



IUL School of Business

Department of Marketing, Operation and Management

**The Influence of Trust on
Risk Allocation in Chinese PPP Projects**

Meng Gongming

Thesis specially presented for the fulfillment of the degree of Doctor in management
specialization in strategy and entrepreneurship

Jury:

Doctor Renato Lopes da Costa, Assistant Professor of ISCTE - University Institute of Lisbon;

Doctor Hugo Emanuel dos Reis Sales da Cruz Pinto, Assistant Professor of Universidade do Algarve;

Doctor José Duarte Moleiro Martins, Professor Coordinator of Instituto Superior de Contabilidade e Administração de Lisboa;

Doctor Paulo Resende Silva, Assistant Professor of Universidade de Évora;

Doctor Shaozhuang Ma, Associate Professor of ISCTE - Instituto Universitário de Lisboa;

Doctor Nelson José dos Santos António, Full Professor of ISCTE - Instituto Universitário de Lisboa.

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Supervisor:

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Abstract

In order to improve the performance of PPP project management, remarkable numbers of work has been done by theorists and practitioners. However, the incentive of PPP partners has not fully been interrogated. When looking for an incentive approach of project governance, we found proper risk allocation as a motivating factor. It suggests that proper risk allocation allows contractor control construction costs reasonably, and gain compensation from the contract status changes, to ensure the profits expected at the end of the construction process. Currently, despite the fact that proper risk allocation has been recognized by practitioners to have a positive impact on the performance of project management, however, due to the lack of trust and trust insufficient supplies from PPP partners when designing risk allocation. Therefore, the purpose of this research is to explore the impact mechanism of PPP partners' trust on proper risk allocation scheme formation and mechanism chain in which contractor achieves compensation as the contract status changed to form "trust-PPP partners proper risk allocation-PPP partners act dutifully while obtaining compensation when contract status changed positive loop adaptive process has become an important key scientific problem. Specifically, this thesis is discussed in the following four areas:

1. Theoretical sort of trust and risk allocation in PPP project: we analyzed research progress of risk allocation in PPP project from the perspectives of technology, organization and contract paradigms. Based on the sorting existing literature of trust, we analyzed fit of trust and risk allocation with paradigm tension as foothold, and proposed the potential impact of trust on the formation of risk allocation scheme.

2. Research design employed qualitative and quantitative study for reliability: Trust in construction project involves characteristics of scenarios dependency and moral risk, where data reliability issue has become a bottleneck of development of trust research in PPP project. Therefore, by having focus groups to explore on the optimal projection and 'scenario into'

semi-structured interview process design module, we designed targeting approaches for trust and risk allocation study.

3. Building of ‘trust, proper risk allocation and contract status changes compensation’ theoretical assumptions model based on exploratory analysis with grounded theory and interpretation of literature: due to the gap in the literature which explores the relationship between trust and risk allocation, initial exploratory analysis model along with grounded theory and the analysis of social exchange based on reciprocity, social capital, and incomplete contract theories, we build driver, moderating theoretical assumptions model between trust, proper risk allocation and contract status changes compensation.

4. Empirical Analysis from questionnaire: by fixing existing scales of trust and proper risk allocation, hypothesis testing were answered through questionnaire survey, where it revealed driving action of trust on the formation of proper risk allocation and risk-sharing non-moderating act of trust on the relationship between proper risk allocation and contract status changes compensation.

Key words: Trust, risk allocation, contract flexibility, contract state compensation, moderated regression analysis

JEL: F283; F294

Resumo

Nos últimos anos temos assistido ao aparecimento de um grande número de trabalhos realizados quer por académicos quer por gestores sobre como melhorar o desempenho da gestão de projetos das PPPs. Contudo, somos da opinião que os incentivos dos parceiros não foram totalmente analisados em especial no que respeita à alocação do risco enquanto fator motivador. Apesar da alocação do risco ter sido reconhecida pelos gestores como tendo um impacto positivo no desempenho da gestão de projetos, aquando da definição da alocação existe uma falta de confiança ou esta é insuficiente entre os parceiros das PPPs, o que prejudica o resultado final. O propósito desta tese é pois investigar o mecanismo do impacto da confiança entre os parceiros das PPPs na formação do sistema de alocação do risco adequado e na cadeia de compensações para o contratante quando ocorrem mudanças contratuais. Mais especificamente, esta tese abordará as seguintes quatro áreas:

1. Tipo teórico de confiança e alocação do risco adequado em projetos de PPPs:

analisamos a investigação realizada na alocação do risco nas perspetivas da tecnologia, organização e contrato. Com base nos tipos de confiança existentes na literatura, analisamos de que forma a confiança se adequa à alocação do risco.

2. A nossa pesquisa combina métodos qualitativos e quantitativos. Considerando que a confiança envolve cenários de dependência e de risco moral e que, em projetos PPPs, a fiabilidade dos dados é um problema para a investigação da variável confiança utilizámos um método qualitativo - a discussão em grupo - como método de aferição desta variável.

3. Com base numa análise exploratória e utilizando o modelo da teoria fundamentada investigámos a construção da “confiança, alocação de risco adequado e compensação derivada de mudanças contratuais”. Considerando a lacuna existente na literatura no que concerne à relação entre confiança e alocação de risco, realizamos uma análise exploratória com base na teoria fundamentada (grounded theory) relevando as questões relacionadas com

o capital social.

4. Análise empírica com base em questionários: utilizando escalas de confiança e escalas de alocação de risco já existentes, testamos hipóteses através da recolha de dados provenientes de questionários. Com os questionários pretendemos estudar a relação entre a alocação de risco adequado e a compensação devido a mudanças contratuais.

Palavras –chave: Confiança, Alocação de risco, Flexibilidade contratual, Compensações contratuais, Parcerias Público Privadas, China

JEL: F283; F294

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Contents

Chapter 1 Introduction	1
1.1 Research topic	1
1.2 Objective and content of the research	5
1.3 Research methods and technical routes.....	6
1.4 The structure of the thesis.....	11
Chapter 2 Literature Review	13
2.1 The Connotation and practice of PPP.....	13
2.1.1 The Definition of PPP	13
2.1.2 Basic features of PPP	16
2.1.3 Application conditions of PPP.....	18
2.2 Risk allocation and paradigm evolvement of PPP projects.....	20
2.2.1 Analysis on risk allocation of PPP projects from multiple perspectives	20
2.2.2 Path and paradigm evolvement of PPP risk allocation in cognition of the nature of projects.....	21
2.2.3 Conclusion and review	25
2.3 The evolvement of the research on risk allocation of PPP projects: From technique and organization paradigms to contract paradigm.....	25
2.3.1 Technique and organization paradigms on risk allocation of PPP projects.....	25
2.3.2 Contract paradigm on risk allocation of PPP projects.....	29
2.3.3 Conclusion and review	32
2.4 New trends in risk allocation of PPP projects—the introduction of relationship paradigm	33
2.4.1 Paradigm tension of risk allocation to PPP projects.....	33
2.4.2 The Basis of trust research of PPP projects: development of research from the perspective of sociology	35
2.4.3 The Nature of trust in PPP projects: risk allocation under incomplete contract	45
2.4.4 The development vein of research on trust in PPP projects and situation-dependency.....	53
2.4.5 The generation of initial trust of PPP projects and the evolvement of trust....	56
2.4.6 The association relationship of trust and risk allocation and the success of PPP projects	61

2.4.7 Conclusion and review	64
2.5 Preliminary analysis on the influence of trust on risk allocation in PPP projects.....	65
2.5.1 The research pattern concerning the influence of trust on risk allocation in PPP projects.....	65
2.5.2 Analysis on the literature about the influence of trust on risk allocation in PPP projects	66
Chapter 3: Research design	70
3.1 The development trend of the research design of PPP projects.....	70
3.1.1 The guarantee of the reliability of data source: the combination of qualitative materials and quantitative analysis.....	71
3.1.2 Systematic analysis on qualitative materials.....	71
3.1.3 Quantitative analysis based on the reliability of data.....	72
3.2 Research content and plan.....	75
3.2.1 Research content.....	75
3.2.2 Plan design	78
3.3 Technical routes.....	80
Chapter 4: Construction of the conceptual model and Research hypothesis	82
4.1 Analysis on the influencing relationship between trust and risk allocation based on semi-structured interviews	82
4.1.1 Semi-structured interview levels and topic design with the situation simulated level by level	82
4.1.2 Samples and theoretical sampling	84
4.2 Construction of the conceptual model of the influencing relationship between trust and risk allocation of PPP projects.....	85
4.2.1 Analysis on qualitative materials in the circumstance of open coding.....	85
4.2.2 Analysis on qualitative materials under axial coding.....	92
4.2.3 Analysis and saturation test on qualitative material using selective coding....	95
4.3 Hypothesis of how trust based on reciprocity theory drives proper risk allocation ..	97
4.3.1 Analysis on the characteristics of PPP risk allocation from the perspective of reciprocal trade	97
4.3.2 The hypothesis of the driving influence of trust on proper risk allocation ...	101
4.4 Hypothesis of the association of risk allocation in the two dynamic phases based on contract flexibility	104
4.4.1 Description of characteristics of risk allocation in the dynamic two phases under the perspective of incomplete contract.....	104
4.4.2 Analysis on the influencing mechanism of risk allocation to state compensation under contract flexibility infusion.....	105

4.5 Hypothesis of the function of adjustment of trust in proper risk allocation and contract state compensation.....	109
4.5.1 Description of two dynamic phases of risk allocation from the perspective of incomplete contract	109
4.5.2 Analysis on the realization of the compensation of trust for contract states from the perspective of non-concurrent social exchange.....	110
4.5.3 The attribute of social capital in trust contributes to the stabilization of the compensation for contract state.....	112
Chapter 5: Scale development, questionnaire design and empirical research.....	118
5.1 The formation of scale measurement dimensions	118
5.1.1 The formation of the measurement scale of trust in PPP projects.....	118
5.1.2 The formation of the measurement dimension of proper risk allocation of PPP projects	122
5.1.3 The formation of the measurement scale of risk allocation under contract state compensation of PPP projects	128
5.2 The design, distribution, collection and descriptions of questionnaires.....	130
5.2.1 Questionnaire corrections based on small sample pretests	130
5.2.2 Demographic and criteria of respondents.....	131
5.2.3 The distribution and collection of questionnaires	131
5.3 The reliability and validity testing of scales.....	132
5.3.1 Scale reliability testing	132
5.3.2 Validity testing of the scale	135
5.4 Data fitting analysis on theoretical hypothesis model.....	136
5.4.1 Selection of the data processing method of theoretical hypothesis models ..	136
5.4.2 Theoretical hypothesis model testing and data analysis.....	137
5.5 Discussion of research results	142
Chapter 6: Conclusion, limitation and outlook	144
6.1 Research conclusion	144
6.2 Research enlightenment	145
6.3 Research innovation	146
6.4 Research limitations and outlooks.....	147
Bibliography.....	149
Appendix	170
Appendix A - Interview Outline	170
Appendix B – Questionnaire Form	170

List of Figures

Figure 1 Qualitative Data Analysis and Quantitative Empirical Analysis Process	7
Figure 2 Technical routes of the research.....	10
Figure 3 Dynamic deconstruction of risk allocation of PPP projects under incomplete contract.....	32
Figure 4 The missing of sociology paradigms in research on risk allocation of PPP projects	33
Figure 5 Model of trust based on individual characteristics	44
Figure 6 The development of research on trust in PPP project	54
Figure 7 The formation and dynamic evolvement of trust.....	60
Figure 8 The generation and dynamic evolvement of trust in PPP projects.....	61
Figure 9 Logic of research contents	76
Figure 10 Technical Routes.....	81
Figure 11 Theoretical models of the influencing mechanisms of trust on proper risk allocation.....	96
Figure 12 Frame of how trust drives the formation of proper risk allocation based on the perspectives of reciprocity and social exchange.....	103
Figure 13 Risk allocation frame based on incomplete contracts.....	105
Figure 14 The association between contract state changes with the dynamic changes of contract flexibility.....	108
Figure 15 Governance structure embedded in institutional environment	114
Figure 16 Theoretical hypothesis models in this research.....	117
Figure 17 Model of the measurement of trust.....	119
Figure 18 Trust-project success mechanism models	121

List of Tables

Table 1 Major research paths of risk allocation of PPP projects	21
Table 2 Analyses on risk allocation in the cognition of project nature	23
Table 3 Major research paradigms of risk allocation of PPP projects	24
Table 4 Research on risk identification/assessment under technique paradigm	26
Table 5 The connotation of trust under multiple perspectives	47
Table 6 Classification of trust	49
Table 7 Analysis on the nature of trust of PPP project participants in cognition of different projects	51
Table 8 Situation-dependency of trust in PPP projects	55
Table 9 The influence factors of the generation of trust	58
Table 10 Factors that hinder the generation of trust	60
Table 11 The formation of cooperative relationship based on trust	64
Table 12 Research methods/approaches relating to the issue of trust involving sociology, psychology and economics paradigms.	73
Table 13 The data collection process and security mechanism.	79
Table 14 The ‘situation-simulated semi-structured interview’” and question design	83
Table 15 The screening indicators of interviewees based on focus groups	85
Table 16 Open coding and concept description	86
Table 17 The fundamental and definition of axial coding	92
Table 18 Relationship types under main categories based on axial coding	94
Table 19 The characteristics of the function of trust based on “state-structure-performance” analysis	115
Table 20 Analysis on the types of trust in typical cases	120
Table 21 The Scale dimensions and measurement indicators of risk allocation	124
Table 22 Standardized concepts of proper risk allocation	125
Table 23 Description of the characteristics of contract flexibility	127
Table 24 The scale dimensions and measurement indicators of risk re-allocation under contract state compensation	129
Table 25 Statistics from valid questionnaires	131
Table 26 The backgrounds of the respondents	132

Table 27 Item description and factor analysis	133
Table 28 KMO measure and Bartlett's test of the scale.....	135
Table 29 Regression analysis on trust and proper risk allocation embedded in contract flexibility	138
Table 30 Analysis on the adjustment effect of trust on the correlation between proper risk allocation and state compensation	140
Table 31 Regression analysis on proper risk allocation embedded in contract flexibility and risk re-allocation under contract state compensation	142

Chapter 1 Introduction

1.1 Research topic

With the increasing need for public service, the expansion in the gap between supply and demand in public service in China is inevitable. On one hand, 'land finance' is being broadly criticized due to the huge amount of local government debts have been accumulated in a short period of time in the government financing platforms. According to the audit report released in late 2013, by the end of June 2013, government of all levels in China had ¥2.07 billion legally binding debts, among which ¥1.09 billion belong to local government. It has become an urgent issue for the government to raise necessary funds for the development of public services. On the other hand, 'rent-seeking' is a common phenomenon in the government public investments. 'Three Exceeds' frequently happened where the quality of services cannot be guaranteed, which resulted in a large amount of 'vanity projects' that provoked a strong sense of dissatisfaction and doubt among the public. Therefore, we should learn from other countries' PPP (public-private partnership) models, thus build China's own PPP model where the public and private departments work together along with the social capital and multiple invest mentor in the public service sector, to assure that the supply of public goods are more efficient, where positive externality and public goods can be achieved (Wu, 2007).

There is no global unanimous definition of PPP. In general, it refers to the cooperative relationship between public and private departments with the aim of providing public goods and services. PPP takes the form of a variety of services, such as outsourcing, OM, DB, DBM, DBO, LBO, BLT, BOT, BOOT, BBO (Deng, 2006). Variety is one of the major characteristics of PPP model. Public and private partnership can take various forms. PPP models are distinctive in different countries, according to their own systems and the motivation of reform. Different PPP models are also different in property rights, financing, and operation. However, various PPP models have similar essence. Efficiency of public

services can be improved by using the strength of ‘market’. By stressing on the participation of non-government departments in the decision-making process of government, rather than focusing only on technical aspect. It represents the cooperation of public and private department based on equality and mutual benefits. ‘Equality’ refers to the participation of both parties in the decision-making process and their co-shouldering responsibilities. ‘Mutual benefits’ means that it’s benefitted both parties.

PPP model has the advantage of integrating the resources and strengths of both parties. However, the establishment of partnership may not always lead to expected results. Issues and risks inevitably exist in PPP itself. There is also complaint about the unsatisfactory performance of PPP projects. Therefore, to improve the situation, a large number of efforts both in theory and in practice have been made. New technical tools in techniques, data, and contract regulations have brought upon remarkable improvements. Nevertheless, there is still a gap in the research that needs further exploration, which specifically focusing on the initiative of project managers. Scholars such as De. Wit(1988), K Munns & F Bjerimi(1996), Baccarini David (1999) pose a question about the paradigms of project management, in order to improve the motivation of project managers, which could contribute to improving the project management performance. But the paradigms of these studies share a common weakness, which is the limitation of motivation methods. Corporate governance could provide property right incentives and profit incentives, which, however, could not be brought by projects. In addition, the zero-sum game traits may result in hard constraints of profit incentives of the opposite party. When looking for incentives of project management, we find that proper risk allocation is a feasible incentive, because proper risk allocation ensures that both parties get compensation from changes in contract status, which is conducive to stabilizing management performance. In this circumstance, both parties could meet their benefit expectations, where a win-win outcome could be achieved.

In-depth studies have been conducted concerning risk allocation in PPP models, which mainly focused on refined and quantified risk identification and evaluation processes by

using Delphi method, artificial neural network analysis method, Monte Carlo simulation analysis method, indistinct mathematics analysis method and net present value method to identify, evaluate and allocate risks in PPP or BOT projects. The research methods demonstrate traces of technological paradigms. If risk identification and evaluation are the basic research concerning risk allocation, then it is the problem of organization paradigms how to reasonably allocate detailed risks among PPP projects and stick to the resources-oriented allocation principle that “risk taking matches risk controllability”. Risk allocation process has the latent attribute of the fermentation and transmission of risk information, and the effective allocation of resources. Based on partnership theory, Chan and Daniel (2006) raised the idea of establishing virtual organization based on partnership, sharing risk information through organization flow designing, minimizing information disappearance during risk identification and evaluation, and realizing proper allocation of identified risks through statutes inside the projects. In recent years, as people acquire a deeper perception of contract nature, achievements have been made in the research relating to the deconstruction of initial and subsequent allocation of risks under the perspective of contract, the construction of risk allocation model under the perspective of game, and risk allocation under ownership distribution. Relevant research brought in the analyses of responsibilities, rights, and benefits under the hypothesis of ‘economic man’, hence form the risk allocation research method from the perspective of incentive and restriction.

Although risk allocation research of PPP projects under technical, organization, and contract paradigms has made some breakthroughs, and provided intellectual supports for PPP practices, however, the bottlenecks of the paradigms have also revealed themselves. As the complexity of PPP projects and the uncertainty of markets are more evident, under the hypothesis of bounded rationality, the incompleteness of risk allocation is unlikely to be compensated by all kinds of qualitative or quantitative math models or statistical approaches. In the meantime, research has shown that quantitative models and statistical analysis techniques have their limitations in the risk allocation process, where the basic data may not

be precise since most of the data came from the subjective estimations of experts (Monir, 2008). From a practical angle, due to the inevitable differences in the benefits of the parties and information asymmetry during risk allocation, it is impossible to solve the issue of information and resources integration and allocation during risk allocation simply through an idealized partnership. In fact, there is some existing situational deviations between the current risk allocation theories and actual PPP projects, and the current analysis paradigms cannot convincingly explain risk allocation. Generally speaking, current research failed to analyze risk allocation under the ‘social man’ hypothesis, which means that it neglects the disturbing influence and relevant strategies of ‘trust’—an important part of the partnership in PPP trading. This is contrary to realism and incomplete. Due to the intrinsic incompleteness of contracts, part of the incentive strategies under hard constraints lose efficacy, and the focus of research is shifting into intangible and immeasurable fields or fields with more subjective definitions. Research on the incentive mechanisms of risk allocations of PPP projects also faced a shift in research paradigms and the attention in the theoretical cycle on ‘trust’, critical elements of social capital, which is in line with the current focus on the improvements of risk allocation incentives.

It is generally agreed that China’s society norms are relationship-oriented, where mutual interests and benefits are stressed upon (Zhu, 2006). On the contrary, Arrow (1971) and Williamson (1985) stressed that greed would push people to try everything to maximize their own interests. In the case of PPP projects, it is shown in that the trust-based risk allocation is not sufficient to guarantee that all parties would follow the rules. On the one hand, positive reciprocity may result in extra efforts besides the efforts brought about by material incentives; while on the other hand, negative reciprocity may result in opportunistic behavior (Bewley, 1995, Caliendo, 2012 and Ulrika, 2010). According to the ‘eye for eye’ principle, once one party betrays, the other party would not keep a cooperative relationship. If both parties keep their promises, a virtuous circle in trust takes shape, which enhances the trusting culture in PPP projects. If betrayal frequently occurs, skeptical cultures would be

strengthened, and both parties may eventually end up in distrusting each other. The overuse of proxy by a partner results in distrust, skepticism may appear, and communication may be terminated, connections may be broken, and the vicious circle may eventually result in the fracture of trust. Dispersive noncooperation mood may easily affect the strategic selection of managers inside the organization, erupting the social capital in the PPP projects.

Therefore, it is an important research area to explore the mechanism of how trust affects proper risk allocation and the compensation scope chain in case of changes in the contract between the parties, as well as how to realize a virtuous circle of ‘trust—proper risk allocation—compensation to changes in contract status to keep the partners on the rails’.

1.2 Objective and content of the research

Where most of the current research on risk allocation of PPP projects focusing on the allocation process and contract designing, this research innovatively introduced the element of trust in exploring how trust affects risk allocation and provide proper risk allocation strategies for partners in PPP projects based on trust, which in turn may provide a path to improve the management performance of PPP projects. The objectives are two folds which are as follows:

First, this thesis aimed to reveal the incentive mechanism of trust on proper risk allocation, and to help make proper risk allocation plans. By providing the theoretical verification of how trust prompts Proper Risk Allocation (PRA) and results in improvements in performance, this thesis intended to help partners in PPP projects in realizing the importance of PRA, with the purpose of adopting the PRA plans in practice. By identifying PRA plans, guidance for the process of making PRA plans will be provided.

Second, this thesis aimed to analyze the mechanism of how trust compensates partners in PPP projects when changes of contract statuses occur. The interaction and level of trust of partners in PPP projects are positively correlated, and this relationship would improve the environment of PPP projects, and realize the anticipated goals of PPP, which would improve its management performance. This thesis will utilize the research outcomes previously

mentioned to reveal the ‘trust—PRA—compensation mechanism in case of changes in contract status in PPP projects’ mechanism, to help both parties reach an agreement, and have a deeper understanding in the management performance of PPP projects based on risk allocation.

To realize the above research objectives, further explorations with the approaches of both theoretical research on how trust affects risk allocation in PPP projects and empirical analysis in PPP projects will be conducted:

1) Theoretical approach

This thesis will discover problems in current PPP practices, and analyze research literatures relating to PPP risk allocation and trust. This thesis will conclude the PRA-related research status and trends, which will provide theoretical supports for semi-structured expert interviews later.

2) Empirical approach

1. With case study of PPP projects, this thesis will deduce measurement clauses on critical elements such as trust and risk allocation. Final feasible measurement clauses are provided after small samples pre-test are conducted.

2. This study will examine the validity and reliability test data through surveys, results from test on the correlation mechanisms among variables by the method of regression analysis, verification on the reliability of the models, and review the outcomes of empirical data.

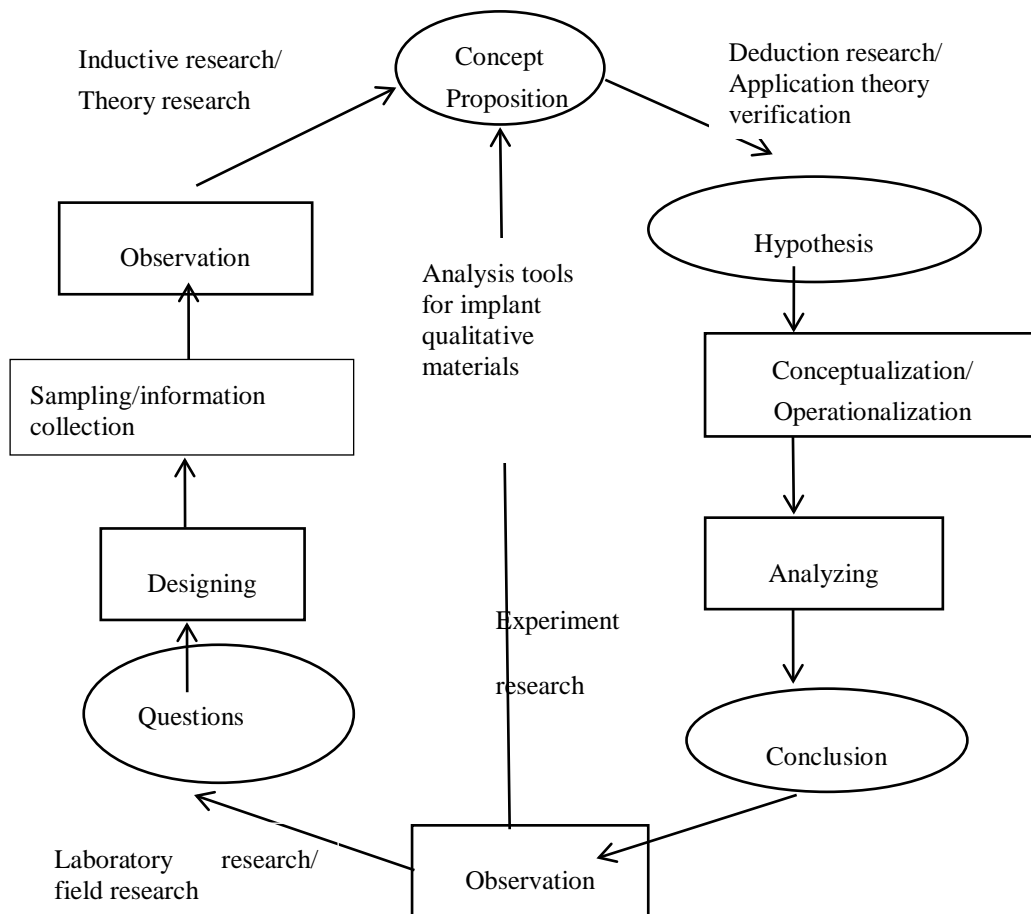
3. This thesis will provide management strategies for risk allocation of PPP project practices and highlight shortcomings of the research and gap in area of research, based on feedback during research.

1.3 Research methods and technical routes

This research will adopt integrated research methods for critical issues which are the qualitative data analysis methods based on theories (explorative research), and quantitative empirical analysis methods based on surveys (descriptive research).Correlation of the

research methods are manifested through research logics, i.e. after the observation of risk allocation in PPP projects, the problem is the effect of trust under relational perspective, sampling and analyzing existing materials and constructing theoretical models (observation—problem—sampling/ collecting qualitative data—analyzing materials—concept and proposition); and quantitative verification of the concept proposition and empirical analysis based on surveys. The research process of qualitative data analysis and quantitative empirical analysis under the integration perspective is shown in Figure 1

Figure 1 Qualitative Data Analysis and Quantitative Empirical Analysis Process



To guarantee the reliability of qualitative data, this research specifically employs the following tools:

1. Literature research

By analyzing current literature about risk allocation in PPP projects and trust among organizations, the progress and achievements in the existing research and relevant fields that needs further exploration can be recognized, as it is a vital preliminary research to acquire innovative points. In addition, the literature collection concerning risk allocation and trust are also the source in designing the semi-structured interview. Theoretical deduction based on literature analysis will contribute to hypothesis models.

