3.2.3 Comparison of defects between Quantitative Analysis and Case Study

At present, there are many inferior fallacies in the field of Quantitative Analysis, which reveal the defects in scientific research system and investigators subjective conditions (Yang, 2009). There will be issues if assumptions are made for the current unprecedented management problems, for example it will be difficult to identify new theoretical defects. Due to the prejudiced ideas of researchers, it is difficult to find errors in theoretical construction, data analysis and even the results obtained. When integrating information, researcher rarely pays attention to the key data in practical situation due to their subjective constraints, thus ignored the actual problems. Since Quantitative Analysis is to grasp the development by measuring, calculating and analyzing the quantifiable elements and their relations, it is not suitable for study of complex and dynamic management problems and phenomena. Chinese management scholars now pay more attention to the division between practical management and theoretical construction (Zhang & Xi, 2017). Case Study which emphasizes contextualization provides answer on how to resolve the division between the two. Case Study is more time-sensitive and situational compared to Quantitative Analysis as it requires a large sample size. In recent years, the number of papers in Case Study has increased gradually and the process of Case Study has become increasingly standardized. However, there is still a big gap compared with foreign management Case Study, especially in current situation analysis based on Chinese management Case Study and the construction of localized management theory. This is also a common problem in Case Study which require researchers having advanced research and writing skills.

4. Discussion

Quantitative Analysis based on positivism paradigm has developed rapidly in China since 2000 and occupied mainstream public opinion and research in the management field (Zhang, 2014). Although there have been increased analyses for Quantitative Analysis in the past 20 years, not many was contributed to management practice and theory. There is no absolute advantage or disadvantage between Quantitative Analysis and Case Study. Both should be used when applying to Chinese management research. In other words, the professional and standardized application level of Quantitative Analysis should be improved and also to improve the integration of Quantitative Analysis and applicability of comprehensive Case Study (Wu, 1992). The Quantitative Analysis on social science in western countries is based on its comprehensive and standardized operation process and has benefited scientific research. Learn from the experience of foreign management case studies, such as methods and standardization, helps to narrow the gap with western countries. Looking forward, the research method that should be advocated is the one that can identify and solve Chinese management problems” (Guo, 2008). The comprehensive qualitative research paradigm led by Case Study will be the research trend of management research development in China. The development of management research methods in China is shown in Figure 3 (concluded according to the data). Development of management research methods in China.

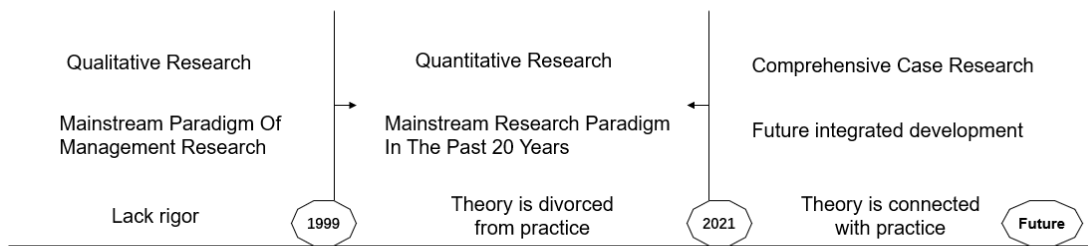


Figure 3. Development of management research methods in China.

Conclusion

In order to demonstrate integration of quantitative research and case study and give full play to their respective advantages, it is necessary to take case study as the guiding principle and quantitative research as the supporting means. Tang and Yang (2017) suggested that Case Study selection process should be improved by matching Case Study paradigm with restrictive factors, evaluating research results and feedback. According to different research stages, case studies can be divided into three modes: theoretical construction, theoretical verification and mixed. It is advocated that the attributes, categories and research paradigms of case studies should be reconstructed, and literature meta-analysis and case investigation techniques should be incorporated into case studies. Therefore, the case-oriented mixed research paradigm comprehensive qualitative Case Study can well bridge the shortcomings of single Quantitative Analysis or qualitative research and promote management science research to a higher level.

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