2. Semi-structured expert interview

Since research in the existing literature about trust and risk allocation mechanisms in PPP projects is very limited, in order to theoretically substantiate hypothesis models, this research apply semi-structured expert interviews to for further feasibility verification, and finding the gap in the literature for further theoretical derivation. While expert interview is used to obtain qualitative data, the understandability of interview topics, the accessibility and relevancy of materials are vital parameters measuring the reliability of the research method. Therefore, these should be taken into consideration and according steps should be taken in the designing phase of the research. In addition, during the phase of questionnaire development and designing for critical elements (trust, PRA), expert interview is an effective way to guarantee the credibility and efficacy of questionnaires.

3. Qualitative data analysis based on solid theories

Qualitative data acquisition such as semi-structured expert interview is a way to complement the shortcomings of literature. The challenge in qualitative analysis is how to systematically analyze qualitative data. This thesis uses solid theories to analyze qualitative data in perspective of open coding, axial coding and selective coding, and uses NVIVO, coding software for qualitative data, and to reduce the bias resulting from subjective coding. Qualitative data analysis based on solid theories will reach an explorative conclusion about the correlation between trust in projects and risk allocation.

4. Questionnaire method based on focus groups

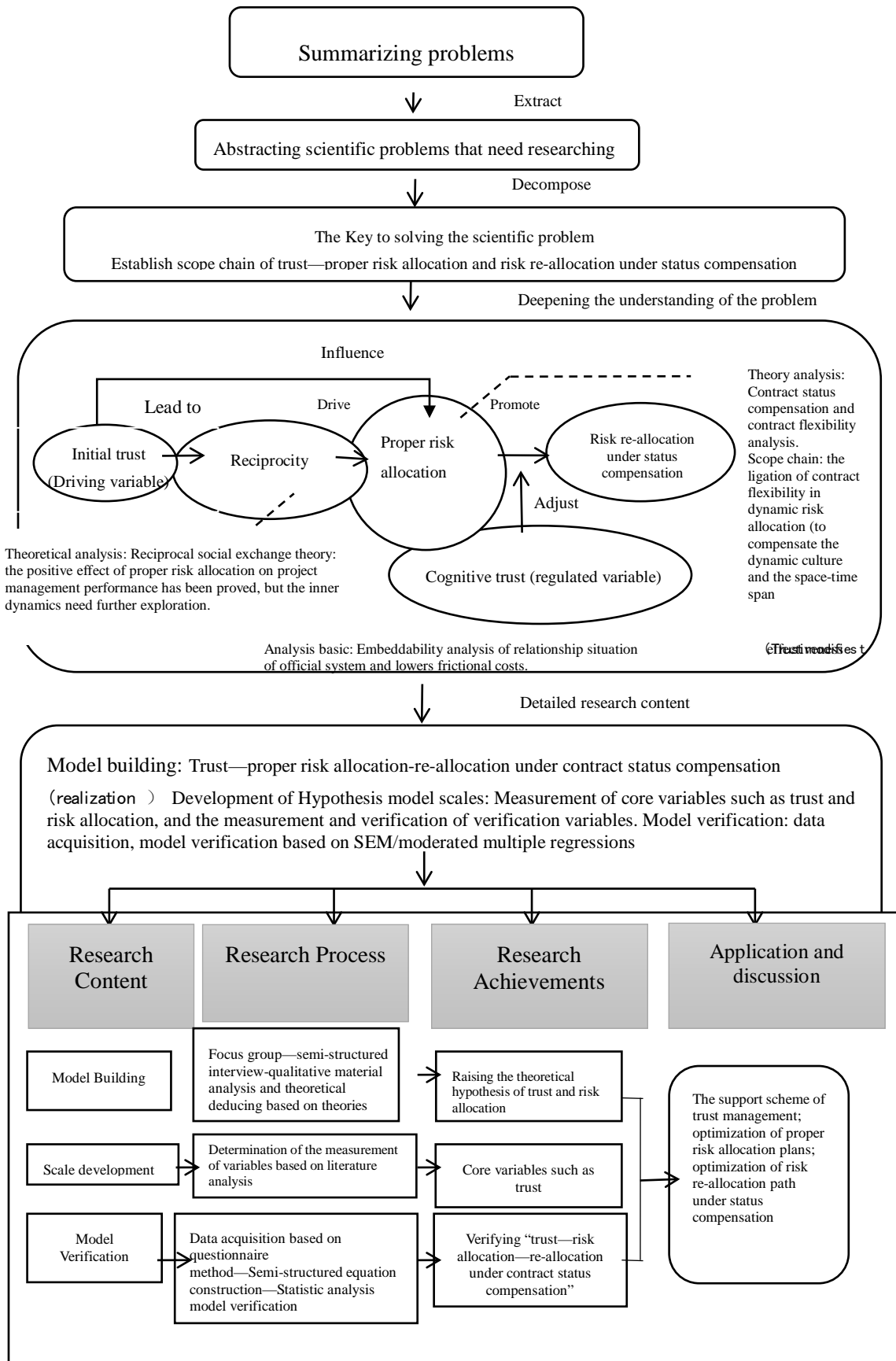
The research on trust in PPP projects inevitably requires description and measurement of the trust status of the parties, and questionnaires is a suitable method to collect data. To guarantee the feasibility of the data and the pertinence of the empirical research, this thesis sets standards for parameters of respondents using focus group during questionnaire issuing and data collection.

5. Empirical analysis

This thesis will collect data through questionnaires to quantitatively verify the achievements in the exploration of the relationship between trust and risk allocation, and hypothetical models based on literature analysis. According to the types of hypothesis models, the potential major empirical research methods adopted by this thesis are structural equation modeling and multi-factor regression analysis. The selection of empirical methods depends on the relationship structure of trust, proper risk allocation and proper risk re-allocation.

This research aimed to explore the mechanism of compensation to participants in case of changes in contract statuses concerning trust and proper risk allocation in PPP projects. This research is structured with problem statement, theoretical modeling, and model verification. The technical route is shown in Figure 2.

Figure 2 Technical routes of the research



1.4 The structure of the thesis

The structure of the thesis is as follows:

Chapter One: Introduction. This chapter illustrates the problems existing in current risk allocation in PPP practices, and concludes its relationship with trust through theoretical analysis. It illustrates the objectives and meanings of the research topic. It also defines the subject and range of the research topic, and chooses scientific research methods.

Chapter Two: Literature Review. This chapter analyzes current research literature concerning PPP projects as well as risk allocation and trust. It points out the current research status and the trends of risk allocation. It examines research literatures relating to trust in PPP projects, and provide ideas for semi-structured expert interviews later.

Chapter Three: Research Designing. This chapter summarizes the focuses of existing research literature concerning trust in PPP projects, and explores the future direction. This chapter then present research plans based on the reliable acquisition and analysis of data, and form technical routes, which could guide further research.

Chapter Four: Construction of the conceptual model and research hypothesis. Due to the lack of resource literature on the impact of trust on risk allocation in PPP projects, this chapter utilizes solid theories to analyze qualitative data relating to the relationship of trust and risk allocation in perspective of open coding, axial coding and selective coding. This chapter form explorative conceptual model, which may be conducive to research hypotheses raised later. This chapter is based on formerly organized theories and explorative analysis, as well as PPP project risk allocation structure in view of dynamics of incomplete contracting theory and how contract flexibility plays its part. This chapter explores how trust can drive proper risk allocation in view of reciprocal social exchange. It analyzes the regulating effect of trust on proper risk allocation and risk re-allocation in the state of contract compensation. It builds theoretical model of how trust affects risk allocation.

Chapter Five: Questionnaire Development, Data Collection and Empirical Analysis. This chapter concludes measurement clauses of crucial elements such as trust and risk allocation through literature analysis and theoretical deduction, which could finally lead to feasible measurement clauses. It distributes and collects questionnaires and uses descriptive statistical method to analyze the questionnaires. It uses regression algorithms to examine the relevance mechanism of variables, and the feasibility of models, and review the empirical data.

Chapter Six: Conclusion and Outlook. This chapter concludes overall review of the research and provides management strategies for risk allocation practices. It highlights the shortcomings of the research and the field that needs further exploration, based on feedbacks and reflections from the research.

Chapter 2 Literature Review

2.1 The Connotation and practice of PPP

2.1.1 The Definition of PPP

Public-Private Partnership (PPP) is still a relatively new concept, and has different connotations and denotations in different political, economic and cultural environments. Therefore, there are various explanations for PPP models, where the most common ones are as follows:

Generally, PPP refers to the long-term cooperation between public government departments and private departments under service contracts, where the government departments establish and manage infrastructure, while the private investors provide public products and services to the public (Grimsey, 2002). According to Parker(2003) , using the model of PPP to provide public goods could minimize government expenses and loans, and lower the costs of providing public goods. Through transparent operation procedures and mandatory contracts, positive incentives of costs could be achieved.

Public departments and private investors, provided that one party has the required technical skills, shared established infrastructures, and cooperation mainly by means of proper allocation of resources, risks and revenues, with condition that public needs are satisfied. PPP serve the purpose of realizing benefits of sharing public needs, as well as mutual benefits. The purpose of cooperation is risk sharing and value for money. Through cooperation from both resources, input and powers are shared. (Sobhiyah, 2008) .

In PPP model, government purchase is realized by public bidding, where governments and private bid winners would cooperatively establish a special project company. The government and the project company sign a concession contract. The project company is responsible for the filing, auditing, preparation and governance of the project,

while the government secure a special agreement with loan-providing financial institutions, guaranteeing that they will fulfill the terms relating to payments as stated in the contract with the project company. Guaranteed agreement provides project company for easier access to loan. The essence of such financing model is that government help private investors raise funds by offering them certain operating concessions, to facilitate the establishment and governance of infrastructures are realized.

According to Essing (2005), PPP is the contract relationship between government departments and profit-push private investors, where both parties share not only techniques and assets but also risks, as well as the potential profits from providing public services. PPP has the characteristics of relationship-based contracts, which is the cooperation based on trust. The transaction of projects from government to private investors could facilitate the private investors to manage risks more efficiently, consequently achieving constant risk governance. (Bettignies, 2004)

PPP can be defined as an embodiment of diversified cooperation between governments and private sectors, where part of public goods traditionally provided by governments are now provided by private investors. Partnership of infrastructure construction refers to cooperative enterprise established by governments and private investors with the purpose of developing and improving infrastructures(Osborne, 1997) The duties of both parties include project planning, launching and designing, financing, and stipulating ownership, operation rights and administration rights.

PPP model usually refers to a long-term cooperative relationship bound by contracts between public government departments and private investors to provide public products or services, where both parties procure the best of both worlds, by sharing profits and risks. (Zhan zhongle, 2007)

PPP is a cooperative relationship among public departments, not-for-profit and for-profit enterprises based on certain public projects. Better results would come out of such cooperation compared to the outcomes without cooperation. Despite role of private investors,

responsibilities are not completely shifted from the governments to private investors. (Li Xiuhui, 2002). Instead, all parties have shared the responsibilities and risks. PPP is a modern governance philosophy stressing a win-win outcome.

PPP refers to a cooperation model between public departments that provide public goods and private investors, with the aim of providing public products and services which traditionally offered by governments. Whence, such cooperative relationship is a kind of cooperative partnership between government departments and private investors based on certain public projects, where the rights, obligations, risks and profits of both parties are clarified in contracts, in order for both parties to fully exert their advantages, which leads to a win-win or even multi-win situation. (Chen Yuemei, 2007)

PPP is a cooperation model between governments and private investors, as it is a modified model of financing and project construction in the field of infrastructures. PPP, broadly used in fields of medicine, transportation and education, is a new financing model aimed to cover the shortages of BOT, BOO and BT. PPP is advantageous in the following six aspects: 1) The quality and efficiency of public goods could be largely improved since infrastructures are operated and maintained by private investors. 2) It facilitates the government to change their role from the provider to the supervisor of public goods, while effectively eases the fiscal pressure of governments. 3) The fact that private investors are involved in projects at early stages helps introduce advanced governance experiences and techniques of private investors. 4) All partners would easily become strategic allies, which would effectively coordinate their benefits. 5) Governments could not only lower construction and governance costs, but also gain some control. 6) PPP could effectively shift risks and minimize construction limitations. According to the characteristics above, the main advantages of PPP relates to construction, financing, transferring and operation (Zhang Qizhi, 2007).

Though there are many other explanations about PPP, we can conclude the basic characteristics of PPP from the explanations follows: All partners, seeking for the same goal,

provide public products and services jointly, which requires mutual benefits, shared resources and profits. PPP model stresses risk allocation and optimum allocation aim to provide the public with quality services. However, the priority of these characteristics may vary with specific projects, depending on their objectives and requirements.

2.1.2 Basic features of PPP

Compared with other financing models, PPP has its distinctive strengths:

1. PPP usually involves two or more investors or partners, at least one of which is a government department, with the other (others) being private investors, including individuals, partnership companies, all kinds of associations, or limited liability companies with explicit stock rights. Thus, the public government departments and private investors cooperate and become strategic allies. Both parties participate in the construction and operation of infrastructures, for the mutual benefits and achieving win-win situation, thus, better public products and services are provided for the public. In this process, the strengths of private investors, such as innovation, capital, advanced techniques, governance experience, governance efficiency and entrepreneurship, can be combined with the social responsibilities of government departments. The application of such cooperation is very promising. (Deng Xiaopeng, 2006)
2. Under PPP models, private departments usually involves at early stages of the construction of infrastructures, which is conducive to introducing their advanced techniques and governance experience. They also address the problem of risk allocation of the whole projects at the beginning, so that the governments and private departments share the mutual responsibilities for public goods and services.
3. Under PPP model, each partner is an independent subject and accountability unit that can participate in negotiations about the projects.

4. PPP is based on long-term friendly cooperation. Agreements are reached between the parties through negotiations since the project is initiated.
5. PPP helps attract private investors and experienced financing institutions; the participation of private investors raises the capital for infrastructures and lowers the debt-to-asset ratio of projects, which makes the projects more feasible in aspects of techniques and finance.
6. Since private investors are usually not constrained by government purchase and administration regulations and have more freedom in their operation, they can largely shorten the construction period, so that public infrastructures can be completed and put into use earlier to satisfy the public's needs.
7. The innovation of PPP lies in the improvement of government service quality. The duty of government is to 'provide a way to modify rules, therefore disagreements in the interpretation about the rules can be mediated, and a few people who break the rules would abide by them'. This indicates that the core service of government is to provide good systems and establish laws and regulations to make sure of the systems, so that economy and the society would function properly. (Da ling, 2007)

The shortcoming of PPP lies in the potential monopoly of infrastructures. Once private investors obtain the ownership, they may have the impulsion and power to gain monopoly profits. To prevent monopoly, government must make social and economic rules to constrain the investors. Particularly, measures of price adjustment in economy rules and regulations shall be taken to regulate the risks and profits of public projects, with the purpose of providing public benefits and saving budgets.

The objective cause for PPP lies in the deficiency of government functional organizations: the government lacks the incentives of providing quality public products or services. Government departments have no full understandings about consumers' needs for public products and services, so they can hardly satisfy their needs; on the other hand, the

governments are not very efficient when they make decisions about infrastructures. Additionally, the government can neither catch up with private investors in the latest technologies and information, nor compete with private investors in the understanding of public needs; PPP model indicates the combination of effectiveness and fairness. The objective of cooperation is to provide greater quantity and better public goods: on the one hand, customer costs remain the same while public goods are greater and of higher quality; on the other hand, while the quality of public goods remain the same, a little increase in cost would largely improve the quality of public goods or services.

2.1.3 Application conditions of PPP

From practical research on PPP conducted by scholars from home and abroad, we conclude that the following conditions are taken into consideration when government decides whether or not to apply PPP model to certain public projects:

1. The public services welcome private investors. From the perspective of consumers, PPP is conducive in improving the quality of public services, lowering service costs, and satisfying the diversified needs of the public.
2. Fair competition among private investors is guaranteed by the system. Fair competition can lower costs and increase efficiency. With fair competition systems, proper private investors can be chosen, so that the formerly state monopoly in public services would not turn into private monopoly.
3. There are no legal problems with the cooperation between private investors and governments in providing infrastructures. Since contracts are signed between public departments and private investors, the cooperation is protected by law, as well as the legal position of private investors. Both parties are in equal positions.
4. The public products and services can be roughly measured and priced. It is necessary that the PPP model in infrastructures be operable, meaning that the public products and services can be quantified into measurable economic indicators. Only in this way

can the performance of PPP be measured, and accurate judgments are made concerning the success indication of PPP projects.

5. PPP models are conducive to the innovation of public products, specifically, innovations in governance, technology, systems and mindsets. The introduction of PPP model shows that in comparison to the model where government is the only provider of public goods, the participation of private investors may increase effectiveness.
6. PPP model may facilitate economic and social development. Every public project is part of the economic society. The projects that cannot be completed in time due to the government's limited abilities when the government was the only provider of public products and services, can now be accelerated due to the participation of private investors, which would facilitate the development of economy and the society.
7. One prerequisite of PPP is that the public goods provided by project companies have higher VFM (value for money) and better performance than those provided by government departments. The comparison between the NPV (net present value) of cooperation projects (which was calculated considering the costs and revenues) and the revenue of the public goods provided only by government should last for the whole cycle of the project. If the PPP model fails to generate higher time value of money, then the government should be the only provider of the certain public product.
8. If the scale of the subject project is too small, the costs of public-private cooperation would be relatively high. Hence, it is a good idea to cluster similar small projects, and then apply the PPP model on the cluster projects to increase its success rate.
9. The allotted time should not be too short. Government may prefer short-term cooperation projects, so that they can cooperate with better companies through re-negotiation and lower the costs of government operation. Meanwhile, short-term contracts improve the accuracy of projections and estimation in costs. Hence, the contracts do not necessarily include every situation that is encountered. However,

from the perspective of private investors, short-term contracts prevent optimizing capital values, and may hinder their capital and techniques from giving full play. Henceforth, the government should decide the allotted time of projects respectively.

2.2 Risk allocation and paradigm evolvement of PPP projects

Nowadays PPP projects are becoming more complicated, and the risk allocation of PPP participants is having more influence on the performance of PPP project governance. In recent years, research on risk allocation among PPP participants has become the focus of attention for scholars from various countries, where relevant studies had shown evolvement and diverse perspectives into the context. It can be shown from the induction and reorganization of literature that different phases of research on risk allocation use similar approaches, theories and have similar beliefs, which indicates the transformation of paradigm. From technology, organization paradigm, to contracts and relationship paradigm, every transformation of paradigms stimulated the theoretical development of PPP risk allocation projects, strengthened the explanatory power of practices, and expanded the space for future research. The literature review of this research tries to summarize and analyze relevant research theories, and inspire new thoughts on this topic both in theory and in practice.

2.2.1 Analysis on risk allocation of PPP projects from multiple perspectives

From scientific research to PPP practices, exists diverse views on risk allocation. Mainstream views include the following core elements: the risk allocation of PPP projects is the decision-making process to allocate risks properly among the project participants based on risk identification and assessment. Meaning, it is the process of delimitating the liabilities and rights that may cause losses or bring profits in the future, where the coupling of the residual control right and residual claim of projects in principal-agent relationships should be taken into full consideration, for effective stimulus in achieving risk bearers and moral hazards could be prohibited. (Ke, 2009, John, 1995, Arndt, 1998, Ke, 2011, Abednego, 2006, Uff, 1995, Yan & Zhao, 2008). In addition to the core elements above, the disturbances on

risk allocation of the transaction market and relationship situation of the participants are more obvious, which, like a set of variables, are influencing the process of risk allocation and the attitudes of contracting parties, while restricting the formation of proper risk allocation plans and the improvement of PPP project management performance through the intervening effects of mutually unbalanced negotiation. (Loosemore, 1999). From multiple perspectives, risk allocation is an interdisciplinary research field of management paradigm involving the process of management, economics paradigm concerning contract design and sociology paradigm influenced by social environment and a systematic and complicated project to improve the effectiveness and efficacy of risk allocation, as well as the path-dependent paradigm.

2.2.2 Path and paradigm evolvement of PPP risk allocation in cognition of the nature of projects.

Paths used in research on risk allocation of PPP projects can be divided to three kinds from the summarization and analysis of current literature: the first path is to start with theories relating to risk allocation, where decision on the path of risk allocation mechanisms are made through theoretical deduction; the second path is to obtain original data through questionnaires, and decision on plans of risk allocation for specific risks are based on mathematical models and mathematical statistics methods, specifically on plans of risk allocation for legal risks and risks for controversial clauses such as force majeure; the third path is to analyze the risk allocation clauses in relatively mature contract examples, and conducting research on the existing risk allocation plans of PPP projects based on case studies, with practical examples to follow. The major research paths of risk allocation of PPP projects are shown in Table1.

Table 1 Major research paths of risk allocation of PPP projects

Path	Main research content or structure	Theoretical base	Scholars
Research on risk allocation based on	Design the plan based on transaction costs of	Transaction costs theory;	Yan Ling (2005), Xiaohua Jin and

transaction costs and project governance	project/ risk allocation mechanism of ownership distribution	Project governance theory	Hemanta Doloi (2009)
Quantitative research based on quantitative models	Based on the principles of ‘the participant with the most control power bears the risks; risks are matched with profits’, deduce risk allocation plans using Game theory, appraise analysis method of indistinct mathematics, Delphi method (The original analytical data are obtained by experts grading)	The application of mathematical modeling method	Ling Bing and Akintoye(2005), Yelin Xu, Albert P. C. Chan. Eta (2010) Xiao Hua Jin and Guo Ming Zhang (2011)
Research on experiences based on mature contract examples and PPP practices	Targeted at mature standardized contract clauses, analyze the risk allocation methods, and the success or failure of past experiences.	Contract governance. Theoretical risk governance. Case studies	Shuibo Zhang and Bosen He (2003), Li Zhao and Hongjun Yin et. Al (2011)
			YongjianKe, Shouqing Wang and BingquanChen (2008)

Source According to literature review

The inheritance and development of scientific research is a process of accumulation, and in this process, the exposure of natures, as well as the selection of theories and methods, individual or combined, are all blended in the paradigm of scientific techniques and knowledge. (Thomas S Kuhn, 2004). From the existing research process of risk allocation of PPP projects, the evolvement of paradigm derives from the accumulated and deepening understandings of the nature of the projects. Along with the changing views from deeming the project as a one-time production process under the constraints of resources, stressing the

projects' nature of temporary contract organization, new perspectives came up in the cognition of risk allocation, and theoretical, method and technological breakthroughs came up in relevant research (Turner, 2003). Furthermore, the rise of project governance expanded the research field of risk allocation, and plenty of achievements were made under contract paradigm. Current discussions on the nature of projects, produce analyses on social relations in the perspective of sociology, and the paradigm may be expanded again in the research on risk allocation. (Pryke, 2006 & Ding, Ronggui 2010). Analyses on risk allocation in the cognition of project nature are shown in Table2.

Table 2 Analyses on risk allocation in the cognition of project nature

Nature of the project	Analyses on the traits of risk allocation	Start point of research and the objectives
A resource constrained one-time task, which stresses the function of production and the process of the projects.	Resource constrained, stressing the process of risk allocation such as risk identification, assessment and assignment.	Research based on the process: addressing the difficult problems of risk identification, assessment and assignment one by one.
Temporary organization of several sets of contracts, which stress the trait of contract of the projects.	The rights and liabilities of principal-agent relationship are allocated properly, stimulating effective incentives for risk bearers.	Research based on system designing: optimizing the principal-agent relationship under the hypothesis of bounded rationality and socialism
A temporary social network organization, which stresses the embedment of the projects in social networks	The efficiency and effectiveness of risk allocation are affected by the situation of the projects (including formal systems and informal systems)	Research based on embedment: the influence of situations on risk allocation processes and systems designing, i.e. the influence of trust on the transaction costs of risk allocation.

Source: According to literature review

As projected in the chart above, research on risk allocation of PPP projects is related to the cognition of the nature of the projects in different times, and these two are internally consistent. Research on risk allocation in the cognition of the process of projects stresses

on technical improvement and organizational design, which depends on refined quantitative analysis of risk definition and assessment using complex mathematical models and statistical methods and improves the organizational designs and process of risk allocation through organizational theories, in order for effective governance of risk allocation process to be formed with limited resources. As the governance philosophies deepened, and social capital theories were applied in the fields of governance and economics, further research was made on risk allocation under the paradigm of contracts and relationships, more scholars are paying attention to the analysis on transaction systems. Major research paradigm of risk allocation of PPP projects are shown in Table3.

Table 3 Major research paradigms of risk allocation of PPP projects

Paradigm	Core ideas	Research objectives/Problems to be addressed	Theoretical methods/Technical approaches
Technique paradigm	Risk allocation is a popular task, relating to risk identification, assessment and assignment.	Try to improve risk identification and quantify risk assessment using various mathematical models and statistical methods, as to achieve refined governance.	Method of fuzzy mathematics, analytic hierarchy process, Delphi method, Risk breakdown structure etc.
Organization paradigm	Risk allocation is the process of effective allocation of the information and resources of developers and contractors.	Build integrated organizations and coordination mechanisms to promote the transmission and fermentation of risk information and allocate risk governance resources properly.	Organization integration theory, Stakeholder theory and Partnership theory
Contract paradigm	Risk allocation is the contract-making process of properly allocating the controlling rights of risks and residual	Allocate the rights and liabilities of risks in the perspective of principal-agent, provide effective incentives for risk bearers and lower	Incomplete contracting theory, Contract governance theory and Project governance theory

	claims (which belongs to research on risk allocation in the formal systems.)	the moral hazards.	
Relationship paradigm	Risk allocation is affected by the disturbances of relationship elements (which belongs to research on risk allocation in the informal systems.)	Analyze the influences of social capital elements (norms, trust, cognitions, and etc.) on risk allocation, among which key elements provide lubricant for the allocation process and lower the complexity.	Social capital theory, Relationship governance theory.

Source: According to literature review

2.2.3 Conclusion and review

In conclusion, risk allocation of PPP projects is a comprehensive scientific subject relating to governance, the economics of contracts and sociology. Research paradigms of risk allocation are changing and evolving with deepened understanding the nature of the project. Technique paradigm, organization paradigm and contract paradigm are interdependent. The introduction of relationship paradigm complements the other three paradigms, and probe into relationship situations (such as trust) is conducive to the deep analysis of the internal mechanisms of the other three paradigms. This is also the objective of introducing methods of sociology into the analysis of risk allocation.

2.3 The evolvement of the research on risk allocation of PPP projects: From technique and organization paradigms to contract paradigm.

2.3.1 Technique and organization paradigms on risk allocation of PPP projects

1. Risk identification and assessment under the technique paradigm

The research on risk allocation under the technique paradigm came out of the traditional

cognition of the production and the process of projects, and how to make the process of risk allocation more refined is key in improving the efficiency and effectiveness of allocation under such paradigms. Mathematical modeling methods and statistical analytical techniques such as fuzzy mathematics, Monte Carlo simulation, and artificial network analysis are widely applied in the research of risk allocation, which enrich the information collection relating to risks and assessment techniques, hence increase the feasibility of risk identification and assessment and the quantitative research of risk assignment. Under the influence of the technique paradigm, the research on the process of risk allocation went to the refinement stage. Relevant research is shown in Table4.

Table 4 Research on risk identification/assessment under technique paradigm

Classification	Techniques	Major scholars/literatures
Risk identification	Risk information collection techniques: Risk breakdown structure, Delphi method, Analytic Hierarchy Process, TFDANN, and etc.	Wang SQ and Tiong RLK (2000) identified major risk elements such as political risks, constructional risks, operational risks and market risks in PPP projects using the method of Risk breakdown structure and Delphi Method; Xiao hua Jin and Guomin Zhang (2011) identified the risks of PPP infrastructure projects using TFDANN, and built a decision-making system which allocated risk
	Tools to analyze risk allocation experiences: Case studies, Empirical analysis on mature contract examples.	Shuibo Zhang and Bosen He (2003) analyzed relatively mature project contract examples and managed to extract major risk elements from them; YongjianKe and ShouqingWang (2008), as well as Wibowo and Mohamed (2010) raised a series of risk elements and allocation principles after analyzing typical cases.
	Qualitative analytical techniques: Expert scoring method, Analytic hierarchy process, Graphic technique method.	Research conducted by Akintoye and Macleod (1997) proved that the analytical methods based on expert judgments and subjective assessment are still the main risk allocation techniques; Using Chee and Yeo (1995) conducted risk assessment in BOT project using Graphic technique method.
Risk assessment	Quantitative analytical techniques: Method of fuzzy mathematics, Net present value equation, Monte Carlo	Yelin Xu and Albert (2010) built a risk assessment model using fuzzy analytical method, which achieved quantitative analyses of the extent of damages of opportunity risks; the research team led

	method, etc.	by Dashuang Dai (2008) made the risk assessment plan targeted at BOT project, with whether risks may influence cash flow in franchise period as the standard, and the plan was tested in practices; Songer and Diekmann (1997) made risk assessment of toll road projects using Monte Carlo method.
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Source: According to literature review

2. Risk allocation mechanisms based on partnership under organization paradigm

Risk identification and assessment are the basic of risk allocation, and it belongs to the question of organization paradigm on how to properly allocate specific risks among project organizations, while following the resource-oriented allocation principle of ‘coupling the bearers and control powers of risks’ (Graham M, 2001) The process of risk allocation contain latent attributes such as the fermentation and transmission of risk information, and the effective allocation of resources. Based on partnership philosophy and case studies, Albert Chan and Daniel W. M (2006) raised the idea of building virtual organizations based on partnership, and achieve information sharing through the procedure design of organizations, minimize information loss during risk identification and assessment, and manage to properly allocate identified risks through statutes of the projects. Similar to partnership model, from the perspective of the coordination mechanism of projects, Qinming Liao and Xiaodong Li (2010) built an allocation and coordination mechanism with ‘optimizing risk control powers’ as the principle of effectiveness, thus raise the idea of forming a risk allocation coordination team for collecting risk information and resources in the early stage, to achieve the effective allocation of resources. In conclusion, research under organization paradigm shows the analytic paths different from those of the technique paradigm, but, it is still a discussion within the process of risk allocation.

3. Evolvement from technique and organization paradigms to contract paradigm

Although some breakthroughs have been made in research under the technique and

organization paradigms, which have provided intelligent support for project practices, the bottlenecks of the paradigms gradually presented themselves. With the increasingly obvious changes in the internal and external environments such as the complexity of projects and the uncertainty of markets, under the bounded rationality hypothesis, it is very difficult to address the problems of incompleteness of risk identification through various qualitative and quantitative mathematical and statistical methods. Meanwhile, quantitative models and statistical analytical techniques are not comprehensive enough in the process of risk assessment, since the results may not be precise enough because the data mostly come from subjective ideas of experts. Moreover, from the angle of PPP practices, due to the inevitable differences in the interests of the risk bearers and the asymmetric information relating to risk, it is considerably difficult to address the problems of information and resources allocation in the process of risk allocation simply through idealized partnership organizations, due to the lack of the research analysis about incentives and constraints under the ‘economic man’ hypothesis.

According to Kuhn’s paradigm, the selection of research paradigms depends on the extent understanding of the current puzzles. If paradigm tension appears when paradigm are used to address scientific problems or explain real situations, a new period of seeking basic theories, new methods and tools for expanded explanations will occur. The exposure of the projects’ trait of temporary contract organizations met the internal requirement for paradigm expansion and facilitates the introduction of principal-agent theory in the project situation. Meanwhile, the changes of basic theories expanded the research on risk allocation from being simply process-based to the level of system designing which pays attention to the allocation of liabilities, rights and benefits of risks and effective incentives. Contract paradigm expands research fields of the expectation for principal-agent relationship of risk allocation which was never part of technique and organization paradigms where it explores the traits of incomplete contract and promotes the new evolvement of paradigms.

(1) The matching of the liabilities, rights and benefits of risk allocation based on principal-agent relationship. The research on risk allocation using technique and organization paradigms is based on the analysis on process, which ignores the effective incentives to bearers of the surplus value caused by risks. Even the research on partnership coordination mechanisms under organization paradigm ignores the design of incentive mechanisms, and its implicit premise is that the relationship between risk bearers is undoubtedly bureaucratic, where there is no opportunistic behavior or moral hazard in the bearing of risks.

(2) The dynamic deconstruction of the initial risk allocation and risk re-allocation based on incomplete contract theory. Under technique and organization paradigms, risk allocation deemed as a one-time static process, meaning that the process of designing contracts for initial risk allocation during the period of bidding and contract negotiation is paid much attention to, but readjusting mechanisms caused by the incompleteness of contracts are ignored, which, in project situations, is shown as risk re-allocation such as engineering change notice, claim for compensation and price adjustment (Du Yaling, 2012, Zhao Hua, 2011). Contract paradigm stresses more on the expansion of governance space afterwards, and pay attention focus on to the changes that the participants have difficulties dealing with, which shows the traits of governance in advance and afterwards of dynamic risk allocation.

2.3.2 Contract paradigm on risk allocation of PPP projects

The research on contract paradigm of risk allocation stresses the regulation of the economic behavior of contracting parties through incentive and restraint mechanism within the framework of dynamic analysis in addressing the problem of inefficiency of resource allocation caused by value benefits and risk preference differences. The current research achievements of risk allocation under contract paradigm are mainly the analysis of the game of risk allocation between the participants of PPP projects, and contract design and contract re-adjustment that arise from them.

1. Game model design of risk allocation

Risk allocation is the process of contract games, where the contracting parties inevitably

have different attitudes towards risks driven by different benefits, which very likely evolve to the bargaining in negotiations, sometimes even cooperation dilemma. To improve the efficiency of risk allocation contracts, based on the hypothesis that risk bearers are rational, Medda.F (2007) discussed the problem of risk allocation between public departments and private departments in PPP model from the perspective of game theory, then pointed out that both parties agreed on price-compared bidding game model. Meanwhile, Xueqing Wang and Gang Yu (2007) built the risk allocation game model based on preferences, following the principle that risks are matched with benefits, and stated that the overall satisfaction of both contracting parties was the highest and the risk controlling costs were the lowest when risks fell on the shoulders of the party with stronger risk preferences. From the angle of risk bearers, the studies mentioned above are all under the hypothesis that a single risk cannot be split, which means that the ratio of sharing risks is out of the question. Tao He and Guojie Zhao (2011) on the other hand, taking the risk preferences of the interested parties, built a random cooperation game model where the ratio of risks to bear can be quantified, and raised the method to decide on the best ratio of risk allocation, and proved its effectiveness through cases.

2. Design of risk allocation contracts

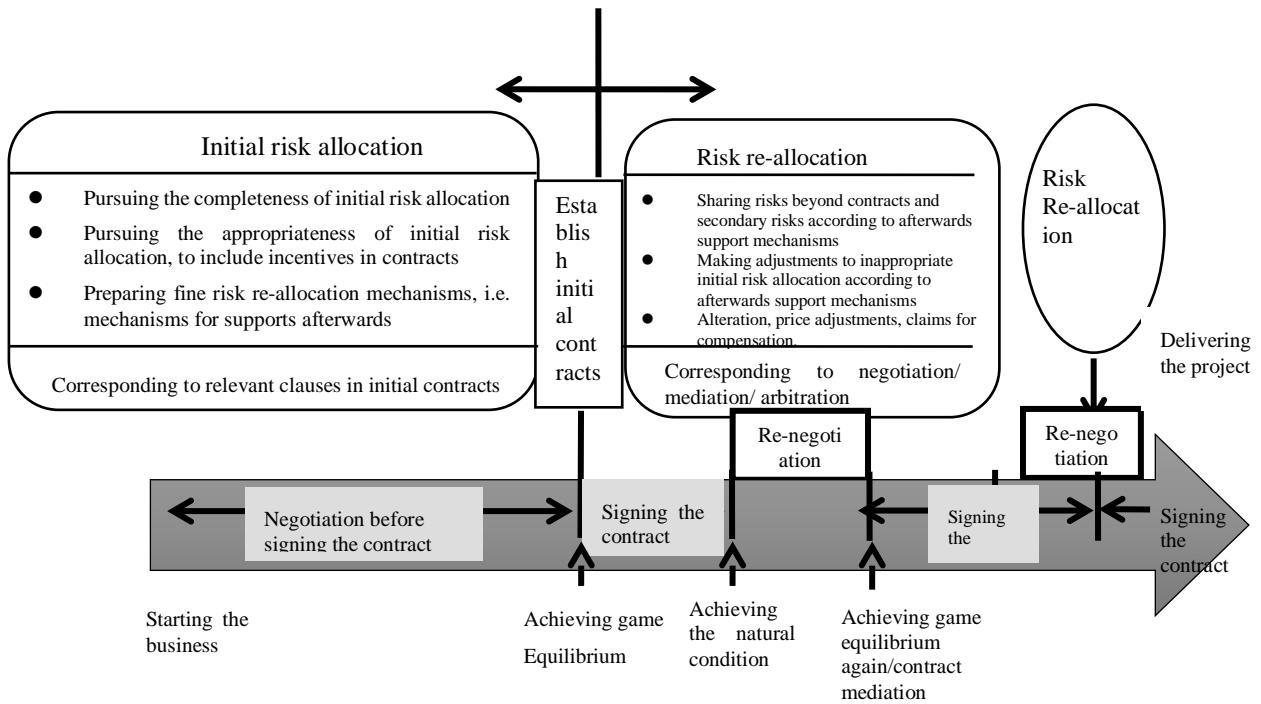
Different from the research perspectives of risk preference and game model, based on project governance theory, Yan Ling and Zhao Hua (2008) raised the question of the matching of the control power of the projects with the residual claims, and revealed the mechanism of action of contracts where the liabilities, rights and benefits of project subjects are correlated, on the effective incentives to risk bearers. In the meanwhile, Yilin Yin and Yaling Du (2010) pointed out that the allocation of liabilities, rights and benefits of the major interested parties of public projects had direct influence on the configuration structure of the rights relating to the projects, which would further affect the reasonability of risk allocation. Based on theoretical research, under this paradigm, several research achievements gradually appear, such as the risk allocation mechanism design based on the control power of projects, and the charging mechanism design based on risk allocation or risk preference. Such achievements

applied theories of effective incentives to risk bearers to specific mechanism designs and provided operable systematic advice for practices. (Yin, 2007)

3. The dynamic deconstruction of risk allocation process

Based on incomplete contract, the dynamic traits of risk allocation of PPP projects are stated in contract agreement in advance for any adjustments or re-negotiation afterwards, as been published in the research conducted by Hartman and Snelgrove (1996), Rahman and Kumarswamy (2002). According to contract paradigm, contracts are the main carrier of risk allocation of PPP projects, and most research focuses on risk allocation in the process of making contracts, expecting to make reasonable initial terms, which shows the idea of 'agreement in advance'. Risk re-allocation is the remedy or adjustment to initial risk allocation plans, and may take forms in engineering change of notice, price adjustment and claim for compensation. The allocated risks concerned includes two types: the first type of risks are those that have been agreed upon in the initial contract but need to be adjusted in real situations; the second type of risks are those that are not in the initial risk allocation agreement but appear in the implementation of the projects. Risk re-allocation illustrates the idea of 'afterwards governance' in risk allocation of the project (Ming-Ten Wang, 2003, Yilin Yin, Zhao Hua, Yan Ling, 2013). As a compensation mechanism, risk re-allocation able to some extent, compensate for the allocation plan in the initial contract, improves the efficiency of risk allocation trades, and enhance the performance of project governance. This is shown in Figure 3.

Figure 3 Dynamic deconstruction of risk allocation of PPP projects under incomplete contract



Source: Own drawing

2.3.3 Conclusion and review

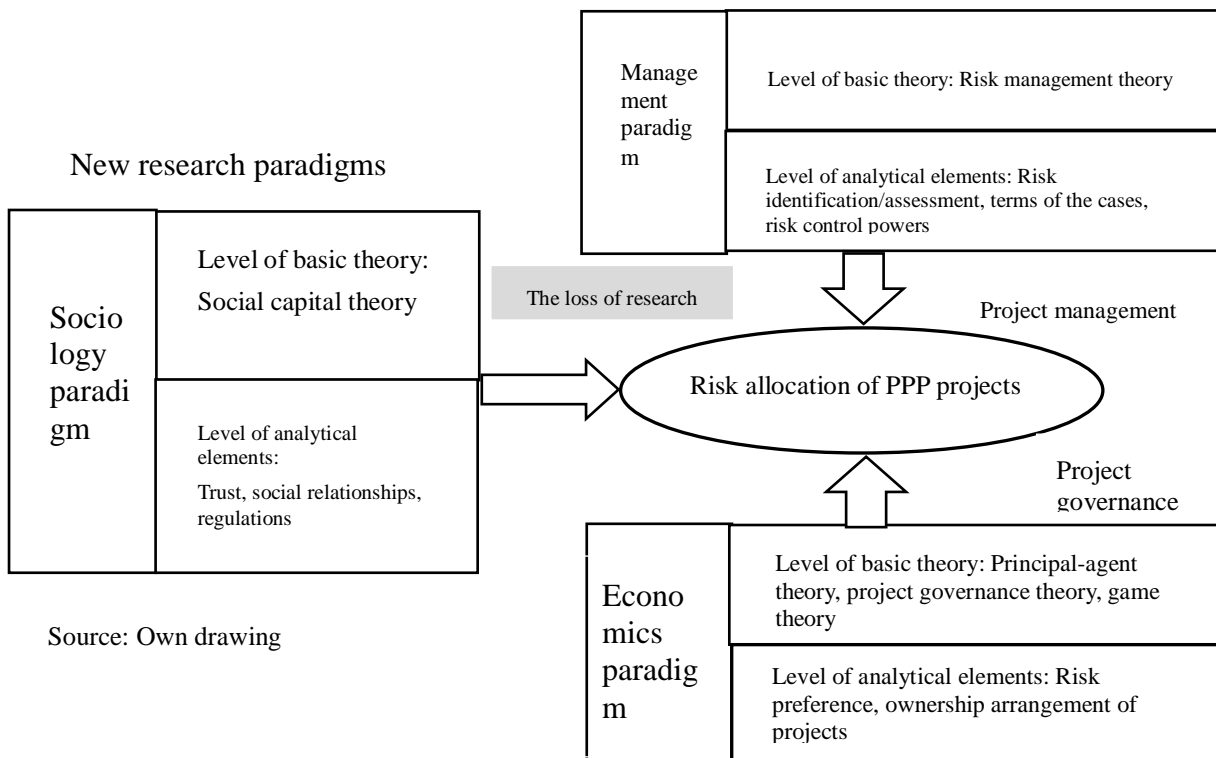
As showed in the analysis on the technique and organization paradigm, breakthroughs have been made in current research paradigms relating to risk allocation procedure design, integrated organization design and contract design. Specifically, the deconstruction research on the two phases of risk allocation from the perspective of incomplete contract expanded the analytical paths of risk allocation, and gradually opened its ‘black box’ relating to its improvement of governance performance of the projects, thus its expansion from one-time static allocation research to dynamic comprehensive research. The introduction of relationship paradigm enriched the view of project governance based on contracts, facilitated the raise of the research topic about risk allocation based on trust, and provided preliminary basics for research structures and frames.

2.4 New trends in risk allocation of PPP projects—the introduction of relationship paradigm

2.4.1 Paradigm tension of risk allocation to PPP projects

The current research noticeably places more emphasis on technique and contract, depending on quantitative technique and contract incentive mechanism in formal systems to improve the efficiency and effectiveness of risk allocation. However, some situational deviations or even paradoxes have appeared between theory and practice, and refined quantitative governance of risk allocation and rigorous contract design cannot guarantee the success of the projects. There are still signs indicating loopholes in the formal system, which in need of certain informal systems of fixation. As an organization in the social network, the informal systematic environment of the projects is influencing risk allocation like a set of parameters. The contract paradigm under ‘economic man’ hypothesis ignored the influence on decision makers of some key governance elements in project transaction such as its common criteria of trust and cognition. Analyses made without taking ‘social man’ hypothesis into consideration are not only against the reality, but also incomplete, as shown in Figure 4.

Figure 4 The missing of sociology paradigms in research on risk allocation of PPP projects



Source: Own drawing

Research under technique and organization paradigm is a research on process chain of risk allocation namely risk identification and assessment. Research under contract paradigm is based on theories such as governance, principal-agent and information economics, and relevant risk allocation mechanisms try to satisfy risk preferences of interested parties to the full extent and minimize moral hazard and transaction costs, which, in a broad sense, is an economic incentive chain. Though the two research paradigms have differences in their research approaches and theoretical bases, they have reached harmony in the improvement of governance performance of PPP projects. Different from the two paradigms above, sociology paradigm expands the elements to be examined, enriches research angles of risk allocation of engineering projects, thus provided new research logic to systematically improve the efficiency and effectiveness of risk allocation.

The two-stage dynamic pattern under contract paradigm provided two paths for the optimization of risk allocation: the first path is to optimize the risk allocation plan in initial contract signed in the periods of bidding and negotiation, so that systematic improvements could be formed in the governance performance of engineering projects through the direct influence of initial risk allocation; the second path, targeted at uncertain risks, is to focus on the re-negotiation in the process of implementation as well as to expand strategy sets of performance improvement by signing framing clauses and agreements. Particularly, uncertain project should attach importance to the design of adjustment mechanism design based on risk re-allocation.

Although certain breakthroughs have been made in relevant research, some key problems are still yet to be addressed. Currently, the research on risk allocation under relationship paradigm is still in the phase of theoretical evidence. Though fuzzy description are necessary, requirements for precise description, quantitative research and modeling analysis have emerged. Only if typical scales of credence feature and risk allocation specifically applied to PPP participants are developed, can bases be established for empirical research on the influence on risk allocation of relationship elements such as trust, and the

rationality of theoretical hypotheses and practicability of projects can be recognized.

2.4.2 The Basis of trust research of PPP projects: development of research from the perspective of sociology

1. Reflection on the importance of trust

(1) The importance of trust in social economic activity

Trust, as the interdisciplinary field of sociology, social psychology and economics, has become a debated topic in recent years, but it did not arouse much attention in scientific field as a common scientific topic until the 1870s. However, it was in *The Philosophy of Money* by Simmel (2002) published in 1900 that trust was mentioned by a scholar as the subject of research for the first time.

Simmel (2002) made great contribution to the development of trust theory by constantly analyzing and pondering on social problems. In his perspective, interaction was the major form of social economics, and the carrier of exchange. With the development of money as a vehicle, money became the basis of economic exchanging activities and it is undeniable that such exchange would not happen without trust in social relationships, as asserted by Smith in *The Theory of Moral Sentiments* (1759).

Simmel (2002), one of the earliest sociologists, deemed trust as a power that cannot be ignored in the society, which influenced the reflection and views about the power of trust of many sociologists later. In 1978, *Trust: a Simplified Mechanism of Social Complexity* by the sociologist Luhmann (2005) was published. In the chapter where he defines the question relating to social complexity, Luhmann (2005) pointed out that in the broad sense, trust referred to the confidence in someone's expectations, and was the basic fact in the society. Unquestionably, in many situation, people decide by themselves whether to trust. But if there were no trust at all he may not even get up the next morning. Luhmann(2005) even pointed out that without trust, the society would be filled with a vague sense of horror.

(2) The importance of trust in transaction

As trust gained more attention in academic field, economists gradually noticing how trust affected economic activities. Its importance was increasingly realized in a spiral way. According to Arrow (1974), trust is the lubricant of economic exchanges, and the most effective mechanism to control contracts. This it is a form of implicit contract, and a unique commodity that is hard to purchase. He pointed out that the lack of trust was the reason why many regions in the world are economically underdeveloped.

According to Williamson (2001), trust is a type of calculative interaction. There is a natural link between research on trust and game theory. Analyzing the classic model of the Prisoner' Dilemma in game theory, Deutsch (1958) thinks that the extent of trust could be reflected by the extent of willingness to cooperate. Through a research on game experiment, he found out that trust is a variable that changing depending on situational materials (variable). To some extent, his research reflects that one-shot game is not enough to comprehensively evaluate the extent of trust, and this approach is lacking contrasts.

Axelrod (1996), an influential scholar in research on trust game. His research slightly different from Deutsch during the same time frame. He thinks that collaborative decision-making was the current judgment made about the unknown future, so was trust. He paid more attention to the changing of trust in the future, not only at the present. Generally, their research has something in common: they both think trust is a comprehensive judgment about the present and the future.

Axelrod (1996) reached such conclusion about his research where cooperation can develop in a multifarious environment and can protect the parties as soon as it is established. Cooperation does not need authority, morality, friendship, rationality, trust or foresee ability. In other words, the basis of cooperation is not genuine trust, but the continuity of relationships. Trust is deemed to play very tiny role in early research on game theory.

The importance of trust is shown in the research on transaction cost economics. Williamson (1975) analyzed trust in social economic activities through transaction costs and found out that the frequency of transaction and assets specificity were under the influence of

trust, and high trust can lower transaction costs. His research inspire us that trust can keep special investments to run smoothly by lowering the expectations for moral hazard, while having positive influence on transactions of the parties.

From the perspective of early sociological research and economics, trust is a situational variable (dependent variable), which influence other variables. In the research mentioned above, the embeddedness of trust is especially obvious. Granovetter (1985, 1992) is a leading scholar in the field of embeddedness research. He pointed out that in social economic activities; the embeddedness of relationships was a typical trait. Any decision are influenced and constrained by the environment, and relationship situation is an important environment variable. The link between trust and transaction costs also showed in his research. On the macro level, trust is a significant premise of transaction, while on the micro level, trust can influence transaction cost by changing governance structure.

As for the classification of trust, Williamson (2001) has provided detailed analyses and descriptions. He made great contribution by raising the idea of calculative trust in his work *The Mechanisms of Governance*. He thinks there are two levels in 'trust' in economic transaction. On the one hand, transaction, deriving from calculations of cost and revenue, cannot be conducted effectively without incentive contracts, which is not only the result of rational choice, but also the basic restrain of contract paradigm analyses; on the other hand, interpersonal trust has influence upon transaction, which cannot go on smoothly with merely calculative trust without interpersonal trust. But it is difficult to completely distinguish or analyze the two types of trust by their function on transactions, because the combination of the two has transcended the analytical category of pure sense and sensibility. Williamson's studies proved that it is very important to define trust in this research, which is the premise of scientific analyses. Fuzzy concept hierarchy is risky for the model establishment and empirical analyses of trust and risk allocation. Generally speaking, though Williamson' transaction cost theory was raised on the bases of man's bounded rationality theory, he argues that trust in transactions is mostly calculative trust, i.e. trust based on rational thoughts, where

he is skeptical about personal trust.

At the end of the 20th century, with the development of behavioral economics, more scholars agreed to include social psychology into economic research. Game theory was developing to the direction of behavioral game theory. Berg, Dickhaut and McCabe (1995) designed trust game experiments, the results of which had obvious deviations from predictions made under pure self-interest preference hypothesis. The results showed that on the premise of the existence of trust, some individual actions showing fairness preference might guide self-interested actions of others, which could make the distribution of income much fairer, and might even improve social benefits as Pareto suggested. Furthermore, Jiade Luo and Yongzhu Ye (2007) integrated Williamson's (2001) and Granovetter's (1992) ideas and raised transaction cost-embeddedness structure. Jiade Luo and Yongzhu Ye (2007) reached two conclusions in their research. First, all governance models are only discrete-structured, but they are also succession—there are different extents to which governance methods are used, and the issue is which method is more frequently used, and which is not. When the frequency of the use of a certain method reaches some point, the corresponding model is chosen. Second, though Williamson did not believe in interpersonal trust in transactions, there is still relationship based on trust even in Taiwan's high-tech manufacture industry which is competitive internationally, highly demands for efficiency, and constantly lower the costs. It is indeed important to keep relationships or systems in transaction.

In recent years, research in the interdisciplinary field of sociology and economics has expanded the research perspectives relating to trust. Its importance, already recognized by sociologists, is gradually accepted by economists. More and more research on economic phenomena sets its bases on trust. The position of trust has been equal to that of systems and regulations. Trust is playing its role in economic activities.

2. The efficacy of trust in social economic activities

(1) General introduction of the function of trust

Targeted at the uncertain complexity of the society, Luhmann (2005) thinks that trust is a mechanism to simplify the complexity. Such idea is mentioned repeatedly in *On Social Trust* by Yefu Zheng published in 2001. According to Luhmann (2005), under any circumstance, trust is a social relationship, which itself is subjective to a special regulation system. Trust is an important part of the regulation system of complex latent social behavior, and its formation and evolvement are both influenced by individuals, groups and social macro-value systems. In the analysis of social systems, the topic is always around terms such as value system, social environment (humanity), and defining highly complicated analytical questions is instructive to research. This research considers logical thinking under sociology paradigm to fit both psychology and sociology, thus it can compensate for the analysis simply under economics paradigms. This explains the huge differences in trust indifferent cultures. Trust reflects behavior relation to both the present and the future, and is uncertain due to multiple potential possibilities, which, in this context, are the judgments about the present and the future. Trust can be explained and analyzed from the two perspectives above, which provides basis for the definition and quantitative analysis of trust for this thesis.

Similar to Luhmann (2005), Williamson (1975) from New Institutionalism and Coleman (1999) from the School of Rational Choice both see the other side of trust. While deeming trust as a mechanism to lower the costs of transaction and supervision and punishment, they also point out that trust is an ‘action of risk’ based on costs-benefits. According to Coleman (1999), trust is a social capital to lower the costs of supervision and punishment: trust is more about calculation than emotion, where both parties concerned—the consignor and the consignee are rational, and trust is an emotionless tool to restrain free riders. Unity in group is a product of consciousness, coming from direct communication relating to common interests. Later on, Fukuyama (2001), an influential scholar in the field of trust and social capital, compared and analyzed the trust of Chinese people in the US, Japan, Germany, Italy, Korea, France, and regions beyond the mainland China in his work of ‘*The Social Virtue and The Creation of Property*’, where he reached the conclusion through data analysis that

economic prosperity cannot be achieved without high trust environment, otherwise only family companies can be established, this degree of trust is shaped by traditions.

The analysis of studies conducted by Luhmann(2005) and Williamson(2001) shows that trust has undeniable influence on the process of economic transactions. Contracting parties need to identify trust, and establish trust coordinates through purposeful and targeted analysis, to achieve a status where the bound level of contract matched with the level of trust. Such result not only lowers unnecessary expectations for moral hazards, and slows down the increase in transaction costs, but also prevent from excessive controlling, specifically for the contract letting party of engineering projects.

(2) The impact of trust in organizations

Existing literature about trust show that most studies focus on the field of organizational behavior. These studies can be classified into two types: the former is relating to trust issues within organizations, and trust between employees and between higher and lower levels; the latter is relating to trust between organizations. (Zheng, 1999). In relevant literature, studies on horizontal trust between employees within organizations and vertical trust between superiors and subordinates are usually related to correlation analysis about information transfer and knowledge sharing and fermenting likewise provide governance strategies according to the relationship between the independent variable of level of trust and relevant dependent variables. On the level of trust between organizations, the studies mostly focus on the governance of relationships of the parties, relating to relationship elements such as strategic alliances, relationship marketing and inter organizational network.

Robbins and Judge (2010) pointed out in their research on organizational behavior that trust within organizations is a kind of positive expectations for others, i.e. others would not conduct opportunistic behavior relating to commitment, action and decision-making. Based on the research of Shunsheng Qi and Hongqing He (2006) divided interpersonal trust within organizations into two sub-categories, i.e. vertical trust between superiors and subordinates within organizations, and horizontal trust between members within organizations.

1) Vertical interpersonal trust

In the research on vertical interpersonal trust, Robbins and Judge (2010) pointed out that the core function of trust in organizations lied in its improvement of the leadership of managers. When subordinates have faith in their leaders, they are willing to follow their lead, and trust their decisions, and will not suspect them of abusing powers. Nonetheless when subordinates don't trust their superiors, or feel that they have no faith in themselves, exist potential moral hazard. If this situation spreads to the whole organization, there lacks internal motivation for the improvement of governance performances of the organization. This is also the basic hypothesis made after many scholars analyzed the influence of trust on organization performances through intervening variables such as knowledge sharing fermenting and team works.

According to the descriptions above, leaders in organizations can send signal of trust to employees or subordinates through obvious trusting behavior, and thus trust is formed. For example, Whitener (1997) and some other scholars raised the idea of the function of Managerial trustworthy behavior, which involves the continuity of policies made by managers, the integrity of behavior, the level of open and honest communication with employees, the level of attention and care for subordinates, and the level of voluntary delegation and effective allocation of powers. They think the five elements are the basis of trust between managers and employees.

Analysis on literatures shows that the existing studies ignores the characteristic differences in trust of the two groups (managers and employees), and the differences in their starting points of trust. Therefore, general and indiscriminate description of trust is not scientific. As Zheng boxun (1999) pointed out in his research, the trust of managers in employees mostly comes from their loyalty to the company and their work abilities, while what the subordinates pay attention to is similar to the elements in Whitener's theories. Therefore, the future direction of such research lies in how to establish two-dimension structures of trust between superiors and subordinates, and how to strengthen such trust.

In conclusion, classification analysis of differentiation of trust is the basic of research on the relationship between trust and risk allocation. In other words, the thrusters and the trustees need to be clearly defined at the beginning of the research.

2) Horizontal interpersonal trust

Trust between organization members and functional departments are very important for an organization to some extent, the trusting environment in organizations is conducive to the manifestation of competitive advantages. Both Porte (1996) and Dirk (2000) analyzed the positive impact of trust on internal cooperation from the perspective of organizational strategies. According to their research, in organization with high levels of trust, sharing of knowledge and the transmission of information is more efficient, which would hinder the formation of 'information islands', and promote cohesion in organizations.

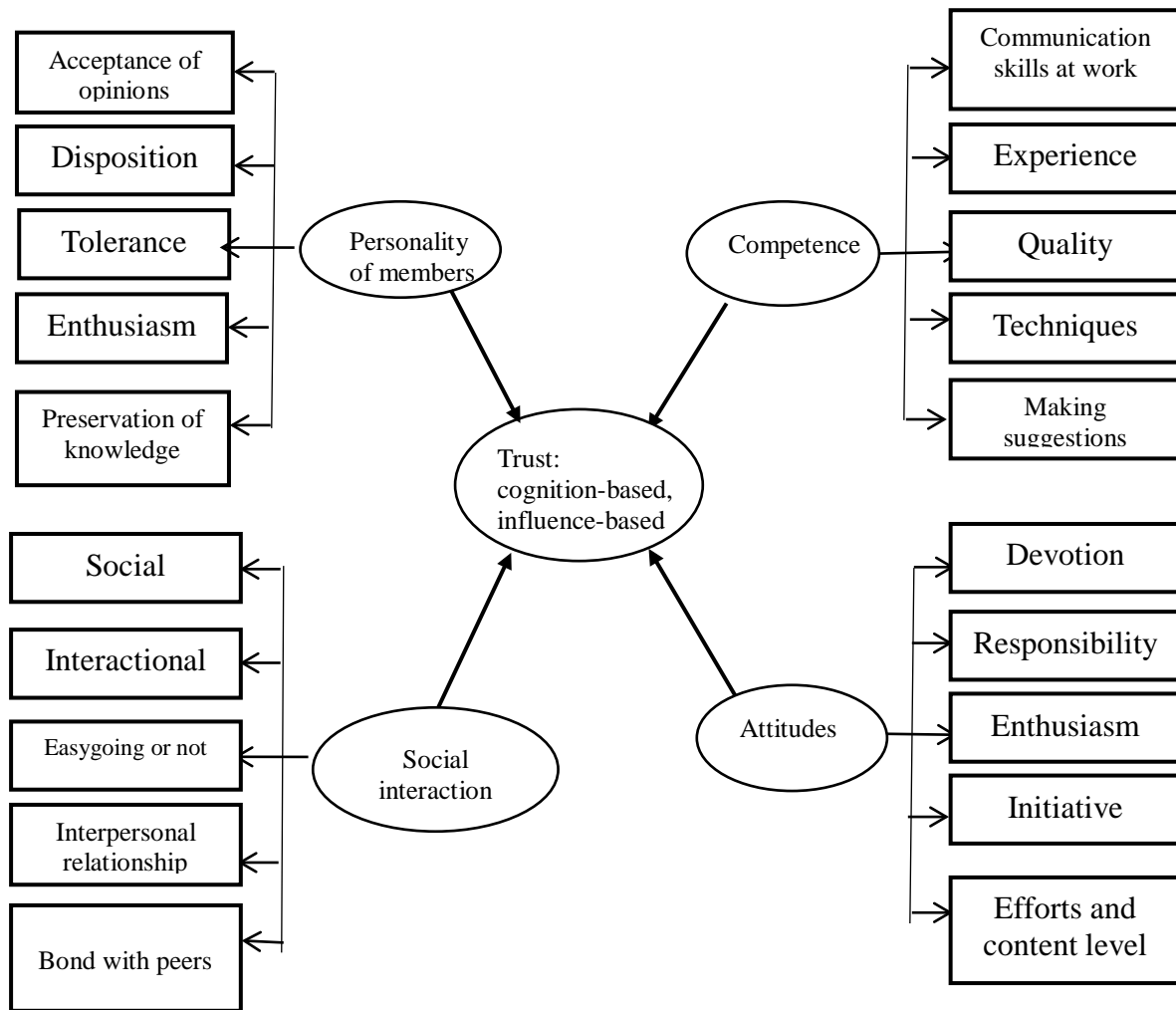
Moreover, trust within organizations could melt down the estrangement among departments that are formed because of business conflicts. For example, Labebo (2005) studied two agricultural development projects in Nigeria, where he sampled 296 relevant personnel for questionnaires. He reached the conclusion that the trust level among members of an organization was positively related to the cohesion of the organization. In terms of strategies implementation, trust among the members inside an organization is also an important element for the improvement of implementation's force. As Davis (2000) and Morgan (2003) pointed out, the trust of employees in managers was conducive to the formation and implementation of high-level strategies. The internal mechanisms are that in the process of strategies implementation, though different opinions may occur inside an organization, trust capable to some extent lower the implementation cost and decrease the resistance power, which would alleviate the implementation of strategies and has positive impact on the in-time implementation of strategies.

With the spiral improvement of organizational structures, the structures of modern companies are developing towards delayering, which means decreases in functional levels and increases in span of management. Trust among all functional departments is especially

important for the improvement of efficient cooperation between departments. Not only that trust can lower transaction costs between organizations, but also that its latent effects could lower the interaction costs within organizations, improve the efficiency of cooperative work, which is one of the focuses on trust of school of organizational behavior (Hogan, 1994).

In the field of project management, Ding Zhikun and NG (2010) focused on the features of trust among employees in project organizations. Focusing on the establishment of trust among members of project design team, their research pointed out that the level of trust was an important element concerning the performance of designing. They made data analysis through structural equations on the four variables, i.e. the characters, the social interaction of project members, the work attitudes and capabilities, which concluded that the social interaction and work attitudes are important impact factors of the establishment of trust. The results are shown in Figure5.

Figure 5 Model of trust based on individual characteristics



Source: According to literature review

(3) The impact of inter-organizational trust

Das and Teng (1998) defined inter-organizational trust as a party's expectation for the other party's behavior considering the risks it is faced with. Compared with intra-organizational management, alliance cooperative partners have independent economic interests and strategic objectives. Instability is an important feature of such alliance. Partner companies inevitably have interest conflicts, which would impair the rationality of decisions made by alliances and the flexibility of decisions according to the changing external environment, thus impact of the performance of the alliance. One effective approach in

addressing or easing the conflict is to work on the social relationship of the partners and establish trusting abilities.

Macoby (1997) pointed out that trust could facilitate the formation of cooperative relationships. According to Whitener (1998) and some other scholars, trust is conducive to equal relationships within organizations and the improvement of management efficiency. Bigley and Pearce (1998) asserted that trust is very important to the governance of organizations when various risks exist between two parties. With the importance of trust in organizational management being increasingly realized, more research was conducted concerning the impact of trust on the performance in project management. Zaghoul and Hartman (2003) reached the conclusion that trust could ease the hostility between the contractors and developers and decrease the possibility of latent losses including transaction costs. Naoum (2003) believed that trust is an important approach to easing the hostility among all parties. Wong and Cheung (2005) found out that trust could strengthen the cooperation between contractors and developers. Doloi (2009) proved the hypothesis that trust strengthens cooperation and pointed out that such cooperation is conducive to the guarantee of the time limit for projects, the improvement of quality and the cut-off of budgets. The research conducted by Lau and Rowlinson (2010) found out that trust in engineering projects could smoothen the process of construction, increase the flexibility and improve the management performance.

2.4.3 The Nature of trust in PPP projects: risk allocation under incomplete contract

1. The definition of trust and the analysis of formation environment theory

In PPP project practices, the intra-organizational trust issues can be boiled down to the representation of economic relationships. In relevant literatures, the relationships among PPP project participants are commonly defined as a kind of opposite and inefficient contracting relationship, where adversarial thinking and mutual distrust commonly exist, which prevents the success of projects. (Munns 1995). Under this circumstance, many scholars started the analysis of trust relationships among PPP project participants. First, Kadefors (2004) ,

Levitt (1984) and some other scholars started with the business features of all phases of a project and revealed the representation of trust issues in PPP projects: in the contract negotiation phase, some PPP project participants focus too much on making terms in favor of their own interests, and repeated games increase transaction costs. Expecting opportunistic behavior, some participants even ignore the principle of matching risk bearing and risk tolerance and try to transfer more risks to other parties in order to gain more interests, which makes risk allocation less reasonable, and even causes cooperation dilemma at the beginning of projects. In the phase of implementing contracts, mutual distrust causes the consequence that the parties resort to irrational alteration and vicious claims for compensation in face of disturbing elements such as alteration and claims, which prevents the constant improvement of governance performance of projects.

Inspired by the research on organizational trust conducted by Williamson (1993) from the perspective of governance mechanisms, Carolyn and Akintola (2000) carried out research based on the function of trust. Empirical research showed that trust is an important component of the transaction system and has functions of lowering transaction costs and addressing cooperation dilemma. (Wasan, 2009) Though the empirical studies are not focused and thorough enough, it has been preliminarily proved in different situations that trust among PPP project participants is conducive to the success of projects. In recent years, research on trust among PPP project participants has developed a lot.

According to Lau and Rowlinson (2005), trust is a multidisciplinary, multi-level and multi-dimensional question, so a clear definition of trust is needed in research on specific issues. (Liao Chenglin, 2004). Scholars with different backgrounds have defined trust from different economics and sociology perspectives, such as market transaction actions, social networking interaction and non-institutional regulation, which is shown in Table5. There is still no unanimous definition of trust in PPP projects. Since definition is the starting point of academic research that provides valuable fruit of thinking, a good definition not only promotes theoretical thinking, but also is a projection of theories, which is the higher value of

definition. The definitions of trust have been made by sociologists, economists and psychologists from perspectives of the function and attributes of trust.

Table 5 The connotation of trust under multiple perspectives

Perspective	The definition of trust	Core concept	Scholar
Rational analysis on behavior expectation	If someone has trust in something, he has expectations for it and carries on certain behavior. The negative psychological impact of the results contradicting his expectations overweighs the positive psychological impact of the results comforting to his expectations.	Psychological expectation	Deutsch
	Trust is a generalized expectancy held by an individual that the word, promise, oral or written statement of another individual could be relied on.	Expectancy for reliability	Rotter
	The society would collapse without mutual trust. There is almost no relationship of general trust is based on accurate understandings of others. Almost no relationship could last if there is no rational, observable or stronger proof for trust.	Observability	Simmel
	Trust is purposeful behavior pursuing maximized utility with the existence of risks. Trust is a kind of social capital, which could decrease the costs of supervision and punishment. Trust is more about calculations than emotions.	Behavior based on calculations	Coleman
	Trust is an efficient lubricant of economic exchanges. A lack of trust can account for the economic backwardness in many regions in the world. It is the most effective mechanism to control contracts. It is an implicit contract and unique goods hard to purchase.	Goods to lubricate the economy	Arrow
Economic and social tool	Trust is a public good necessary for many economic exchanges.	Public good	Hirsch
	Trust is a kind of social relationship under any circumstance. From the angle of function, trust is one of the mechanisms to simplify complexity. (There are many simplification	Simplification mechanism	Luhmann

	mechanisms: language, currency, standard, scores, and reputation).		
	Trust is a tool for social control, but it is an omnipresent and significant one in any social systems. In social control, powers cannot be effective to the full or even the greatest degree without trust.	Tool for social control	Barber
	Trust is a generally reliable belief about others ‘sincerity, kindness and credibility.	Custom and belief	Wrightsmen
Belief and custom	Trust is the mutual confidence of interacting parties that neither party will take advantage of the vulnerability of the other party.	Cognitive belief	Sabel
	Trust is the continuous belief in others and the objective world.	Pervasive belief	Giddens
	Trust is an attitude of believing that someone’s behavior or the order of the environment conforms to one’s own expectations: Trust is the media of exchange and communication, which may take various forms such as introducers, tokens, oaths, and pledges.	Sense of trust	Yefu Zheng

Source: Own drawing

Trust can be classified into two types in terms of broad sense or narrow sense. In a broad sense, trust, also known as general trust, is the general recognition among groups under the regulation of some specific systems without a particular object, which can be simply described as regional environment with broad confidence. In a narrow sense, trust, or specific trust, exists in a two-party relationship, and is the recognition coming out of interactions. Most research concerning trust in a broad sense belongs to the field of social capital in sociology paradigm. As for research concerning trust in a narrow sense, scholars at home and abroad have classified trust from the angles of project cycle, the formation of trust and the level of trust. The research results are important reference for the classification of trust in PPP projects. Details are shown in Table6.

Table 6 Classification of trust

Perspective	Classification	Explanation	Literatures
Static and dynamic	Initial trust	Initial trust based on cooperation experiences and mutual commitment.	Liao Chenglin and Xianmu Qiao (2004)
	Continuous trust	Continuous trust that comes out of the interdependence and cultural convergence developing in the process of interaction.	
Project cycle	Commonsense trust	Trust that develops at the beginning of the projects due to the social norms and reputation mechanism.	Tao Wang and Xin Gu (2010)
	Continuous trust	Mutual acknowledge of capacity and values in the process of projects	
	Continuing trust	Trust in the next project after the end of the last one	
	Trust in the planning period of projects	Initial trust at the beginning of projects	
	Trust in the transaction period of projects	Changeable trust in the transaction period of projects	Walker, D.H.T., Bourne, L (2008)
	Trust in the completion period of projects	External formation of trusting relationships	
The level of trust	Low-level trust	Inefficient economic activities aimed at short-term interests	Marek Korezynski (2000)
	Medium-level trust	The middle ground between low-level and high-level trust	
	High-level trust	Efficient economic activities aimed at long-term interests strongly restrained by social regulations	
How trust is formed	Calculus-based trust	A rational choice as an economic man; corresponding trust when it's in favor of the expectancy for his own value.	Rousseau, Sitkin and Burt Etal (1998)

	Relationship-based trust	Trust that comes out of bonds formed due to long-term social interaction.	
	System-based trust	Trust generated due to explicit systematic regulations	

Source: Own drawing

According to the occurrence conditions of trust relationships, Bhattacharya and Devinney (1998) raised the idea that there is no trust issue when the process and outcome are determined, and that trust issue only occurs when there is uncertainty on risk and the outcomes. Rousseau and Sitkin (1998) analyzed the issue from the angle of the uncertainty of risks, where he concluded that the dependent process of risk allocation is conducive to the occurrence of trust, because proper risk allocation and trusting relationships derive from reciprocal actions of the contracting parties, and such reciprocal actions may facilitate trust. In general, PPP project have the features of large investment and long project cycles, and risks in project cycles are uncertain. There is the adaptive environment for trust.

2. Exposure of trust in the cognition of project feature.

It goes without doubt that trust is a multidisciplinary multi-level and multi-dimensional definition concerning the perception of psychological state, expectancy for economic behavior and social morality. There is still no universally accepted theoretical explanation for the nature of trust relating to engineering projects. According to the existing literatures, the differentiated definitions of the nature of projects decide the nature of trust relating to projects. Traditionally, projects are deemed as a one-time task under certain constrains, which focuses on the relationship between inputs and outputs, where trust is another important capital element affecting the success of the project in addition to material capital and human capital (PMI, 2000 and Mike,2005). As the understanding on the nature of projects are deeper, research paradigm changed from technique to organization, contract and relationship paradigms. Due to the cognition of temporary contract and social networking characteristic, analyses on trust of PPP project participants show the perspective of ‘embeddedness’, which mean that informal system and trust that impact the environment of projects, are embedded in

the projects as relationship governance factors, and interact with contract governance elements as to achieve the balance of governance mechanisms (Eric, 2006 and Smyth, 2007). Analysis on the nature of trust of PPP project participants and latent research illustration in cognition of different projects is shown in Table 7.

Table 7 Analysis on the nature of trust of PPP project participants in cognition of different projects

The nature of projects	Characteristics	The nature of trust	Latent research illustration
PPP projects are deemed as a one-time task under certain constraints (quality, costs, time limit, and etc.)	Focused on the one-time relationship between inputs and outputs, and stressing production function	Trust is a capital element, which has impact on input-output relationships along with material capital and human capital	Trust is a “black box” on which little research is focused. More efforts are put into research on governance techniques of projects.
A PPP project is a temporary organization that is linked by a series of contracts.	A temporary contracting organization with production functions	Trust is an important project governance element in the dimension of relationship governance	Trust is defined in the category of governance. The coupling of contract governance and relationship governance is a latent research point.
A PPP project is a social networking relationship organization influenced by formal and informal institutional environment.	Temporary social networking organization	Trust is manifested as an informal institutional environment/ influence parameter	It shows the view of “embeddedness”. Trust influences the selection of governance mechanisms and costs as a kind of institutional environment.

Source: Drawing it by document analysis

According to the above analyses, even though the existing scattered research on the nature of PPP project participants has different perspectives on capital element, project governance parameter and institutional environment/ influence parameter, it is however, not focused and thorough enough therefore the overall research still shows internal consistency, which is the focus on economics research paradigm. Such consistency is rooted in the disturbances of incomplete contracts among PPP project participants to trust, which is apparent from the perspective of governance parameter and institutional environment.

3. Analysis on trust based on incomplete contract theory

(1) Trust as a relationship governance parameter and opportunism expectancy

PPP projects are highly uncertain, where any risk that could occur in project cycles cannot be fully expected, therefore, contract strategies cannot be drafted in advance. Under the hypothesis of bounded rationality, it is not realistic to address the problem of uncertainty in principal-agent relationship by designing contract. However, since the benefit and risk co-exist, PPP project participants protect their own interests by rationally expect other parties to perform opportunistic behavior such as hiding information in the contract-making stage and hiding actions in the contract-implementing stage and deem moral hazard as the relationship-based risks that they are faced with. In theory, trust between PPP project participants depends on good wills and expectancy for mutual cooperation. In the environment full of uncertainties, expectancy for opportunism creeps in, and distrust is an inevitable result.

(2) Trust as institutional environment/ influence parameter and the control power of the projects

With the natural incompleteness of contracts and the distrusting environment, games between PPP project participants relating to the control power of projects and residual claims became inevitable. Both parties deem the fight over control powers as an effective strategy to deal with the opportunistic behavior of the other party. On the other hand, in a mutually trusting environment, chances are that PPP project participants transfer part of the control

power through transfer's right. When expected risks occur, PPP project participants may take rational action through the transferred control power, which would accomplish the aim of reducing governance cost and improving governance efficiency. But it is undeniable that in such situation there exists the risk of inefficiency due to opportunistic behavior caused by excessive trust. The coupling of an ideal trust level and control power should be the focus of contract design.

2.4.4 The development vein of research on trust in PPP projects and situation-dependency

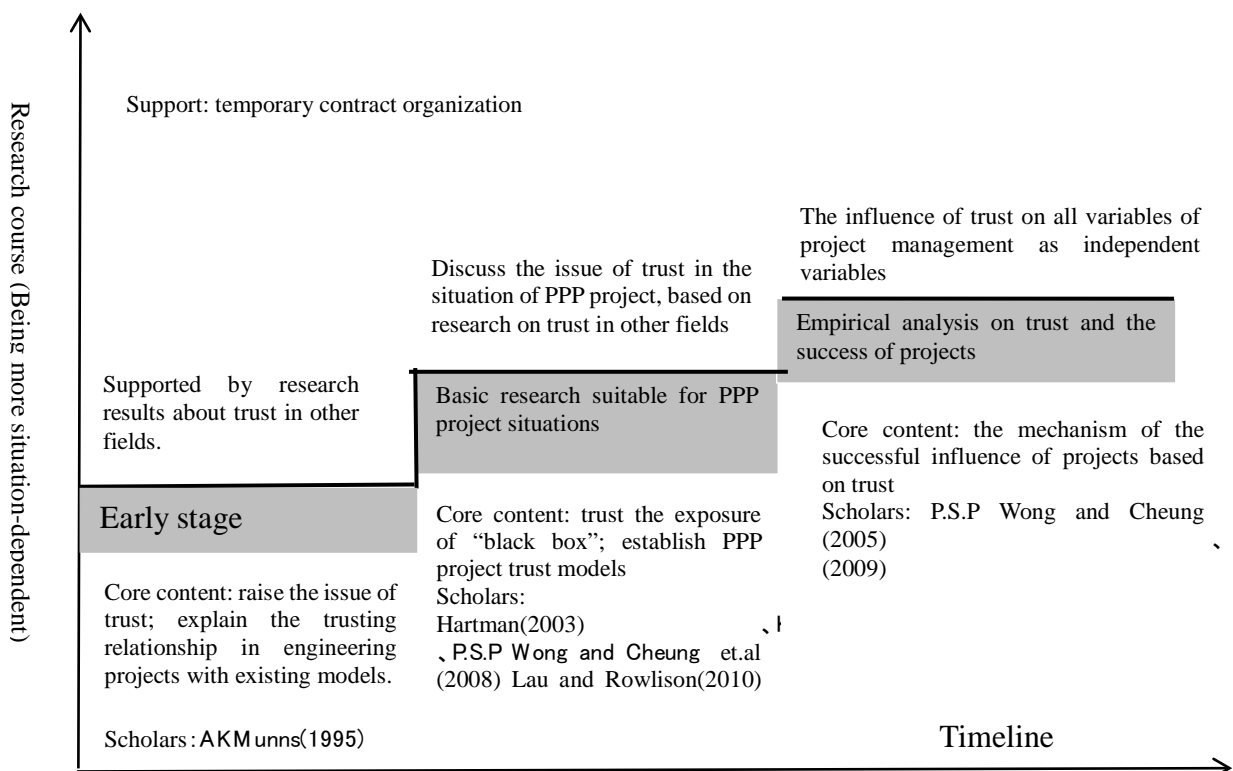
As stated earlier, contract-based and social networking relationship-based cognition expands the characteristics of one-time tasks of projects, which makes it possible to analyze the development of research on trust of PPP project participants, and gradually applied early reference studies to the typical research in project situations.

1. The development vein of research on trust of PPP project participant

In early reference studies, the dynamic trust model studied by Lewick and Bunker (1996), Rousseau and Sitkin (1998), the spiral trust model studied by Zand .D.E (1972) and trust and risk-driven model studied by Mayer (1995) focused on the analytical target at the organizational level. The raise of the characteristics of project contracts made it possible for reference studies, but studies on trust at that time just simply introduced the definition of trust and types of trust into PPP projects, which was not targeted enough. Compared to traditional organizations, PPP project organizations are special in that they are temporary, transient, and different in interests and values, and the establishment of trust is also special. To make trust in PPP projects more explicable, from the angle of realistic issues such as the incompleteness of PPP project contracts and the information asymmetry of contractors and developers, scholars built trust models in the situation of PPP projects, such as the trust model including the process of projects raised by Hartman (2000), which includes integrity-based trust at the beginning of projects, relationship-based trust in the middle of projects, and capacity-based trust in the completion of projects. WeiKei Wong and S. O. Cheung (2008) perceived this

issue from multiple angles such as contracts and market reputation, and raised the idea of system-based, cognition-based and influence-based trust models, which have been proved as been applied to Hong Kong PPP fields in empirical research. In the meanwhile, Zaghoul and Hartman (2003), as well as Kadeors (2004) and Lau and Rowlinson (2005) linked trust with governance elements such as contract and control, analyzed the role trust played in PPP project participants, and further revealed the ‘black box’ of trust of PPP projects. In recent years, there are more and more successful empirical research based on trust, and there appears research on intervening variables between trust and the success of projects. The development vein of research on trust in PPP projects is shown as Figure 6.

Figure 6 The development of research on trust in PPP project



Source: Extracted and drawn from document analysis

2. The situation-dependency of research on trust in PPP project

Various regional environments and specific project situations result in the differences of trust models and research focuses, which further caused the regional uniqueness of research

conclusions. Empirical research results show that with almost the same variables, trust in PPP project participants in Canada came mostly from capacity and behavior altitudes, while PPP participants in Hong Kong view the market reputation as an important element for trust. Furthermore, the acting points of trust function are not the same in different project situations, which has been proved by the research of Smyth (2007). The situation-dependency of research on trust in engineering project is shown in Table8.

Table 8 Situation-dependency of trust in PPP projects

Project situation	Relevant research	Reference literatures	Research inspiration
Africa: In the situation of international aid projects, foreign organizations and organizations in host countries are different in management culture and values, resulting in communication barriers.	Research on the links between trust and communication systems: trust improves the efficiency of communication systems, which is conducive to the success of projects	Diallo Thuillier (2005), Atkinson and Crawford L(2006)	The antecedent elements vary in different project situations and governance models.
Britain: PPP models are applied to public projects, where more risks are transferred to private departments. In the process of negotiation, mutual trust is needed to improve the reasonableness of risk allocation plans	Research on the links between trust and risk allocation: trust improves the reasonableness of risk allocation, which is conducive to the success of projects	Smyth and Andre Edkins (2007)	The internal mechanisms of how new comers facilitate the success of projects in different project situations. (The intervening variables of how trust facilitates success are different)
Hong Kong, China: Partnering model is applied to infrastructure projects in Hong Kong, where mutual trust is the basis of effective operation	Research on the mechanisms of antecedent element identification and the impact of trust on the success of projects in the partnering model	P.S.P. Wong and S.O.Cheung (2005)	

Source: Extracted and drawn from document analysis

Even though differences in the range of empirical research and regional markets result to the differences in research conclusion to certain extent, it is undeniable that analysis on project situation is important for research on trust. Literature research also reveals that research on trust in PPP project situations in China is relatively limited: it seems that there is only one trust generation model, which was built by Jin and Ling (2005), aimed for project cycling risks and targeted at communication strategy and joint decision-making. The gap in this area is yet to be explored by scholars

2.4.5 The generation of initial trust of PPP projects and the evolvement of trust

1. The generation of initial trust

In the phases of bidding and contract negotiation, PPP project participants have personal information, and information asymmetry hinders the generation of trust. The generation of initial trust between PPP project participants depends on the information transfer of tentative trusted source, which could weaken the opportunistic expectancy caused by information asymmetry. In the initial phase of the projects, PPP participants can effectively examine the signals of trust by evaluating the management capacity of projects and market reputation. The trust models built by Hartma (2000), W.K. Wong and S. O. Cheung (2008) also stressed the elements above, where relevant empirical research proved that elements like the performance of completed projects, management capacity shown in construction process and financial capacity are important antecedent factors of trust. Market reputation is a valuable asset valued by PPP project participants. But it needs to be noted that market reputation is an incomplete proven trust signal. Therefore, to view it as a trust signal based on the internal mechanism with false information would result in extremely high costs PPP project for the participants with relatively poor market reputation. Consequently, only with perfect mechanism, the market reputation able to be viewed as a trust signal. This account for the attention paid to the market in Hong Kong, which was mentioned earlier by Dutta (1999) and Spence (1973).

Undoubtedly, the design of contract terms of PPP projects is the focus of interest's allocation, and the risk allocation terms relating to interest's allocation in the phase of

negotiation have direct impact on expectancy for behavior of PPP project participants. The initiator elements for the generation of trust, cooperative trust based on satisfactory terms is an important source for the signal of trust. The derivation process: trusting relationship derives from the extensive existence of uncertain project risks, and contract satisfactory terms under the mechanism of proper risk allocation are the manifestation of the reciprocal actions of the contracting parties, which could facilitate the generation of trust; in the process of risk allocation, the level of matching between the benefits and elements such as the transaction costs, degree of game and level of risk allocation in the evaluation and negotiation process of contracting parties can be used to estimate the strength of signals of trust, and actions trying to minimize the risks to bear where self-interests are excessively stressed are the potential manifestation of opportunistic motives, which would start a vicious circle of distrust. Moreover, as for arguments relating to risk allocation, relevant research shows that the adaption of ADR shows the two parties pursuit for the 'win-win' situation, which is a manifestation of trust. In addition to the major antecedent elements of trust stated earlier, regulations based on market rules and the selection of partnering management model also impact potentially the trusting relationship between contractors and developers (Pen, siqin 1999, Gulati, 1995, Luo, 2005 and Ellen, 2011).

2. The dynamic evolvement of trust of PPP project participants in project management interacting behavior

Trust is the realistic reflection of psychological expectancy, and it is a continuously dynamic process from the initial trust at the beginning of the projects to process-based/relationship-based trust in the implementation of the projects, and the elements influencing the generation and evolvement of trust in different phases of projects are also different. In the implementation of the project, chances of PPP project participants' uncooperative behavior caused by risk disturbing elements such as the changes of plans and geology increase, causing malicious claim/ anti-claim, explanations for the differentiation of the adjustment of risk terms and irrational ways to settle disputes, which would directly influence the dynamics of

relationship-based trust. Influenced by the disturbing elements of interactive behavior of projects, the initial trust generated by antecedent elements such as market reputation and capacity cognition would gradually be replaced by relationship-based trust generated in the interaction of project management, and the level of trust would change in a waviness pattern (Teck-Hua, 2005, Vlaar, 2007). According to the literature review, relevant elements impacting the generation of trust among PPP project participants are shown in Table9.

Table 9 The influence factors of the generation of trust

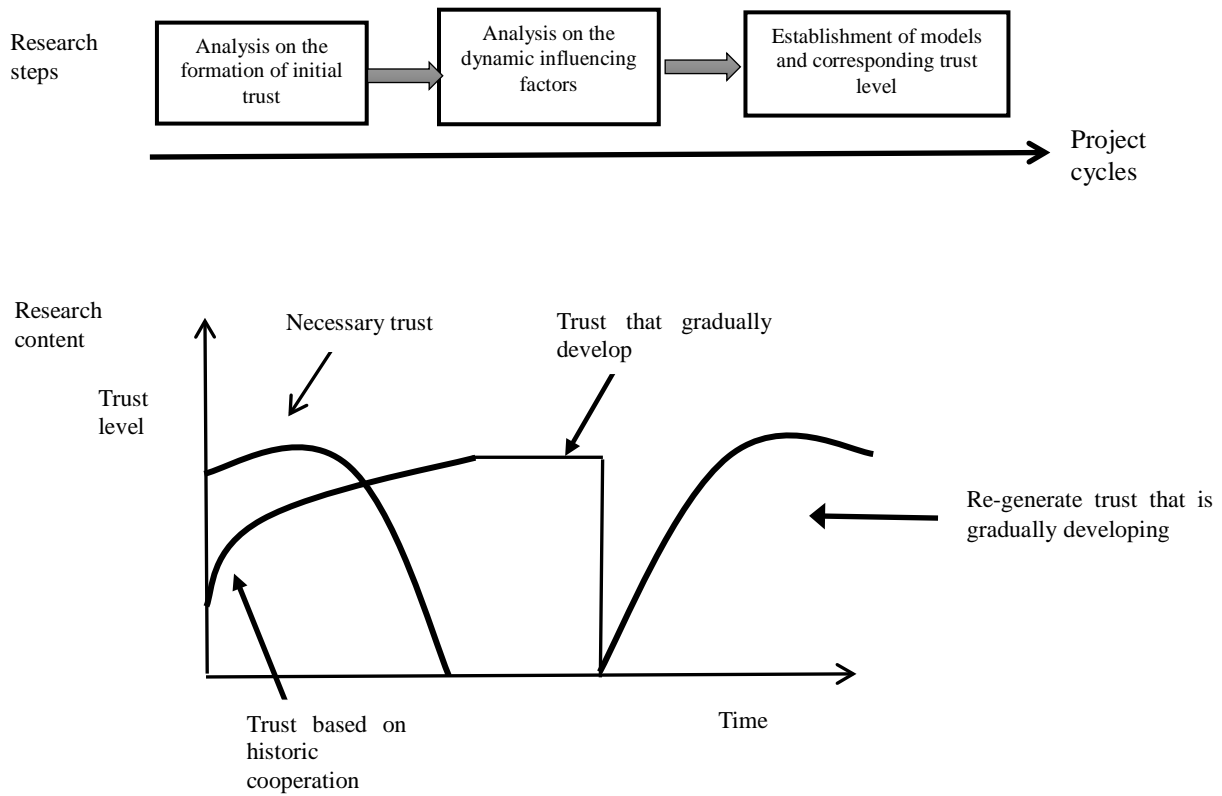
Perspective	Factors of the generation of trust	Explanations
Management capacity	The capacity level in the process of projects (process performance)	Trust between contracting parties is generated by mutual management capacity and the cognition of management performance, including the completion of contracts.
	Satisfaction efficacy of the requirements for mutual values.	The level of understanding and satisfaction of the value demand of the other party (the speed of addressing risks and claims and the issuing of visa)
Social interacting behavior in management	Communication and information exchange	The extent of information exchange in project cycles
	The level of cognition mutual respect	The level of mutual cognition in the behavioral norms and cultures in project cycles.
Contracting Contract	Equal contract terms	Contracting terms recognized by both parties would generate trust
	Adopting ADR	Contracting parties adapt ADR to pursue win-win, which could cause mutual trust
	The coupling of risk allocation and revenues	The coupling of risk allocation and revenues
Market rules	The mechanism of reputation	Both parties valuing their market reputation generates trust.
	Market network regulation	The constrains to industry members of industrial non-institutional regulations
The attributes of projects	Project cycle	The longer the project cycle is, the less opportunistic behavior there will be, where trust will be generated
	Long-term cooperative relationship (cooperation experience)	Long-term, continuous and successful cooperation will generate trust.

	Organizational structure of projects	Partner model may generate trusting relationships.
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Source: Extracted from Peter S.P and S.O.Cheung (2005); Ellen Lau and Steve Rowlinson (2011) research results.

Girmscheid and Brockmann (2010) analyzed the formation principle of trust from the perspectives of economics such as transaction cost and game as well as sociological perspective of social networks. They also analyzed the psychological perspective, specifically the formation path and dynamic changing process of trust of combo contractors of international projects, (Ming-Ten Wang 2003, Yilin Yin Zhao hua Yan ling(2013)thus built a dynamic and changeable trust generation model which focused on cooperation and social interaction. Unlike research on the conceptual model of trust generation mechanism based on mathematics and statistics, their research focused on the analysis on trust generation chain from the angle of project cycles, and attentively to initial trust, dynamic trust and the changes of trust levels. Among the scholars in China, Tao Wang and Xin Gu (2010) adopted similar research logic in their research on the mechanisms of trust generation among members in the knowledge chain. Such research mostly analyzes in theory and lacks the support of statistic data. Research logics based on the trust generation chains of project cycles are shown in Figure7.

Figure 7 The formation and dynamic evolvement of trust



Source: Extracted from Girmscheid and Brockmann (2010) research results

Weiping Jiang, Qian Zhang (2011) and Yun Le (2010) analyzed the influence factors that hinder the generation and constant development of trust, which is shown in Table 10.

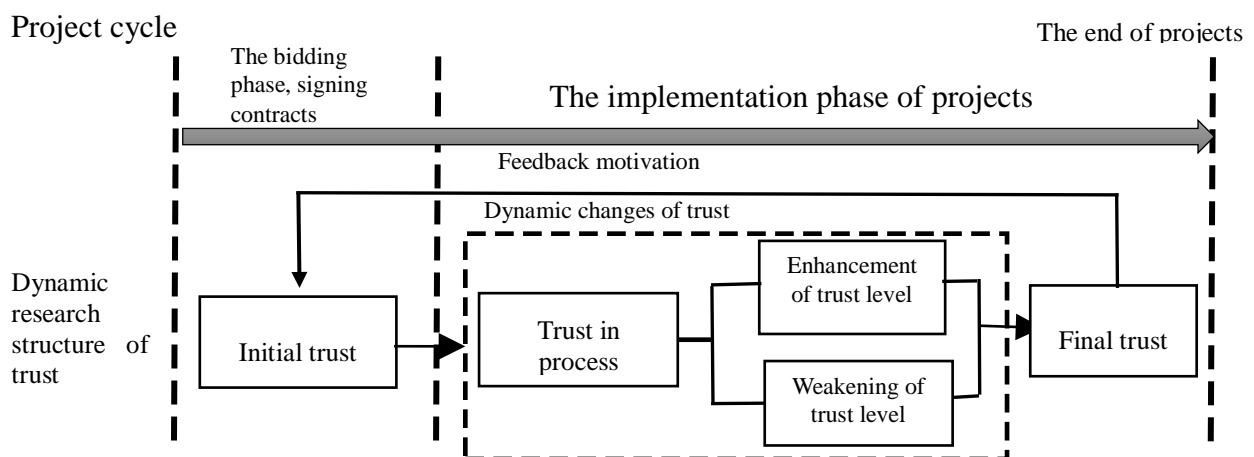
Table 10 Factors that hinder the generation of trust

Influence factors	Dynamic factors that influence	Explanation
Economic indicators	Short-term objectives	Short-term financial objectives, which lacks long-term consideration
	Competitive bidding	Low-price bidding, especially the bidding whose price is lower than cost price
Contract design	Formulation of standard contracts.	Standard contracts prompt all parties to maintain their own values, and encourage non-cooperative behavior
	Improper risk allocation	Improper allocation and mismatching liabilities

		and rights
Social interaction	Loss of control of interactive activities	Loss of control in communication without being dealt with in time
	Presenting and addressing problems	Agreement cannot be reached for emerging problems

In conclusion, the trust generation mechanisms of PPP project participants involve the generation and evolvement of initial trust. The extent of initial trust would change with the interaction of contracting parties in the phase of implementation, forming process-based trust, and eventually reach to a stable state at the end of the projects, which is the eventual trust. The generation mechanisms of project trust are shown in Figure8.

Figure 8 The generation and dynamic evolvement of trust in PPP projects



Source: Own Drawing

2.4.6 The association relationship of trust and risk allocation and the success of PPP projects

1. The relationship between trust and control within the framework of project governance

In the traditional thinking relating to project governance, trust and control are deemed governance measures to reduce the uncertainty and complexity of projects that can replace each other (Knights, 2001). In fact, the trust and control of PPP project participants is complex. Within the framework of project governance, with the rise of research on contract

governance and relationship governance, scholars generally think that trust and control complement each other, where they work in parallel for PPP project participants to cooperate. On the surface, control and trust give rise to independent governance models subjectively and objectively, but in fact control and trust are indivisible and co-exist within the framework of project governance (Faems, 2008). While, trusting relationship between PPP project participants can replace control measures like bureaucratic contract, however, as complement, it can reduce the transaction costs in advance and afterwards in the process of control measures playing their roles (Albertus, 2009). Meanwhile, the selection and effect of control mechanism will impact the trust level of PPP project participants in return. The research above analyzed the relationship between trust and control in PPP project, however the issue lies in that the discussion on trust and control in existing theory only depending on experiences and theoretical research, without considering empirical research on their endogenous decision relationship, where errors are almost inevitable. Without precise analysis on trust and control, any governance strategy aimed at using measure of trust and control evenly within the frame project governance may trapped in paradox. As an example, insufficient or excessive trust may result in parties refusing taking risks or blindly taking risks, which would hinder the success of project (Weibel, 2007 and Anvuur, 2007).

Recent research has made some progress in the empirical analysis on trust and control. Sample data have shown that trust and control in project organizations complement each other, where trust is the prerequisite for control to exert the effect. The empirical analysis made by Tuuli (2010) and other scholars, with Hong Kong as the background, showed that high trust level between PPP project participants may coerce positive behavioral interaction between the parties, including putting more energy on making plan to minimize risk instead of deciding on negligence liability and loss bearer. Therefore, under the condition that trust exists in PPP project participants, trust able to some extent replace supervision and management, high trust level improves control efficiency, and the proper control relationship between PPP project participants further lays the foundation for keeping and improving

mutual trust. Meanwhile, by analyzing Swedish questionnaires, Eriksson and Laan (2007) found that they disproportionately paid attention to formal control measures and ignored the effect of trust, and sample data showed that overly strict control measures did not have the due effect, on the contrary caused the loss of trust, where it eventually preventing the success of project. The above research made clear observation about the counteractive relationship between trust and control of PPP project participants, and their impact on the success of project, but did not make precise description about trust and control. The proportion-controlled quantitative analysis of trust and control within the framework of project governance and the establishment of fit model are the frontier and intricate problem that need to be addressed by further research.

2. The association relationship between trust and the success of project.

The development of quantitative research on trust in PPP project and trust scale laid the foundation for research on the mechanism of the success in trust improvement project. The research hypotheses established by theoretical deduction and quantitative empirical analyses revealed different reference paths between trust and the success of project (Laan, 2011). The empirical research on the success of trust-driven projects with project governance model as the intervening variable showed that the high efficiency of partnering models would not automatically appear, and trust is the key governance factor inducing it, by forming good partnering cooperative environment, where success could be achieved. As for the governance model of DBB with general applicability, under the condition that trust exists among PPP project participants, integrated management under the strategies of joint design and joint selection of contractors with the feasibility of building and construction as the hitting points are the important way to facilitate the success of the project (Eriksson and Laan, 2007) as shown in Table 11. Other than acting on the project governance model, trust can effectively activate the function of soft element, i.e., project management and project governance, conducive to the success of the project. For example, the path of how trust affecting the success of project through intervening variables such as improving the job satisfaction of PPP

project participants, facilitating the information and knowledge sharing and fermentation within the framework of project governance, and increasing the effectiveness of information exchange system have been proved by sample data (Muriithi, 2003 and Ochieng, 2010). Research results from the different perspectives above provide referential analytical logics and measures for expanding the research on success of project based on trust.

Table 11 The formation of cooperative relationship based on trust

Phase	The formation of effective cooperative relationships	The formation of trust
Phase of design	The early intervention of contractors, involving the effective acquisition of information	Trust is generated based on the exchange and acquisition level of information
Phase of bidding	Prequalification: selecting potential trustworthy bidders	Trust is formed based on market reputation
Phase of evaluation	Selecting contractors: price, techniques, management, experience, on-spot environment management, financial capacity, cooperative capacity	Capacity forms trust (especially soft power)
Selection of contractors	The joint selection of contractors and developers	Joint reflection of the preferences of contractors and developers and their mutual recognition
Phase of construction (payment and process evaluation)	The supervision of contractors is averse to the formation of cooperation consciousness.	Trust is formed by the recognition of the self-control capacity of contractors.

Source: Own Drawing

2.4.7 Conclusion and review

Conclusion can be made through the reviews of the literature which research on trust has the following three important characteristics: (1) situation-dependency: the types and formation modes of trust vary with different social environments; (2) research on trust from

the perspective of contract, where the introduction of trust enriches the variables in the research on contracts, also known as, inducements; (3) trust has the characteristics of contextual variables in the project environment, and addressing the issue of trust in PPP project organizations is conducive to explaining the internal formation mechanism of the elements influencing project management performances such as risk allocation and control. Literature review provides guidance relating to trust classification and analytical logic of trust as a situational variable for the research topic of this thesis.

2.5 Preliminary analysis on the influence of trust on risk allocation in PPP projects

2.5.1 The research pattern concerning the influence of trust on risk allocation in PPP projects

In recent years, with the deepening understanding of the nature of projects and the changing practice situations, the paradigms of research on risk allocation are also progressing and evolving, forming diversified exploratory paths. In the research field of informal systems, research on trust under the paradigm of relationship governance innovatively focuses on the formation mechanism of PRA from the perspective of PPP project participants, which is progressively drawing more academic attention. Research conducted by Zaghloul and Hartman (2003), Wong and Cheung S.O. (2005) as well as Lau.E and Rowlinson (2010) raised theories about the influence of trust on risk allocation in PPP projects respectively from the perspective of behavioral expectation and transaction cost, such as statistic and analytical results based on western PPP project samples, where proven that trust can lower the number of risk liability exemption terms of the cooperative parties. It can be said that a series of research has provided new perspective for profound understanding of proper risk allocation. However, in general, the relevant research is still at the stage of theoretical exploration, and the result have two main shortcomings: 1) on the one hand, there exist different opinions about proper risk allocation, and there are lacking a clear definition of the behavior of trust of PPP project participants, which also results in the lacking of the quantitative empirical

research of the relationship of the two; 2) on the other hand, most research focus on the influence of trust static risk allocation (one-time allocation), which according to incomplete contract theory, risk allocation in practice is mostly dynamic. Literature regarding the relationship mechanism that closely related to practice is infrequent, and there is almost no analysis on qualitative material based on interview. It is to be noted that relevant research sourced back to the governance background and sample analysis of western project, and it remain a question whether trust of PPP project participants and proper risk allocation are correlated in the cultural background of China, and how different it is from the western world.

In addition, realistic PPP projects also reflect the importance of research on trust and risk allocation. Through field research and case studies during the period of contract negotiation, PPP project participants put too much energy on the design of favorable contract terms, and under the expectancy of maintaining self-interest and opportunistic behavior, while ignoring the matching principle of risk bearing and risk tolerance, and try to transfer more risk to the other party, which compromises the reasonability of risk allocation, and may even result in the prisoners' dilemma in the early stage of project. In the phase of contract implementation, distrust between the parties may induce the consequence that unreasonable alteration and vicious claims may be adopted in face of risk disturbing factors such as price adjustment and claim, in which case dispute and conflicts impact the improvement of performance, causing the failure of the projects due to the lack of trust.

Therefore, rooted in the governance environment of PPP projects in China, this part acquires description about some core issues such as trust of participants of PPP project and proper risk allocation through semi-structured interview, which through findings will reveal the influencing mechanism of the two, and eventually establishes the influence mechanism conceptual model by sticking to theoretical level-three coding and saturation testing.

2.5.2 Analysis on the literature about the influence of trust on risk allocation in PPP projects

1. Research on the feature and initial formation of trust of PPP project participants

Research on trust mainly focused on the feature and original source of trust in PPP projects and their influencing mechanisms on the success of project, among which research on the feature and original source of trust mainly take the perspectives of the governance capacity of contracting parties, market reputation and behavioral expectancy. For example, Hong Kong scholars Wei Kei Wong and S.O.Cheung (2008) built the models of systematic trust, emotional trust and cognitive trust, of which interest distribution, effective perception in communication system and emotional investment are the key elements where SEM empirical research has proved that it is explainable in practice in Hong Kong. From the angle of practical situation such as the incompleteness of PPP projects and information asymmetry, Hartman. F (2000) built the competence-based trust model based on completed project, integrity-based trust model which maintain the interests of contracting parties, and emotion-based trust model gradually formed because of interaction approaches such as project information. As for the original source of trust, scholars like Kadefors (2004), Wong P.S.P. and Cheung S.O. (2005) connected trust with governance elements such as contract incentives and control, analyzed the trust relationships among PPP project participants, and constantly revealed the 'black box' of trust. The studies showed that in the phase of bidding and contract negotiation, the generation of initial trust depends on signal transmission of tentative trust source, to deter the opportunistic expectance formed due to information asymmetry. The effective way to identify the trust signal is the mutual evaluation of project governance competence and market reputation, which are reflected in the capacity of early designing and optimizing decision, the capacity to realize the value of project, financial capacity, the capacity to control the project as a whole along with the reliability of behavior, the integrity, the addressing of disputes and the level of harmony (the adoption of ADR). It can be found that research on trust of PPP projects has raised systematic features and formation mechanisms. Although research concerning the behavioral reflection is comparatively limited, meaning that the specific behavioral demonstrations of features such as 'integrity', 'behavioral reliability' and 'non-opportunistic expectancy' in the interaction of PPP project participants are not raised from the perspective of organizational behavior.

Feasibly, only a further detailed revelation is conducive to the formulation of operable strategies about the formation of trust relationships. Nonetheless, the existing research achievements have provided a great design direction for the semi-structured interview project.

2. Dynamic deconstruction research on risk-allocation under incomplete contract perspective.

From the perspective of incomplete contract, the risk allocation structure of PPP project was demonstrated in the prior agreement and latter adjustment or re-negotiation of contracts. Research by Carlos and Marques (2013) as well as Chiara and Kokkaew (2009) emphasized that the prior agreement and latter adjustment about risks both have positive influence upon the success of projects, and the efficiency of afterwards adjustment is largely influenced by the flexible beforehand agreement in the phase of contract negotiation. Although definition of the dynamics of PPP project risk allocation is not clear, the idea of complementing or adjusting risk allocation plan in the process of contract implementation has been acknowledged both in theory and in practice. During contract negotiation, the initial contract made through negotiation falls into the category of initial risk allocation, while in the phase of contract implementation, the re-negotiation due to price adjustment, compensation claimant or based on real situations falls into the category of dynamic adjustment of risk. Briefly, the dynamic adjustment of risk is a compensation for or adjustment to initial allocation plans, which includes two situations: the first is when initial risk allocation has been decided, but the contracts are found inappropriate for the real situation in the phase of contract implementation and need further adjustment, such as the price adjustment along with the changing commodity price; the second is about the risks that are not agreed upon in initial risk allocation but have appeared in the implementation of project, where re-negotiation is needed. Regarding the analysis of the dynamic two-phase risk allocation, features of the two phases of initial allocation, re-allocation and key elements connecting the two phases should be reflected in the model construction of the relationship that influence the trust on risk allocation.

3. Research on the relationship of trust and proper risk allocation of PPP project participants.

Trust reflects the mutual cognition of the psychological state and behavioral expectancy of PPP project participants. Naturally, it is an invisible resource embedded in the project situation, which has the function of lowering transaction cost and easing cooperation dilemma (Carolyn, 2000). Limited literature research has shown that risk allocation may be the latent hindrance to receive or employ such function. Zaghoul and Hartman (2003) are among the first scholars conducting research on the relationship of trust and risk allocation in PPP project. They started with the risk liability exemption terms and reached the conclusion from case studies that high trust level can lower the probability of improper risk allocation caused by risk exemption terms and the according risk premium of contractors. Subsequently, more relevant research is conducted. For example, case studies conducted by Girmscheid and Brockmann (2010) have shown that trust can lower the expectation for the perfection of risk allocation of PPP project participants therefore reduce the complexity in the phase of contract design. Jin and Florence (2005) conducted focus research on risk allocation in the bidding phase of project, which show that the trust relationships formed through information communication, capacity identity and value cognition can potentially prompt the contracting parties to take the balance of risk-taking and risk controllability into consideration when deciding on the risk allocation terms, conducive to the formation of proper plan.

In general, several theoretical base for the research on the influence of trust of PPP project participants on risk allocation does exist, however the research are not systematic, lacking in-depth analysis on the inner mechanism, such as the research on the connection among trust, design of risk allocation terms in the phase of contract design and risk re-allocation in the phase of contract implementation, which is the key in deconstructing the inner logic between trust and dynamic risk allocation. Meanwhile, it is conducive to enrich the research on trust and risk allocation in the management environment of PPP projects in China.

Chapter 3: Research design

3.1 The development trend of the research design of PPP projects

Research on ‘trust’, which is the core in the research field of relationship governance of PPP projects, attracting more and more attention in the academic world, due to its innovative studies on the explanation of the formation of Proper Risk Allocation (PRA) and the mechanisms of the improvement of project’s performance (Kadefors, 2007). Long-term accumulation of theoretical research provides a series of progressive hypotheses such as ‘initial trust such as capacity-based trust based on quality review and value-based trust based on market reputation is conducive to the formation of PRA’, ‘trust is a key governance factor to improve the performance of PPP projects’, and the empirical studies relating to relevant hypotheses will provide new paths to improve the performance of PPP practices. Therefore, quantitative empirical hypothesis testing is an important step in the research on trust. But difficulties exist among studies relating to situation-dependency deriving from research on trust, special semantic relationships, and concerned moral issues (such as ‘whether to profit out of the loopholes of contracts if there is no trust between the two parties’), as well as the data collection and analytical processing in research on trust featured by both organizational behavior and mental states.

Obstructions have surfaced in the research on non-technical paradigm in improving the performance of PPP projects, and the key issue lies in the reliability of data relating to core concept. Research on the construction of the security system to guarantee the reliability of data in the whole process mainly involves the following two points: the first is the design of data collection and analysis paths that are fault-tolerant; the second is the combination of analysis on integrated qualitative materials and empirical test, to realize the goal of triangle test.

3.1.1 The guarantee of the reliability of data source: the combination of qualitative materials and quantitative analysis

Increasing the credibility in the process of data collection is the development trend in the design of path for reliable data collection. To guarantee the reliability of collected data, most researchers applied certain security mechanism. First, security mechanism to guarantee the credibility of the subjects is enhanced. It is required that the subjects should be the employees whom involved in the whole process of the project, being high-level managers that are directly related to the project, including department manager and project manager. Second, the security mechanism of research methods is improved. Action is taken to guarantee the authenticity and reliability of data: on the one hand, methods for data collection are combined, and the interview and questionnaire are adopted; on the other hand, follow-up interview are conducted to verify the information provided by the subjects, as to effectively collect data. Concluding, the constraints in the process of data collection are strengthened. For example, requirements such as questionnaires being filled in on the spot, interviews being conducted separately, information collection and memos being completed simultaneously are all conducive in increasing the credibility of the collected data.

However, the management research environment in China makes it difficult to directly introduce foreign research methods. First, the credibility of the subject is a basic prerequisite in the research in developed countries and regions. Second, the subject in developed countries and regions are mostly chosen from local websites of industry associations. For example, the directory of architects in Hong Kong and Hong Kong International Arbitration Center both provide a potential list for the subjects. Therefore, methods used for research in China need further improvement, to guarantee the credibility of the collected information.

3.1.2 Systematic analysis on qualitative materials

The research path was developed from the single questionnaire method to mixed methods of qualitative material analysis. Targeted at the selection dilemma of scientific research methods—experimental research, qualitative material analysis and qualitative

analysis—Venkatesh and Susan (2013) pointed out that Mixed Methods Research is an effective approach to complete the observation and description, information collection and analysis, and it is especially feasible to mend the defects of a single method in the phases of problem posing and theory construction. Since it is difficult to measure and describe trust, mixed method research is conducive to the objectivity of data analysis, which is important to the description of trust; on the other hand, with mixed research method, triangle test to data of trust could be effectively conducted, which could guarantee its reliability. In addition, it is to be noted that trust in PPP project are situation-dependent, which is not simply the trust among individuals, but also the trust among organizations under the influence of the value chain of project and the hard constraints of contract. Individual interviews can only show the trust state of managers but cannot reflect the general trust level of participants in PPP project. Therefore, qualitative materials showing the features of organization such as case studies and contract state analysis are great significance to the complementation of features of trust among organizations.

3.1.3 Quantitative analysis based on the reliability of data

Considering the research range and subject, this research is going to adopt the methods of focus group and questionnaire and screens the respondents to guarantee the reliability of obtained data. Based on the accessed data, corresponding empirical analysis would be adopted to testify the theoretical hypothesis models.

In this research, qualitative material analysis and quantitative empirical analysis are not only the process of mutual authentication, but also the consecutive process of logic analysis. Models under selective coding based on semi-structured interviews supported by theories provide basic theoretical methods for the theoretical deduction and empirical analysis of follow-up hypothesis model, both are correlated.

It can be found through analysis on existing literature and research on trust that research on trust can adopt methods in the paradigm of sociology, psychology and economics, where methods are diversified, which are shown in Table12.

Table 12 Research methods/approaches relating to the issue of trust involving sociology, psychology and economics paradigms.

Analysis methods	Subsection	Research methods	Research design	Research tools/equipment	Referential experience	Research issues
Analysis on qualitative materials (qualitative analysis)	Experimental	Experiments in labs (“Stimulus-Organism-Response” SOR model)	Construct a one-time test system in a single environment with controlled environmental disturbance variables.	DSTIMULATOR PLUS	The moral judgment and the processing method in certain part of the brain of the respondents under specific circumstances.	Social psychology research (the reaction of the respondents towards certain stimulus)
			Conduct experiments repeatedly to see different reactions of various people to a certain matter under various conditions.	Computers, touch display screen, large public display, etc.	Screen the respondents to improve the credibility and efficiency; research on probation and contract methods)	
		Field experiments	Controlled experiment in natural environment.	Various quantitative or qualitative analytical assistant tools under the method of work diaries (such as SPSS/NVIVO)	Compare the conclusions of field experiments and lab experiments to find theoretical contributions.	Description of trust based on qualitative analysis
Non-experimental	Case studies (involving applications based on theories)	Research procedures and operation logics with information collection	Based on theoretical application,	Description of trust features of	Select and conclude key	

The Influence of Trust on Risk Allocation in Chinese PPP Projects

			and analysis as the core, to conceptualize and extract relevant information, and develop theories rooted in information. 1) level-one coding: open coding; 2) level-two coding: principal-axis coding; 3) level-three coding.	Atlas.ti or Mindjet Mind manager pro software input qualitative data, and search for relevant doings according to coding chart, and orient and quote.	qualitative analysis such as literatures and interviews	elements
Quantitative analysis	Non-model analysis	Questionnaires	Research hypothesis-scale design-data collection-analysis-conclusion	Scale design: conceptualization Data collection: lab experiments and controlling the respondents	Adopt various research tools to raise the credibility in the process of scale design and data collection	Testify the correlation level between trust and other relevant elements.
	Model analysis	Game analysis	Analysis on prisoners' dilemma: pay off matrix formed with trust and distrust	Game analysis model	The payoff matrix formed by trust and distrust	Analyze the problems in trust using the prisoners' dilemma.
		Analog simulation	Build the main model in the system and build simulation software and data process software on this basis.	Re-develop simulation software, AGENT procedure, and emulate to obtain relevant conclusions through case data.	Analyze the correlation among different variables, but the operation is difficult (the problem of data resource)	Compare the influence of different cooperation ways on the performance of production system.

Source: Own drawing

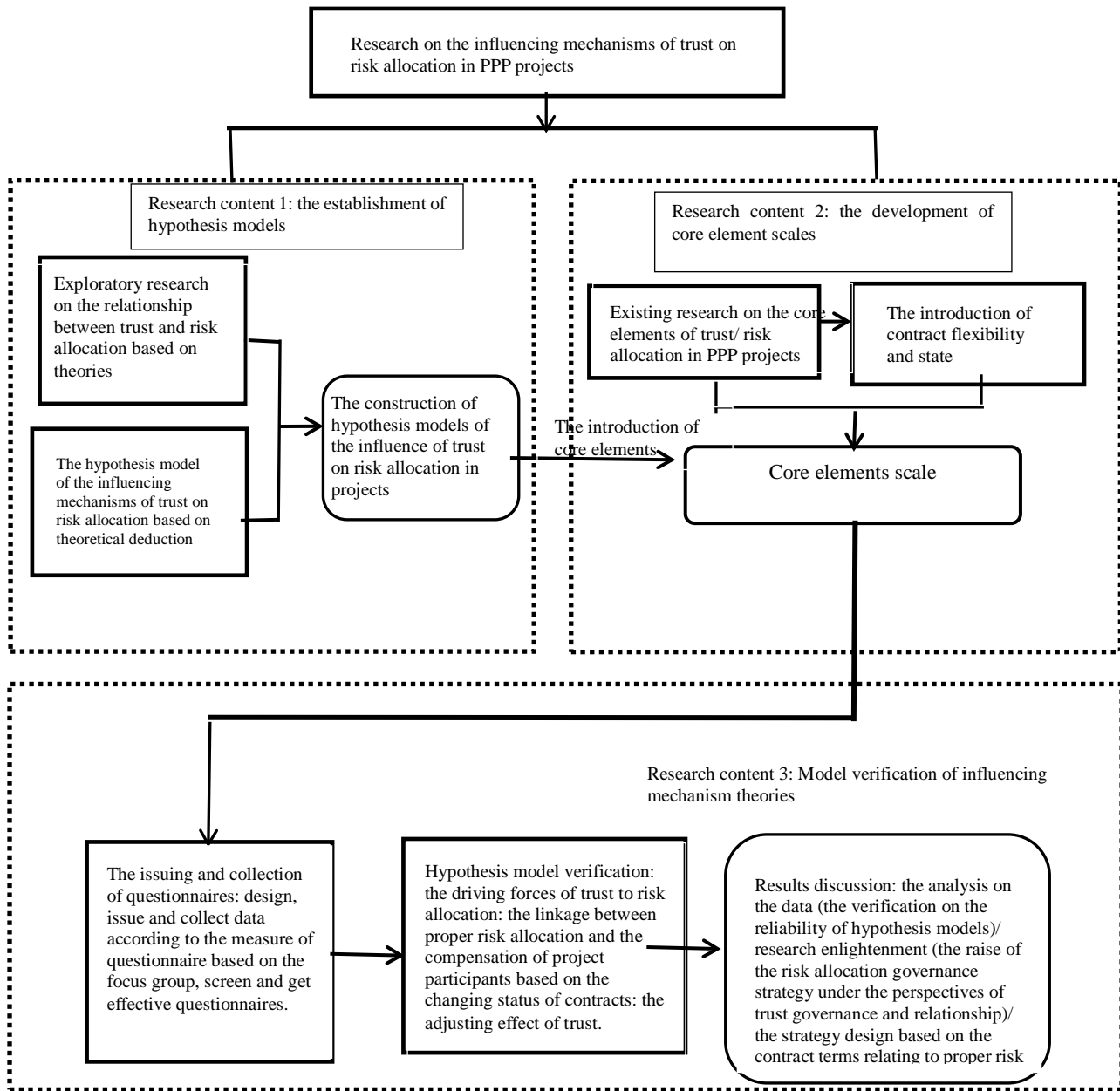
3.2 Research content and plan

3.2.1 Research content

According to the analysis on the current research, studies on the influencing mechanisms of trust on risk allocation in PPP projects can be divided into three types: the construction of hypothesis models of the influencing mechanisms of trust on risk allocation in PPP project; trust in PPP project, proper risk allocation based on contract flexibility and the development of the scale of risk re-allocation under contract state compensation; the verification of hypothesis models and analysis on the mechanism.

It is to be informed of that among the three types of research content, the first one is the basis, and the eventual mechanism hypothesis model is to be established through exploratory research rooted in theories and theoretical deduction based on literature reviews. There is certain research basis for the development of relevant element scales relating to the second research content, and this research only need to complement the elements in the existing scales through theoretical analysis, such as blending in concepts such as contract flexibility; the development of trust scale of PPP projects is already been studied in foreign literatures, and this thesis specifically going to make modification based on Chinese situation and establish more applicable scales. The logics of the research content are shown in Figure9.

Figure 9 Logic of research contents



Research content 1: The construction of the hypothesis model of the influencing mechanism of trust on risk allocation in engineering projects

Given that typical research literatures about the relationships between trust and risk allocation in relevant research fields are rather limited, this thesis firstly conduct exploratory research on the influencing mechanism of trust on risk allocation in PPP project. Besides the research topic being practical and feasible; it also points out the range and direction of the

future construction of hypothesis model based on theoretical deduction.

1) Exploratory research on the relationships between trust and risk allocation rooted in theories. It raises the semi-structured interview item of the relationships between trust and risk allocation through literature analysis and obtain qualitative materials such as the feature of trust of the participants of PPP project, features of proper risk allocation, and how trust influence the process of risk allocation through expert interview; it constructs the concept model of the relationship between trust and risk allocation using the level-three coding system rooted in theories.

2) Raising the research hypothesis based on theoretical deduction and constructing theoretical models. Based on the conclusion of the exploratory research above, the theoretical tools to analyze the key issues are determined; the hypothesis of the influencing mechanism of trust on risk allocation and theoretical models are raised using social interaction theory, reciprocity theory and incomplete contract theory.

Research content 2: The development of the scale of core elements

A scale is needed for the research on the mechanism of trust and risk allocation, to determine the measure index of all elements. This part adopts factor analysis, including exploratory factor analysis and confirmatory factor analysis. This means that it first classifies and identifies observational variables under core elements such as trust and risk allocation through theoretical analysis; then it verifies the constructs and constitutes of concept model through factor analysis, by finding out the optimal observational variables, and affirms the fitting degree, providing reference for the design of follow-up questionnaire.

Research content 3: Theoretical model verification of the influencing mechanism of trust on risk allocation

This part will adopt latent empirical research methods such as C-SEM or regression analysis for conducting empirical analysis to the hypothesis model of the influencing

mechanism of trust on risk allocation obtained through research on qualitative materials and theoretical deduction. It is to be noted that the selection of data analysis method depends on the type of hypothesis model.

3.2.2 Plan design

This thesis adopts and expands the generally recognized research methods on trust in the field of governance of PPP project, and innovatively integrates mainstream research methods such as semi-structured interview and analysis on qualitative materials rooted in theories with empirical methods. The plan is aimed to guarantee the reliability of data. Detailed technical plans are as follows:

1) Targeted at ‘the construction of the hypothesis model of the influencing mechanism of trust on risk allocation in engineering projects’, this research will take the following steps. First, it will recognize the latent incidence relationship between trust and risk allocation in engineering project through literature reviews and theoretical analysis, consequently form semi-structured interview item. Second, it will select respondents that meet the criterion of the focus group, obtain the qualitative material of senior manager of the project based on semi-structured questions. It will initiate the C iterative process to the interview materials based on semi-structured issues, introduce the software NVIVO in CCAQDAS to complete the open coding, principal-axis coding and selective coding processes of qualitative materials, and establish the concept model of the influencing relationship of trust on risk allocation; to end, it will determine the direction of literature analysis based on the concept model, and establish the hypothesis model through theoretical deduction. The design of the interview data collection and input security mechanism from the perspectives of data reliability are shown in Table13.

Table 13 The data collection process and security mechanism.

Data collection process	Data collection requirements	The reliability of the data source	The reliability of data collection	Feasible security mechanisms
The background of the collection of exploratory research data of the influencing mechanism of trust on risk allocation	The mechanism guaranteeing the comprehension of the respondents	Introduction of the research backgrounds (the influencing mechanism of trust on risk allocation)	Meet the requirements for qualitative data of the research: the respondents fully understand the interview contents and ample time for deep interviews.	Play the recording of “research background introduction”, to guarantee the conformity of the environments for various respondents
	Time guarantee	1 hour per respondent		Environment guarantee: the design of lab environment
	Environment guarantee	Quiet; without disturbance		Use recording pens to assist manual record
	The guarantee of the preciseness of documentation	100% matching of key interview contents		
Preliminary processing	The conversion ratio of voice data into text	100% conversion ratio between key reliable statements	Meet the requirements of the completeness and conciseness of the qualitative material of respondents	Data rechecked by multiple people
	The traceability of original statements	The completeness and traceability of the label-coding system based on theories		Organization of the number of respondents-the number of interview questions-the number of statements
Correcting procedure: the initial iteration and feedback of data (data check)	Membership check Cohen Kappa coefficient	Coefficient \geq 0.8, adjust according to the numbers	The semantics of the respondents can be precisely shown by the executive materials with	Independent verification conducted by two researchers
	Data feedback	Re-interview the		Feedback of

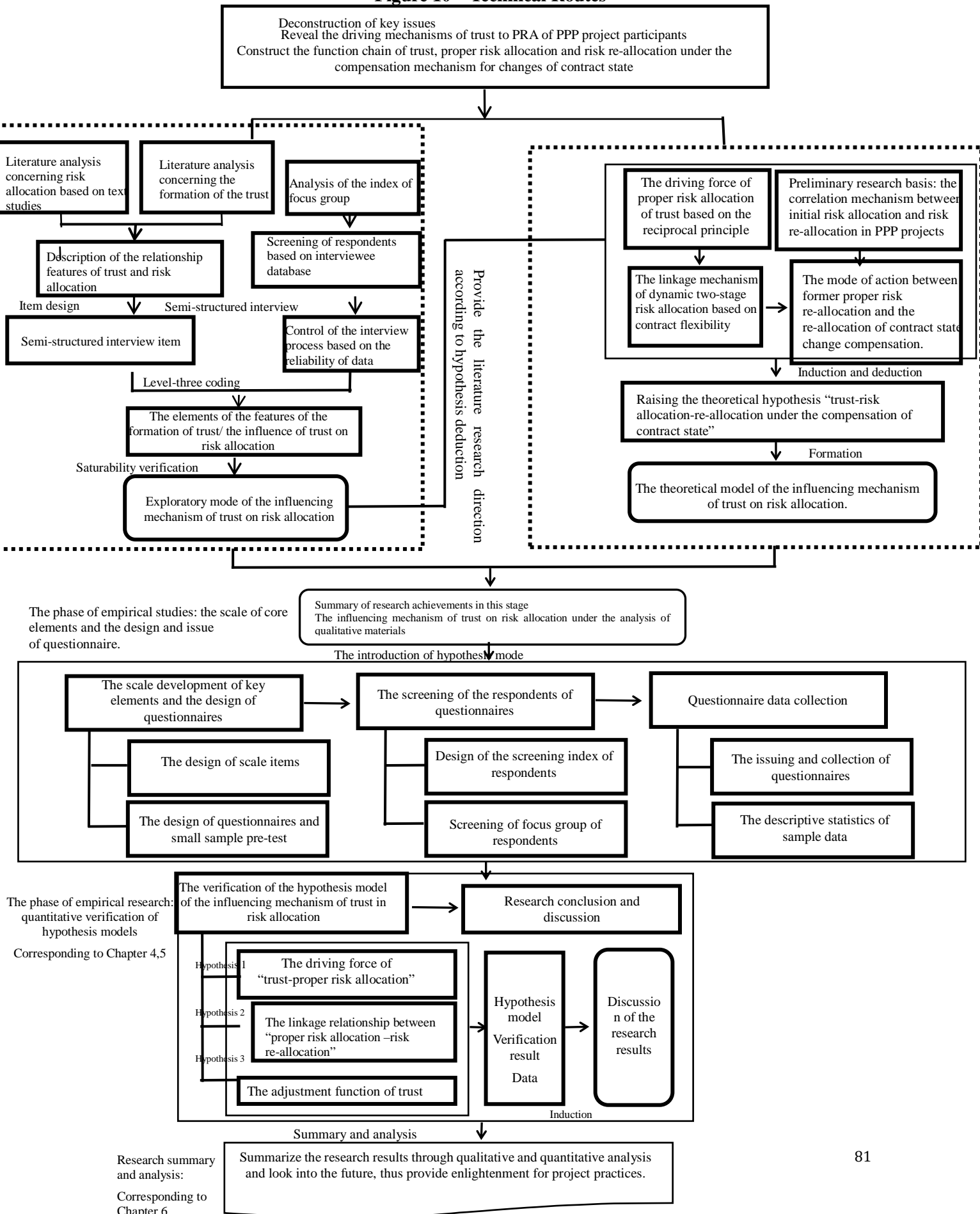
	testing	respondents to guarantee the conformity of the content	deviations rectified	qualitative materials: complete qualitative material reports based on interviews, rectified by the respondents
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2) Targeted at ‘the development of core element scales’, this part firstly discerns the core measurement elements of trust and risk allocation by reviewing literatures and analyzing theories and establishes measurement scales with clear descriptions through scale development procedures such as item constructs and small-scale multiple pretests. Finally, it conducted empirical tests using exploratory factor analysis and confirmatory factor analysis based on the methods of questionnaire and data collection.

3) Targeted at ‘the verification of the theoretical model of the influencing mechanisms of trust on risk allocation’, this part conducts model verification based on empirical analysis such as C SEM and adjusts multiple regressions according to the types of hypothesis models. To meet the requirements of the quantity and quality of data, the author, a researcher must be in the field of PPP project governance for a long time, uses practical case materials that have been stored for a long time, and maintain continuous communication with key participants of the cases, which could guarantee the adequacy and typicality of the data.

3.3 Technical routes

Figure 10 Technical Routes



Chapter 4: Construction of the conceptual model and Research

hypothesis

4.1 Analysis on the influencing relationship between trust and risk allocation based on semi-structured interviews

4.1.1 Semi-structured interview levels and topic design with the situation simulated level by level

According to the literature review, the focus of this thesis lies in: (1) analyses of feature elements of the formation of trust of PPP project participants; (2) the dynamic characteristic structures and proper representations of risk allocation of PPP project from the perspective of incomplete contracts; (3) the mechanisms and paths of the influence of trust on risk allocation. The research will construct the conceptual model with methods rooted in theories, and collect qualitative materials using the method of semi-structured interviews. The initial interview outline was formed by four sets of broad open items, and gradually brought the interviewees to the core issues by “simulating the situation” level by level. The design of the semi-structured interview and questions with the situation simulated is shown in Table 14. In the process of real interviews, it can be found that by comparing the collected data, the interviewees have repeatedly mentioned that adjustment mechanisms of risk allocation such as price adjustment and claims are also influenced by the relationships of the parties in the process of contract implementation. Therefore, item 5 was added in the interview later in the process: in the process of contract implementing, how is trust of PPP project participants influencing the process of risk re-allocation? After the interview, there is no new related questions were found by analyzing the qualitative materials, which means that the item has reached a state of saturation.

Table 14 The ‘situation-simulated semi-structured interview’ and question design

Design levels	Description of interview questions	Purpose of level design	Acquisition of qualitative materials
Level1: situation simulation	Introduction of research backgrounds: question 1) Based on your experience in a successful PPP project, do you think the risk allocation plan in the contract reasonable? What important characteristics do you think proper risk allocation terms should have?	In the phase of simulating the situation, it helps the interviewees understand the background of interview questions, so that the questions to acquire qualitative materials are more targeted.	It is aimed to acquire the key evaluation criteria of proper risk allocation in PPP projects.
Level 2: the introduction of core interview questions	Question 2): Do you think risk allocation terms in the contracts and the risk allocation incidents in contract implementation (such as negotiations concerning the risks that have not been agreed upon) are connected? If so, how are they connected?	It aims to help the interviewees understand the theoretical analysis to the dynamic process of risk allocation, and expose them to deep instructions about risk allocation without limiting their thinking	It is aimed to get the relationships between all incidents about risk allocation in all phases of the projects, and to analyze the dynamic characteristics.
	Question 3): What elements do you think will influence the terms about risk allocation between PPP project participants? If trusting relationship is an important	It is aimed to introduce the interviewees to the topic of “the influencing relationship between trust and risk allocation “based on the periodical	It is aimed to acquire the relationship governance elements which may influence the proper risk allocation plans of PPP project participants.

	element, how do you think this relationship is formed?	materials acquired by questions 1) and 2).	
Level 3: in-depth descriptions	Question4): Is the influence of trusting relationships on proper risk allocation plans positive or negative? For example, is trusting relationships strengthening or lowering the pursuit for proper risk allocation terms?	It is aimed to guide the interviewees to explain the relationships between trust and risk allocation they mention, targeted at the interview records of periodical key sentences.	It is aimed to acquire the influence point and influence outcome of trust, the relationship element on the formation of proper risk allocation plans.

4.1.2 Samples and theoretical sampling

The samples come from 15 PPP projects involving cities such as Beijing, Guangzhou and Shenzhen. The semi-structured interviews in this research were mainly conducted face to face during field investigation. To guarantee the reliability of the description of qualitative materials to the real situations of the cases, this research selected 60 interviewees from 15 cases, with 2 people from each of the two contracting parties of the 15 cases. The screening of the interviewees was based on the indicators of focus group, which is shown in Table15. The beforehand sample selection, semi-structured interviews and preliminary organization of qualitative materials took a year. To increase the reliability of interview data, the interviewees in this research are mainly senior managers with decision-making power over the plan of cooperation situations and risk allocation in PPP projects. Moreover, the screened interviewees are all highly educated or have rich learning experience in PPP projects; hence they can understand the questions accurately after background introduction. To conduct saturation tests to the theoretical model, this research divided the 60 interviewees from 15

cases into two groups: 40 interviews in 10 cases are in the group of model construction, and the rest 20 interviewees are in the group of saturation test.

Table 15 The screening indicators of interviewees based on focus groups

Reliability indicators	The criteria of data source	Notes
The type of department	Public departments, large enterprises and the third-party departments	The projects shall not be too small. The interference of variations shall be eliminated. The qualitative materials shall be authentic, and the trust of senior managers shall have more influence over decisions concerning risk allocation. It shall be divided into even levels.
The type of projects	Education, medical services, infrastructures, etc.	
Contract design of projects	Random	
Time of participating in the project	2-3 years	
Phase of participating in the project	Random	
Position	Senior managers (with certain decision-making powers)	
Time of managing the project	5-10 years	
Industry reputation	Good market reputation. Interviewees on the list of all senior engineers or consulting experts preferred.	
Education background or learning experience	With graduate degree. Among candidates with the same level of graduate degrees, those with theoretical research experiences preferred.	
Quantity of interviewees	60 interviewees, evenly from private and public sectors.	

4.2 Construction of the conceptual model of the influencing relationship between trust and risk allocation of PPP projects

4.2.1 Analysis on qualitative materials in the circumstance of open coding

The purpose for this part of research is to reveal and construct the mechanism of action and conceptual models of trust and proper risk allocation of PPP project participants. To focus on the research topic and to trace the source of materials with, this thesis excerpts and

preliminarily analyzes the interview contents in sequence of ‘the serial number of interviewees - the serial number of interview questions-the serial number of sentences’, and multiply organization and extracts the contents of open coding, using the code analysis methods and iterative process with NVIVO by Hutchisona and Halley (2010) for reference. The researchers acquired 20 frequently appearing initial coding, among which under the concept membership test (Cohen Kapa analysis) ‘the tendency and discrimination of risk allocation’, with its K index lower than 0.7, is eliminated, while the other concepts, whose K indexes are higher than 0.8, become part of the eventual open coding, which is shown in Table 16. Only part of the original interview content is shown in the chart for convenience viewing.

Table 16 Open coding and concept description

Serial number	Main category	Concept description	Part of interview content
1	Perception of the existence of proper risk allocation	According to most interviewees, the proper risk allocation in projects exist throughout the whole process of the project; initial contract terms and adjustments in the contract implementation phase both influence the recognition of project participants on risk allocation; especially when the cooperators lay importance on the possibility of future adjustments.	Risk allocation always exists: question design, wrong plans, workload deviation, and price adjustment all involve risks; cooperators are more concerned with the proper compensation when accidents occur.
2	Trust behavioral incident	Trust is difficult to describe, and is usually stable in a short term; as for demands, trust also means that one party is considered not to utilize “loopholes” of the other party to gain profits; for cooperators, trust means that the other party would make reasonable	The level of trust between us and the cooperators is hard to say. Perhaps some incidents would cause distrust. If the other party does not take advantage of my mistakes and tells me about it, I would trust them more. Such positive

		<p>payments in time, and make objective and proper compensation when the project situations change, rather than make decisions based on the presumption of opportunistic behaviors of the other party; Also, active cooperation in the process of project management is also a potential manifestation of trust. 5)</p>	<p>cooperation can be felt in the process of cooperation, for example, the other party would tell us about the situations we have no knowledge about.</p>
3	Competence	<p>\Most interviewees say that the management competence, technical skills, qualification, financial status and project performance of the participants passing the prequalification are trustworthy.</p>	<p>Under many circumstances, large enterprises such as central enterprises are the first choice because of their management abilities, technical skills, capitals and market reputation. There are many good former cooperation experiences, and if there are difficulties with the projects, the projects of the same type are more valued.</p>
4	Relationship	<p>Former pleasant cooperation experience brings the knowledge to both parties: good market reputation brings trust, which may influence risk allocation.</p>	
5	Unbiasedness and prejudice in risk management	<p>In the designing process of risk allocation terms, even the cooperators pass the prequalification, they are usually thought to be untrustworthy, and are made to take more risks, giving advantages in contract disputes.</p>	<p>Former unpleasant cooperation experiences give us the impression that some cooperators are too picky and unreliable, and intentionally transfer more risks to us.</p>
6	The comprehensiveness of risk allocation	<p>The comprehensiveness is reflected in the comprehensive allocation of risks within project circles. In the comparison of trust, some terms, especially those of more uncertain projects, are not</p>	<p>Review over the comprehensiveness of the risk allocation terms, to decide if all the contents are included. In some urgent circumstance when the two parties have</p>

		<p>detailed enough, which at the same time raise the standards to addressing uncertain risks in the future.</p>	<p>cooperated before, contracts may be ignored. Evidently agreements are still important to avoid disputes in the future, which are more important.</p>
7	<p>The amount of details in risk allocation.</p>	<p>Contract terms decide the basic scales of the future negotiation of risk re-allocation; more detailed contract terms concerning who to bear risks may reduce the disputes about risk allocation and narrow down the negotiation scope in the phases of contract implementation. Of course, the premise is that no major changes happen to the projects.</p>	<p>The range of price adjustment and ratio in the fluctuation of commodity prices is a focus. Sometimes the comprehensiveness of the list needs double-checks, so the standard of preciseness is high. But if we fail to find out the loopholes, the responsibility when things go wrong falls on our shoulders.</p>
8	<p>Understanding of the consistency of risks</p>	<p>The understandings of the risk allocation between the cooperators are consistent. When the parties reach agreement, it is unlikely that inner disagreements still exist.</p>	<p>Disagreements may be due to people's different understandings to the terms and topics in issue, such as the decision on measure projects and measure fees. According to the contract, "no adjustments shall be made without changes in commodity prices". Prices may remain the same at the beginning if the prices of gas and electricity go higher when the project is implemented, but the cooperators think that gas and electricity prices are decided by the</p>

			government, so adjustments should be made.
9	The procedures to manage risk disputes	Cooperators usually resort to mediation instead of pressing charges to lower the costs.	There are disagreements between the description and the regulations of the characteristics of bill of quantity. The disputes are eventually resolved through negotiation.
10	The matching between the risk bearing and the ability to take risks.	The level of risks taken shall be matched with their abilities to take risks. Bearing too many risks may harm the implementation of projects, so risks should be properly allocated at the beginning.	Bearing part of the risks that should not be taken, with governance abilities inadequate or out of control.
11	The adjustability of risk allocation	Risk allocation terms make it possible to adjust when project situations change, to deal with the future uncertainty, and to leave space to both parties.	For complex projects, proper and flexible terms shall be made. Sometimes necessary adjustments cannot be made due to the inflexibility of contract terms.
12	Design of re-negotiation mechanisms	The contract terms pre-stipulate the operation mechanisms in the future risk allocation recognized by all parties.	Just and fair procedures shall be made in advance for the uncertainties in the phase of implementation, to prevent future disputes, and to provide contractual basis for unresolved issues.
13	The number of re-negotiations	In the initial stage of the project, it is impossible to predict all the changes in the future, but the mutual relationship is good, therefore, the terms we made are flexible, but more re-negotiations on risk management in the contract implementation period are set.	In the implementation of projects, some unpredicted risks may occur. At the beginning there are no targeted explanations, where new plans should be made.

14	Time limit for the projects; the adjustment range of prices.	There are several negotiations in the phase of contract implementation, contracting others trust each other, and the price adjustment is obvious.	If there is tension between the contracting parties, the bargaining process would not be very smooth. In real situations, the adjustment range of project time limit and price is flexible, related to their relationship, where good relationship makes it more flexible.
15	Information sharing in the process of adjustment	。 In the negotiation of risk re-allocation, active communication about risk elements and the resolution approaches is conducive to making proper risk management plans; reasonable suggestions(such as optimizing plans) from both parties all have positive influence on risk allocation responding strategy.	Most cooperators would choose the materials or equipment with higher unit price or new technologies when any changes occur, where the profits are likely to increase. Discreet investigates shall be made to guarantee the changes would indeed benefit the projects.
16	The recognition and implementation of the plans of both parties	In a good relationship, contracting parties would accept and acknowledge the outcomes of risk re-allocation, and positively take the risks. Without actions to evade, the efficiency to deal with risks would be higher.	When changes occur, there is no protocol to refer to. With mutual trust, the recognized price plans would be quickly resumed.
17	The emotional investment	The influence of emotional investment to risk allocation: proper social events and communications raise all parties' enthusiasm to cooperate, thus eliminate resentment among them.	Enhance relationships by private communication. Organize social events and visit activities.
18	Lower the complexity of risk allocation decisions	Limit the influence of complexity to risk allocation: have some knowledge of the	We have cooperated with this company before, and think it is pretty good. We

		<p>other party's actions in the past projects and lower the completeness of risk allocation terms in the initial contracts, otherwise the initial costs are too high.</p>	<p>simulate lists and refer to a similar project when making the contract terms, so it is reasonably quick.</p>
19	Cognitive internal friction	<p>A lack of cognition, not sharing risk information and shuffling risk allocation incidents in the process of contract implementation may cause mediation or even charges. Contracting parties with cooperation experiences may reduce the possibility of the problems above and have more cooperation intensions.</p>	<p>First-time cooperation may not be very smooth: disputes may occur, and little problems occurring in things like co-organizing reports may result in bigger issues, affecting changes later.</p>
20	Invisible conflict	<p>Contracting parties want to make the contract terms strict to guarantee their own interests, but instead of raising objections in when making the contracts; they resort to alteration, claims for compensation or even loopholes to make remedies. Faced with risk allocation incidents such as alteration and claims, deliberate delay results in conflicts.</p>	<p>We must take opportunities to earn money, so we must make the contracts strict. Good cooperative relationships should be built between the parties. They should strengthen communication, and should not hinder the other party's jobs, claim for compensation in bad faith, or delay processing claims in bad faith. Sometimes the parties in a bad relationship are suspicious and jealous of each other. They may appear to work in harmony, but the efficiency is low.</p>

4.2.2 Analysis on qualitative materials under axial coding

To acquire more abstract conceptualized coding, this research conducted axial coding based on open coding in acquiring additional general materials. Eight corresponding categories under axial coding after iterative analysis on “trust behavior (appearance), the dynamic development of risk allocation (veins) and the relationship between trust and risk allocation (causality condition)” surrounding semantic relationship (for example, risk allocation “the completeness of risk allocation” and “understanding of the consistency of risk allocation “in open coding may form the fundamental category of the completeness of risk allocation) and process-structure relationship (for example, ‘information sharing” and “invisible conflict’ are the fundamental category of the influence of trust on risk allocation efficiency and effectiveness) are shown in Table 17.

Table 17 The fundamental and definition of axial coding

Serial number	Fundamental category	Definition
1	The perception of proper risk allocation	Proper risk allocation runs throughout initial risk allocation in the phase of contract design and risk re-allocation in the phase of contract implementation. The two dynamic phases are co-related, where initial risk allocation influences the efficiency and effectiveness of risk re-allocation. In the meantime, the level of completeness is influenced by complexity and uncertainty. (Classify fundamental categories “1, 6, 7, 8, 9, 10, 12” in the open coding).
2	The formation of trust	The following characteristics are conducive to trust among project participants: passing the pre-qualification, strong abilities, good qualification, and good market reputation in relevant sub-markets; former cooperation experience is also an important element; information sharing and not using the loopholes in risk allocation terms are also the manifestation of trust behaviors. (classify fundamental categories ‘2, 3, 4, 15, 16, 17’ in the open coding)
3	The completeness of risk allocation	Risk allocation is a dynamic process. Making comprehensive risk lists at early stage, dispute processing procedures, detailed risk allocation plans and getting both parties on the same page are the detailed tasks to improve the completeness of contracts, which have direct influence on the reliability, processing range and scale of risk allocation in the

		contract implementation phase. (classify fundamental categories ‘‘6, 7, 8’ in the open coding)
4	The level of support in risk allocation	In the interview, the interviewees say that when making risk allocation contract, the contracting parties shall try to clarify the operation procedures about the protocol of unpredictable risks in contract implementation, including the adjustability of risk allocation and risks in negotiation mechanisms. (classify fundamental categories ‘9, 11, 12’ in the open coding)
5	The scale of risk allocation	The times of adjustment to risk allocation and costs in the implementation of contracts are related to mutual relationship situations. In good relationships, the terms may not be detailed due to many reasons, so there may be many afterwards risk adjustments. Due to trust, the cooperators are likely to provide some compensation (classify fundamental categories ‘13, 14’ in the open coding)
6	The efficiency of risk allocation	In the process of contract implementation, how the two parties deal with risks came to agreement and adjustments to risk allocation are operable, such as the matching between the abilities of interviewees and risk bearing, and the parties’ information sharing level is also a key element of containing efficiency. To evade from risks, information is likely to be hidden. (classify fundamental categories ‘15, 16’ in the open coding)
7	Positive influence of trust on risk allocation	Trust has the function to potentially lower transaction costs in risk allocation, thus improve the afterwards supports of risk allocation and improve afterwards efficiency through information sharing and emotional investment. (classify fundamental categories ‘17, 18’ in the open coding)
8	Negative influence of trust on risk allocation	Trust, when increasing the flexibility, may compromise the completeness, and increase the range, times and scale of risk allocation in the phase of contract implementation, and to some extent, decrease the positive influence of trust on risk allocation. Cognitive internal friction and invisible conflict are the manifestations. (classify fundamental categories ‘19, 20’ in the open coding)

The cluster analysis on the latent logics and relationships among the eight corresponding categories of the axial coding sheds light on four types of relationship: the first relationship type is ‘the status description of proper risk allocation’, with ‘two-phase dynamic risk allocation’, ‘the completeness of risk allocation’, ‘the level of afterwards support’, ‘the scale

of risk allocation’ and ‘the efficiency of risk allocation’ as the subcategories, where ‘the completeness of risk allocation’ and ‘the level of afterwards support’ belong to initial risk allocation, and ‘the scale of risk allocation’ and ‘the efficiency of risk allocation’ belong to risk re-allocation; the second relationship type is ‘the exploitation of latent trust behavior’, formed by ‘the behavioral manifestation in the generation of trust’; the third and fourth types are “the influence of trust on initial risk allocation” and ‘the influence of trust on risk re-allocation’, which came from software processing of the complete ‘story line—evidence chain’, which is formed by qualitative materials like ‘the positive influence of trust on risk allocation’, ‘the negative influence of trust on risk allocation’ and recognized ‘status description proper risk allocation’. The four types of relationships are shown in Table 18.

Table 18 Relationship types under main categories based on axial coding

Serial number	Relationship type	Description of the characteristics of the relationship of the elements	Explanation of the connotation of relationships
1	Status description of proper risk allocation	Elements such as the completeness and afterwards support mechanisms are the status testing criteria under initial risk allocation; the two phases of dynamic risk allocation support systematic relationships in the initial allocation; in the meanwhile, risk allocation status is influenced by the characteristics of projects.	In PPP practices, the status of contract risk allocation is measured by the initial completeness, level of afterwards support, and the effectiveness and scale when dealing with risk allocation incidents in the implementation of contract. The characteristics of incomplete contracts of PPP project contracts are the theoretical basis of the two dynamic phases of risk allocation, which can be classified as initial risk allocation and risk re-allocation.
2	Exploitation of latent trust behavior	Trust originates in capacity drive based on pre-qualification, cognition drive based on cooperation experiences, and value drive based on market reputation, and is manifested through behavioral incidents	In PPP project situations, the trust of PPP project participants is always latent and hard to measure, which may only be manifested by specific behavior. Behavior of distrust in the process of risk allocation including using “loopholes”, cognitive internal

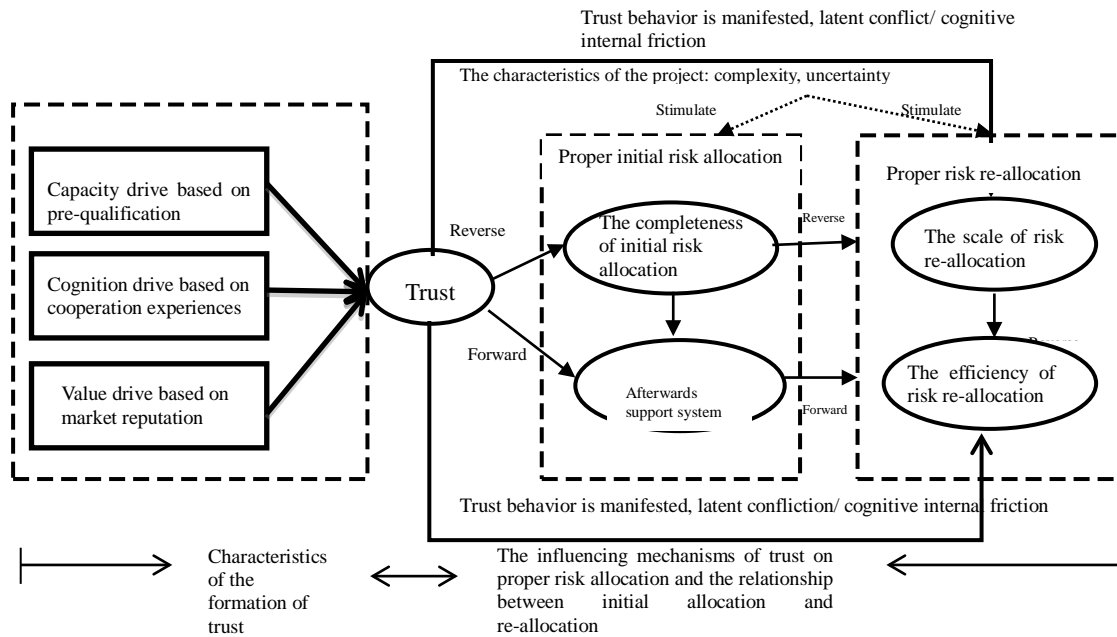
		including proper risk allocation, not using loopholes, information sharing and cooperation.	friction and latent conflict can all be manifested beforehand, especially in risk allocation incidents.
3	The influence of trust on initial risk allocation	Trust has negative effect on the completeness of risk allocation; trust has positive influence on the afterwards support level of risk allocation; new member slower the lower the complexity of risk allocation and reduce the beforehand costs.	Latent trust is strengthened and manifested in the phase of contract implementation through elements like pre-qualification and market reputation, which may influence their attitudes towards contracts. In the situation of Chinese PPP projects, the terms of initial risk allocation are made by the other parties, so high level of trust may facilitate more flexible afterwards support systems of risk allocation incidents and may also lower the demand for the completeness of risk allocation, which may reduce the complexity of decisions concerning initial risk allocation.
4	The influence of trust on risk re-allocation	Trust has positive influence on the scale of risk re-allocation; trust can improve the efficiency of risk allocation.	Latent trust is manifested through information sharing, inter-organizational emotional investment and evasion of latent conflicts in the phase of contract implementation, which lowers their expectancy for opportunistic behavior, improves the efficiency of dealing with risk allocation incidents, but to some extent may expand the scale of risk re-allocation.

4.2.3 Analysis and saturation test on qualitative material using selective coding

This research is aimed to present the influencing mechanisms of trust of PPP project participants on risk allocation in the situation of PPP project management. It firstly deconstructs dynamically the status elements formed by proper risk allocation, then manifests the characteristics of trust that are hard to describe through project management behavior, and discusses the influencing paths and approaches of trust to proper risk allocation, which is

shown in Figure 11.

Figure 11 Theoretical models of the influencing mechanisms of trust on proper risk allocation



The relationship between the core elements is as follows: 1) The initial trust of PPP project participants comes from capacity drive based on pre-qualification, cognition drive based on cooperation experience, and value drive based on market reputation; 2) The dynamic characteristics of risk allocation are manifested in initial risk allocation in the phase of contract design and risk re-allocation in the phase of contract implementation. With afterwards support systems, the two phases have apparent relationship of complementation and lineage; 3) On the level of influencing relationships, trust has negative influence on the completeness of initial risk allocation, where it has positive influence on the scale of risk re-allocation and efficiency; 4) latent conflict and cognitive internal friction are the manifestations of distrust, which has deep influence on risk re-allocation.

To test the saturation level of theoretical models, the researchers conducted level-3 coding based on theories for the qualitative material data for the remaining 20 interviewees, which showed that there are no new categories in relationship types. Therefore, the research deems the theoretical model saturated.

4.3 Hypothesis of how trust based on reciprocity theory drives proper risk allocation

4.3.1 Analysis on the characteristics of PPP risk allocation from the perspective of reciprocal trade

1. Analysis on the reciprocity in the market of incomplete contracts: from the perspective of cooperation

According to Fehr, F (2002), a distinguished scholar in the research field of reciprocity from the perspective of sociology, reciprocal behavior exists broadly in social and economic activities, where reciprocity can not only prompt the inter-organizational actions to have consistent goals, but also is a kind of excitation source itself, which could improve the efficiency of cooperation. Targeted at competitive markets with incomplete contracts, Fehr and Schmidt (1999) define cooperative reciprocity as ‘positive reciprocity’, and retaliatory reciprocity as ‘negative reciprocity’. In a competitive market with incomplete contracts, reciprocal members are leading the overall results. In fact, the efficacy shown in the actions prompting cooperation and acting out of social norms is perhaps one of the most important outcomes of reciprocity. This train of thought showed the other important meaning of reciprocity: the details in institutional environments, the existence of incomplete contracts, or the existence of the opportunities of individual penalties with costs, make reciprocal exchanges significant in prompting organizations to make contracts in social economical activities. In fact, this is consistent with the research conducted by Rabin (1993). His research stressed the idea that the adoption of reciprocal contracts based on the fairness of intension might motivate agents, which is conducive to the improvement of the efficiency of principal-agent cooperation.

The subsequent research conducted by Fehr.F (2002) found out that contract incentives out of the expectancy for opportunistic behavior do not work so well to prompt cooperation between contracting parties with potential reciprocal motivations. This shows that to generate real cooperative reciprocal behavior from the parties with potential reciprocal motivations, actions shall be taken to restrain opportunistic expectancy before transactions, where trust is

an important approach. Earlier research conducted by Whitener E M and Brodt S E from (1998) from the perspective of trust and social exchange and interaction showed that the trustworthiness of one party is a necessary condition instead of an insufficient condition for the other party to generate trust and reciprocity.

To prompt reciprocal cooperation, crowd-out effect shall be restrained in the design of systems. According to Fehr and Ernst (2000), to restrain moral hazard behavior of agents, high controlling contract may crowd out potential cooperation, resulting in crowd-out effect. From the angle of 'crowd-out', Xiaoyi Li and Jianbiao Li (2009) discussed the relationship among reciprocity, trust and management efficiency, thinking that the demand for reciprocal transaction from organizations or individuals and the characteristics of trust are important part of social preference, which have positive influence on the improvement of complementary management structure based on social preference to management efficiency, while the crowd-out of reciprocal social preference due to improper design is bad for the improvement of performances.

In conclusion, the need for reciprocity is deemed an important measurement element to stimulate organizations to act positively, and the research paradigm to generate reciprocal behavior has been gradually shifted from pure physical incentives to non-physical incentives, where the transmission of trust is an important approach.

2. The association among reciprocity, cooperation and performance

In research relating to the association among organizational behavior, reciprocity and performances, Difang Wan and Jinhui Luo (2009 27) used sequential two-phase reciprocal game model and analyzed the associations between the trustworthy behavior of individuals and their devotion to work, from the perspective of material benefits and reciprocal psychological benefits. The underlying hypothesis is that trustworthy behavior can generate balanced reciprocity that is mutually beneficial, which has positive influence on the two parties' devotion to work. After that, they strengthened the association in theory between trustworthy behavior and performances with reciprocity and discussed the influencing

mechanisms of trustworthy behavior of managers on employees with different reciprocity tendencies and performances (Difang Wan and Jinhui Luo, 2009 22). With analytical methods of grouping experimental economics; the research shows that trustworthy behavior of individuals has stronger incentives to employees with reciprocal tendencies. Their research potentially shows that only under the premise of the perception of reciprocal tendencies and reciprocal psychological profit, can trustworthy behaviors generated by trust have prominent incentive effect. Based on a large amount of research, Shuangyan Li and Difang Wan (2009) developed a reciprocity scale targeted at Chinese culture, which includes three types of reciprocity, i.e., generalized reciprocity, balanced reciprocity and negative reciprocity, and concluded that reciprocity and job satisfaction are positively related through empirical analysis. It would harm the satisfaction level to work to only focus on self-interest and does not give other parties their fair returns.

Based on sequential reciprocal model, Yongjian Pu and Wei Shi (2013) analyzed the influence of reciprocal management on the performances of employees from the perspective of interest conflict. The research showed that the benefits of principals under certain level of reciprocal behaviors are larger than those in rational conditions, which can partly replace rigid contracts. Then they made further research and analyzed the incentive effect generated by reciprocity preferences of all economic activity participants in situations with different information. The research showed that under the condition with complete information, where agents have enough reciprocity preferences, the principals would give up mandatory or rigid contracts and endow the agents with more space to make decisions, which is conducive to the improvement of cooperation efficiency (Wei Shi and Yongjian Pu, 2013). Based on the analysis from the perspective of relationship, they also concluded that negative reciprocal behaviors would not only result in ineffective and uncooperative results, but also aggravate conflicts. Traditionally, judicial measures are usually taken to manage crisis, but they pointed out from the perspective of third-party behavior that effective and objective third parties are an operable way to reduce negative reciprocal behaviors. (Wei Shi and Yongjian Pu, 2012).

All the research mentioned shows that in the market of incomplete contracts, reciprocal mechanisms between the contracting parties shall be strengthened, and the manifestation of visual reciprocal behaviors are important tactics to promote sustainable cooperation between market and organization.

3. Description of the reciprocal characteristics of risk allocation of PPP projects

In PPP projects, the initial trust of participants is conducive to positive reciprocal social exchanges among cooperators. Under the natural condition of incomplete PPP project contracts, the adoption of proper risk allocation plans of PPP participants is an important basis for cooperative reciprocity. Compensating contract state changes by way of flexible infusion is an effective way to stimulate partners to accept and carry out positive reciprocal exchanges, which is also an effective way to generate management cooperation. To be more specific, in the phase of contract design, the risk allocation terms designed by the dominant party of PPP does not have characteristics of prompt reciprocity, and profits mainly flow to the dominant party. Non-opportunistic behavioral expectancy that has been lowered due to the initial trust of the PPP dominant party makes them open to balanced reciprocity in seek of proper risk allocation plans. In other words, they are willing to infuse contract flexibility mechanisms to compensate for the potential losses in the phase of contract implementation by the other party and make characteristics of reciprocity and promptness manifested in risk allocation terms by pre-making state compensation tactics, which could eventually lead to the formation of reciprocal social exchanges within a project cycle.

Based on the dynamic characteristic of the reciprocity level of PPP participants, social exchanges in risk allocation of PPP projects gradually extended from economic exchanges focusing on risk allocation to social exchanges. Meanwhile, competition paradigm turned into cooperation paradigm, and the state of ‘giving a plum in return for a peach’ is formed between the contracting parties in a harmonious atmosphere.

4.3.2 The hypothesis of the driving influence of trust on proper risk allocation

1. The association between trust and management performance between PPP project participants.

It has been proved on different theoretical levels that trust can constantly improve management performances. In early studies, targeted at the management model of project partners, Wong P.S.P. and Cheung (2005) analyzed the trust issue in infrastructure PPP projects in Hong Kong. Statistics show that capacity-based trust relating to non-opportunistic expectancy terms is conducive to maintaining stable partnership relationships, where it has positive influence on project management performances. As for the universally applicable Design-Bidding-Building (DBB) management model, research conducted by Eriksson and Laan (2007) shows that on condition that there is trust between contractors and developers, integrated management with united design and united selection of sub-contractors as the core is an effective way to make the projects successful.

Beyond project management models, trust can also improve the performances in its influence on core elements such as project management and project governance. Diallo and Denis (2005) analyzed the organizational coordination issues between donor countries and host countries in African international loan projects, hence concluded that trust among the organizations could compensate their divergence in management culture and knowledge. Studies carried out by J.K.Pinto, Dennis.P.S (2009). Wasan and Chotchai (2009) also show that trust could increase the satisfaction level of partners to work, conducive to information sharing and fermenting relating to the project.

2. Perturbation analysis on the rational distribution of trust to risk allocation in PPP projects

In PPP management field, literatures emphasizing the interactive relationships between risk allocation and trust are relatively rare. Relevant research only made superficial analysis on the internal relationships between risk allocation and trust in its analysis on the formation of trust and the influence of trust on project management performances, which lacks

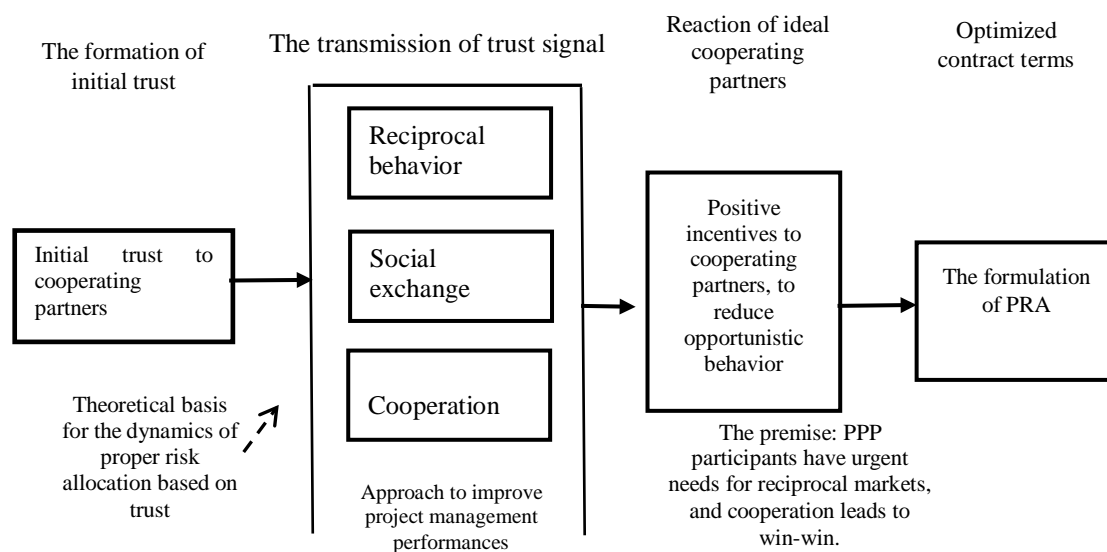
wholesomeness and consistency.

Trust is an important relationship governance factor, and its influence on risk allocation is a hot topic for researchers in every country in recent years. Girmscheid and Brockmann (2010) analyzed the issue from the perspective of transaction costs, thinking that good trusting relationships among PPP project participants can reduce the requirement for the completeness of contracts, improve the contract efficiency of controversial terms of risk allocation, lower the information collection costs caused by information asymmetry, and improve the flexibility of risk allocation plans. A large number of case-based interviews have also proved that trust can improve the efficiency to solve engineering change notice and controversial incidents. Based on behavioral expectancy, a series of studies have shown that in the hypothesis of distrusting situations, PPP project participants would rationally think of others with the expectation of opportunistic behaviors such as hiding information during the phase of designing contracts or hiding actions during the phase of implementing contracts, deem moral hazards as relationship-based risks they are faced with, and try to increase their self-interests by contract term games, while lowering the risks they are bearing. Mutual distrust would eventually result in improper risk allocation. As a matter of fact, the conclusions above are also consistent with the analysis on negotiation situations targeted at risk allocation made by Loosemore (2008). Undoubtedly, in the process of game, the negotiation forces of both parties potentially influence the fairness and rationality of risk allocation, which has been proved in case studies and statistic materials by Loosemore, KeYongjian and Wang Shouqing (2011). According to them, in traditional contracts of confronting relationships, a large quantity of risks is transferred to the weaker party in the contracting relationship, where proper risk allocation plans are difficult to form. Besides the perspectives of transaction costs behavioral expectancy, based on Granovetter (1985)' view of 'embeddedness', Williamson O.E. (1993) stated that trust is the class-one transaction environment of project, which, like a set of variable parameters, influences risk allocation process and transaction costs embedded in it, and to some extent influences the formation of

risk allocation plan. As for empirical research, the analysis made by Zaghoul and Hartman (2003) are innovative and representative. They started with risk exemption terms and pointed out that risk allocation in the phase of contract design depends on trusting relationships formed based on reputation and competence recognition. They made research on risk allocation situations in Canadian and American construction markets, and the data show that high level of trust can decrease the probability of improper risk allocation caused by exemption terms.

According to the analysis on PPP project risk allocation based on the perspectives of reciprocity, cooperation and social exchange, trust can facilitate the formation of proper risk allocation, the driving mechanism of which is shown in Figure 12.

Figure 12 Frame of how trust drives the formation of proper risk allocation based on the perspectives of reciprocity and social exchange



This thesis raises the hypothesis H1 that trust of PPP project participants has positive influence on the formation of proper risk allocation plans.

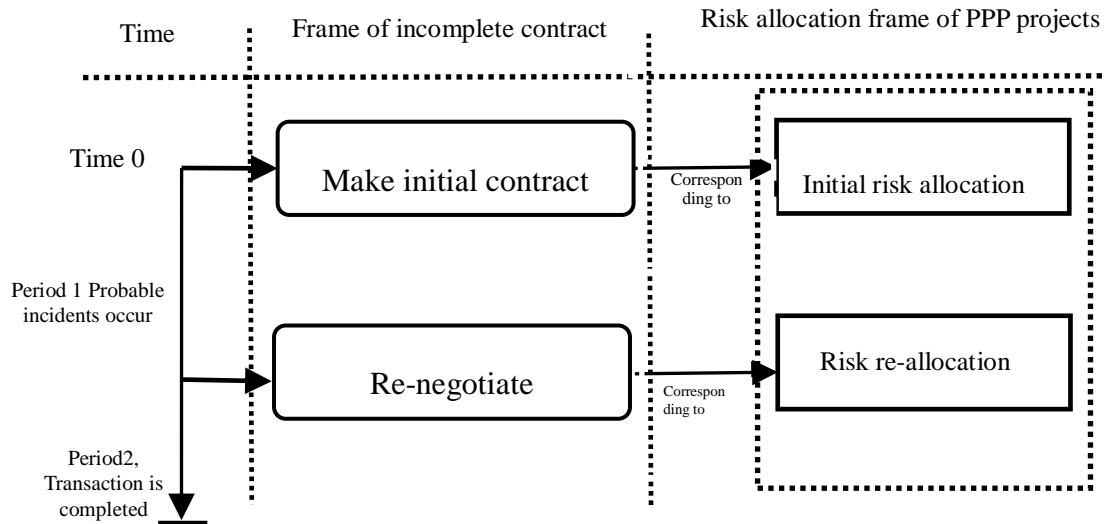
4.4 Hypothesis of the association of risk allocation in the two dynamic phases based on contract flexibility

4.4.1 Description of characteristics of risk allocation in the dynamic two phases under the perspective of incomplete contract

Under the perspective of incomplete contract, the pattern of risk allocation of PPP projects is manifested in the beforehand appointment of contracts and afterwards adjustment and re-negotiation. Studies conducted by Hartman.F and Snelgrove (1996), along with Rahman and Kumarswamy (2002) emphasized that the beforehand appointment and afterwards complementation of risk allocation both have influence on the performances, and that the effectiveness of afterwards adjustment is affected by beforehand appointments in the phase of contracts design. Although risk re-allocation of PPP projects has yet to be clearly defined, the idea that risk allocation plans need complement or adjustment in the process of contract implementation has been acknowledged in theory and in practice. During the negotiation period of project contracts, the initial contract made after negotiation of PPP project participants falls into the category of initial risk allocation, while alteration or claims for compensation in the phase of contract implementation or adjustments to contract terms belong to risk re-allocation. Currently, most research stresses on risk allocation in the phase of contract design, expecting to form incentive proper initial terms, which shows the idea of 'beforehand appointment'. Risk re-allocation is the remedy for or adjustment to initial risk allocation plans. It is targeted at two kinds of situations: first, although possible risks have been considered in the initial risk allocation plan, the initial plan is not suitable for real project situations in the process of contract implementation and needs adjustment. Risk re-allocation can be made by way of price adjustment. Second, some risks were not taken into consideration in the initial risk allocation plan, but they have occurred in the process of project implementation, where re-allocation can be achieved through negotiation, alteration and claims for compensation. The raise of risk re-allocation reflects the idea of 'afterwards governance'. As a compensation mechanism, risk re-allocation able to some extent compensate for the incomplete plans in initial contracts, hence improve the efficiency of risk

allocation in the whole process (Bajari, 2001 and Laure 2007) so that the performances could be constantly improved, which is shown in Figure13.

Figure 13 Risk allocation frame based on incomplete contracts



However, it needs to be noted that there are still divergences around the idea that adjustable risk allocation has positive influence on performances. For example, Bajari and Steven (2001) along with Laure and Stephane (2007) have pointed out that although afterwards adjustment is conducive to adapting to unforeseeable risks, it may at the same time increase the additivity of dealing with contracts, which could result in the rise of transaction costs. Under opportunistic expectancy, it remains a question whether adjusted Pareto strategy with performances as the core can be formed. Therefore, in the situation of PPP projects, it still needs verification whether proper risk allocation can contribute to good performances.

4.4.2 Analysis on the influencing mechanism of risk allocation to state compensation under contract flexibility infusion

1. Contract flexibility mechanism with incentive infusion and control power transfer

Contract flexibility is an effective tool to deal with the uncertainty of projects and is an important part of project governance. Such latent resources in contracts endows the projects

with the competence to effectively adjust the behaviors of PPP project participants as to adapt to sudden changes of situations and can potentially improve the performances. There have been literatures to explain the positive effects of contract flexibility from the perspectives of mechanisms to compensate for contract state changes and proper risk allocation.

Due to the natural incompleteness of the contracts of PPP projects, Haarala and Nari (2010) affirmed that it is impossible that contract documents include all the contingency mechanisms, and contract flexibility terms provide a flexible cooperation frame relating to risks and benefit allocation, which have characteristics of dynamic adjustment depending on project situations. This thought was supported by the research conducted by Carlos and Marques (2013). They analyzed the risks in PPP projects with long-term contracts and pointed out that the most important function of contract flexibility is to provide tactic tools to deal with risk uncertainty, and infusing prompt flexibility reflection mechanisms to contract terms is conducive to reducing risk uncertainty and maintaining project values. Levin, Tadelis (2010), and Steven (2012) made deeper exploration by focusing on the analysis on price compensation mechanisms and found out that project contracts of private institutions are more flexible by comparing contract terms relating to price adjustment of public projects with those of private projects. Data also showed that adjustable price flexibility might result in dynamic incentives to cooperating partners. Eventually, contract flexibility improves the executive effectiveness of cooperating partners when dealing with the uncertainty of projects.

Also, the compensation for uncertainty of contract flexibility is also manifested in management flexibility formed by the transferring of control powers. The research conducted by Bettignies and Ross (2009) pointed out that balance should be reached between contract fixedness and efficiency, especially in PPP projects involving public-private relationships, where the design of flexible terms should be given more attention to, since terms made by government stressing fixed contracts to regulate franchisers' behaviors might reduce the flexibility of project management, compromising the ability to quickly handle uncertainties. As the research conducted by Branconi and Loch (2004) pointed out, contract flexibility

helps to realize management flexibility. When hazards occur, contractors can carry out reasonable actions promptly by transferred control powers without having to ask for the developers' permission, which shows the strength of quick reaction of contract flexibility. Similarly, Carlos and Marques (2013) analyzed PPP project cases and evaluated the positive influence of contract flexibility terms on the success of projects. The case studies showed that under certain boundary conditions, endowing franchisers with the rights to adjust according to real situations is conducive to the improvement of project values. Particularly, flexible terms targeted at facility functions enhance the outflow effect of the facility management values in the phase of operation. In fact, the research showed that the integration mode of potentially induced information of contract flexibility improves facility values in the phase of operation.

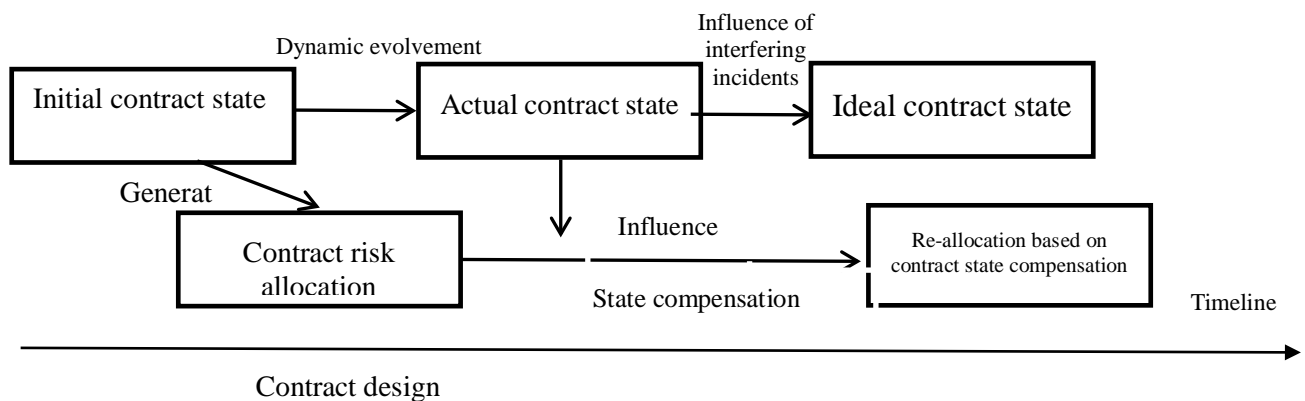
2. The path of contract state compensation based on contract flexibility: from the perspectives of proper risk allocation

Based on the perspective of project proper risk allocation, Chiara and Kokkaew (2009) alongside Dong and Chiara (2010) raised the idea of 'analysis on contract flexibility'" based on the premise of endogenous interdependence within reciprocal social exchange theories. Their theoretical research showed that the effective transferring of project risks under the support of contract flexibility terms between the participants could improve the efficiency of contract implementation. Although the costs of developers may be raised to some extent, this would increase the success probability of the project. Follow-up research conducted by Shan and Garvin (2010) further enhanced the internal connection between risk allocation and contract flexibility. They proclaimed that interdependent contract flexibility induces the realization of the adjustment mechanisms of risk allocation, guarantees the balance among the interests of all parties in the dynamic process of adjustment, and prevents opportunistic behaviors and moral hazards under improper risk allocation.

The propelling impact of contract flexibility on the compensation for contract state changes is mostly manifested in the afterwards adjustment mechanisms of risk allocation.

Plambeck and Taylor (2007) deemed risk re-negotiation in the project implementation phase as the key to contract flexibility. In fact, targeted at risk re-allocation issues such as alteration and claim for compensation in the implementation of projects; the contract flexibility allowing for rational re-negotiation provides a chance for risk mitigation, which is conducive in maintaining its values. Anjana Susarla (2012) also thinks that the core issue of contract flexibility lies in the afterwards situation, which is the adjustment mechanisms of re-negotiation. His research showed that contract flexibility could reduce the opportunistic rent-seeking behaviors of sellers. It can be identified from the observation of sample projects that with the increase of the flexibility of projects, contract flexibility proved significance to Pareto efficiency of adjustment plans. In conclusion, the research above showed that the positive influence of contract flexibility on the improvement of project management performances has gained theoretical supports. The association between contract state changes with the dynamic changes of contract flexibility is shown in Figure 14.

Figure 14 The association between contract state changes with the dynamic changes of contract flexibility



From the perspective of incomplete contract and state compensation under contract flexibility, this thesis raises the hypothesis H2 that initial risk allocation plans have positive influence on the state compensation under contract flexibility in PPP projects.

4.5 Hypothesis of the function of adjustment of trust in proper risk allocation and contract state compensation

4.5.1 Description of two dynamic phases of risk allocation from the perspective of incomplete contract

In the bidding phase of the project, exists information asymmetry between potential cooperators. ‘Mutual familiarity and records of interaction, which are the basis of mutual trust, are both lacking. With the intention to provide reference for mutual trust, research by Eriksson (2007) and Lau.E (2005) indicated that the information of capacity shown in market reputation and pre-qualification is an important media for the formation of trust, tentative trust is formed. The value lies in that trust has the characteristic of embeddedness of social capitals, and this thesis thinks that the terms of the contracts relating to risk allocation in the phase of contract design are restrained by the level of tentative trust, and high level of trust could reduce the probability of the behavior of making strict contract terms to restrain opportunistic behaviors. In addition, the transaction costs of contracts would be lowered, so would the probability that strong contractual relationships may influence risk allocation. As a result, proper risk allocation is easy to be realized. As a function of economic benefit expectancy, trust would certainly affect by the process as well as the results of the negotiation of initial risk allocation, or to put it another way, the level of satisfaction to contract terms. According to the analysis by Rousseau and Sitkin (1998), Laan and Niels (2011) as well as Munns A.K (1995), this research takes the opinion that satisfaction terms under the proper risk allocation mechanisms are a manifestation of mutual reciprocity, which is conducive to the formation of trust, and could make correction to tentative trust formed through market reputation after the negotiation of contracts, where relationship-based trust is formed. From the perspectives of action, Teck-Hua H and K.Weigelt (2005) deemed trust as a function of interactional behaviors, and their research showed the chain-like process of the evolvement of trust. To be more specific, their research shows that the current trust comes from earlier interactions, which, in the situation of the projects, is reflected as the influence of several re-negotiations aimed for the adjustment of risk allocation on trust in the phase of contract

implementation, especially the influence of the re-negotiation targeted at risks that were not agreed upon in initial risk allocation plans but actually happened in the process of project implement on the formation of cognitive trust.

4.5.2 Analysis on the realization of the compensation of trust for contract states from the perspective of non-concurrent social exchange

1. Analysis on the characteristics of intervallic of risk allocation of PPP project: the attribute of non-concurrent transaction

An important difference between the constitutive characteristics of PPP project and concurrent transaction in idealized markets is the intervallic of time. In an idealized concurrent market model, transactions are carried out concurrently, without being affected by the factor of time. But the economic benefits of transactions of PPP participant, especially when risk allocation is involved are not gained promptly. Initial risk allocation in project with short cycles and low complexity has the characteristics of stability in the economic benefits in both contracting parties. The asymmetry in the time of delivery of the contracting parties brings hazards to unilateral actions and any action that requires the investment of resources before getting paid. In general, legal contracts can reduce part of risk, such as the risk allocation terms in PPP project during the phase of contract signing. However, with the expansion of project and the manifestation of the complexity (influenced by factors like market and technology), the balance in value benefits in the early stage of cooperation is hard to maintain, and impossible to estimate accurately in early stage of the project. Therefore, afterwards compensation plans are needed. To put it another way, new governance approaches are needed to replace petrified and outdated contract terms, to motivate the parties to lubricate the implantation process of the project and lower frictional cost.

2. The realization of the compensation mechanism of trust for contract state changes based on social exchanges

Social exchange theory is an important analytical paradigm in research on human behavior in organization, which can to some extent explain changes in the relationships

among members within an organization and the reasons behind this dynamic process (Zhou, Wenchi 2012). It is reasonable to say that the principle of reciprocity is an important premise for social exchange. The essence of the compensation for changes in contract states under proper risk allocation of participants in PPP projects is reciprocal social exchange.

According to the three important dimensions raised by Sahlins (1972) to account for the degree of reciprocity, i.e. the equality, promptness and interest-relatedness of rewards, the research concluded that the feature of incomplete contract of risk allocation in PPP projects makes the compensation for contract state changes impossible to be realized completely by standard reciprocal dimensions, which is mainly manifested in the inaccessibility of promptness. Therefore, to achieve reciprocal social exchange, external elements are needed to compensate for the risks brought by non-concurrency, or to put it another way, valuable variables are added to compensate for the risks caused by interval.

Molm (2010) believes that benefits go to one party during social exchange, while it goes to both parties during negotiated exchanges. The goal of compensation for the contract state changes of PPP projects is to realize two-way flow of benefits. Currently, PPP projects in China have obvious characteristic of one-way flow of benefits, where the participants mostly tend to protect their own interest by taking advantage of their position, fixed terms, or even exemption terms. Particularly, they sometimes refuse to make due compensation for the state of their partners when the contract states have changed in the phase of implementation, which induce the actions of moral hazards both before and afterwards. Concerning the compensation for non-concurrent deficiencies, Molm's research also showed that reciprocal agreement based on negotiation is a direct way of social exchange, and he stressed that social exchange based on reciprocity in negotiation is related to the trust relationship between contracting parties. In the relationship-focused cultural background of China, it is a latent social norm that 'you shall give a plum in return for a peach' and 'courtesy recalls for reciprocity', where the society needs a relationship-based bond with the attribute of social capitals, of which trust is an important factor. In fact, research conducted by Shore, Tetric,

Lynch et. Al (2006) and Wu (2006) also indicated the position of trust in non-concurrent social exchange. Their studies showed that social exchange is manifested in mutual trust among people, and that social exchange is not built on purely interest-seeking relationship, but on the social emotion capital relating to trust.

To be more specific, changes in contract states in the implementation phase of PPP projects make equal social exchange in initial contract terms impossible to realize, compromise the balance of interests between contracting parties. Therefore, negotiations on risk re-allocation under contract state compensation are needed. Particularly, compensation for contract states of cooperating partners is the key to a harmonious environment of project management where the parties play by rules. Based on the theoretical analysis above and the real situation of China's PPP project, giving trust to PPP project participants is the key to the realization of state compensation, but giving trust is a risky action, which should be decided according to the transaction situation of project management. The participants in PPP project are all doers with objectives, which are reflected as the satisfaction of organizational economic benefits under calculation-based trust.

4.5.3 The attribute of social capital in trust contributes to the stabilization of the compensation for contract state

1. Trust simplifies complicated projects: analysis based on social capital

The uncertainty of situation and the complexity in the implementation of PPP projects bring risks to risk re-negotiation based on balanced and reciprocal social exchange. Participants have urgent needs for certainty, and according to expectancy analysis by Luhmann (2005), from the perspective of sociology, trust is an important mechanism to bring certainty to people. Trust has more power than accessible information, thus generates a sense of inner safety to replace the lack of information, which is the key reason why developers are willing to offer contract state compensation to contractors. In the process of implementation, the level of trust of all participants in PPP project able to influence current knowledge and the capacity of simplification. As been stated by Luhmann (2005) in his research, trust goes far

beyond knowledge of the past, transcends the accessible information, and takes risks to define the future. Actions based on trust simplify the future. In conclusion, trust with social capital effect provides solutions for the issue of interval and prepays for the consequences. Trust increases tolerance for uncertainty, conducive to the realization of contract state compensation.

Social capital theories are increasingly mature and comprehensive with basis research going on such as the analysis on social networking relationships by Bourdieu (1986), the production function of social structural resources by Coleman (1990), trust and regulation by Putman (1995) and theory of embedded social resources by Lin N (1999). Due to its positive externalities, social capital is broadly applied to many macro and micro research areas such as regional development and economic behavior analysis (Peter, J. Batt 2008, Guo, Xibao 2003). It has been proved by case studies that social capital has the characteristic of productivity, where it has positive influence on economic efficiency and system performances. Besides macro effects, the micro effects of social capital have also been studied from multiple perspectives, which, according to the research, mainly lie in accelerating the transmission of information, eliminating cooperation dilemma and lowering transaction costs, which can also be applied to PPP projects. (Liu, heng 2010, Nahapiet, J 1998, Knack, S 1997). Risk allocation between PPP project participants is an economic game between the contracting parties, which involves cooperation risks and transaction effectiveness, and to some extent is consistent with the micro effects of social capital.

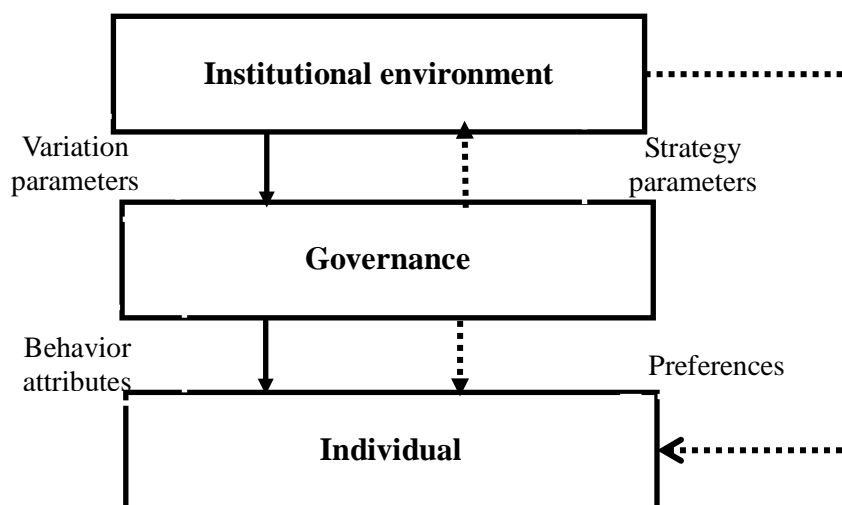
2. Trust as an institutional environment: analysis of environment embeddedness

The Chinese scholar, whom conducted early and deep analysis on social capital theories is Zhang Qizai (2004, 2005) from Chinese Academy of Social Sciences, who conducted early and deep analysis on social capital theories reflects that sociology is different from economics mostly in its focused that economic situations are embedded in social structures, and behaviors of both individuals and organizations are restrained by social structures. This thesis

also takes this view, with the idea that initial design of risk allocation of PPP projects and state compensation adjustment in the phase of contract implementation are both embedded in the environment of the projects, which has influence on the decision-making process of both parties.

Concerning the question of how social capital is embedded in market economy, Yanjie Bian and Haixiong Qiu (2000) expounded the meaning of social capital from the perspectives of the transaction cost theory relating to the relationship between market and enterprises, the social networking theory based on embeddedness, views on resources under network theories and network relationships. They stressed the important role of trust in research on social capital and raised two functioning mechanisms of social capital on market economy: the compensation for and replacement of market mechanisms based on the views of social networking. From the perspective of governance, Williamson (2001) agreed on Granovetter's (1985) view of embeddedness. In his government structure system, trust is seen as an institutional environment parameter, which has influence on governance cost. Things like property right, contract law, regulation and convention are embedded in the governance structure, and all kinds of governance modes vary with the system environment and people engaged in economic activities, as is shown in Figure 15.

Figure 15 Governance structure embedded in institutional environment



Source: Williamson (2001) 《The Mechanisms of Governance》

From the point of view of incomplete information and limited rationality, Allan Schmid (2009) raised the ‘state-structure-performance’ analytical approach in his work of *The Institution and Behavioral Economics*, which deepened the influence of environment embeddedness on governance structure and performance. Although it remains a question whether the approach above is universally applicable, it still helps the discussion on the relationship type of trust between contract flexibility and state compensation in this thesis. The adjustment function of trust in PPP project contract flexibility, risk allocation and state compensation shown in Table 19.

Table 19 The characteristics of the function of trust based on “state-structure-performance” analysis

Premise for potential decision-making	Level of trust (state)	Risk allocation; contract flexibility (structure)	Contract state compensation (performances)
Contract state: high cost for changes in contract state; potential expectancy state; opportunistic expectancy; moral hazard expectancy	The level of trust in PPP project participants: high/low	Risk re-allocation on formulated contract flexibility terms: contract flexibility may re-structure risk allocation in the negotiation/controversial terms concerning contract flexibility may compromise the structure of initial risk allocation that produces contract flexibility	Compensation is realized and both parties are happy with the harmonious results (with high level of trust)/ Compensation is not realized or only partly realized. Moral hazards may occur in pursuit of interests. The cost for supervision is higher (with low level of trust)

Source: Allan Schmid (2009) : 《 *The Institution and Behavioral Economics*》

3. Analysis on the intermediation of trust in the association between contract flexibility and contract state compensation

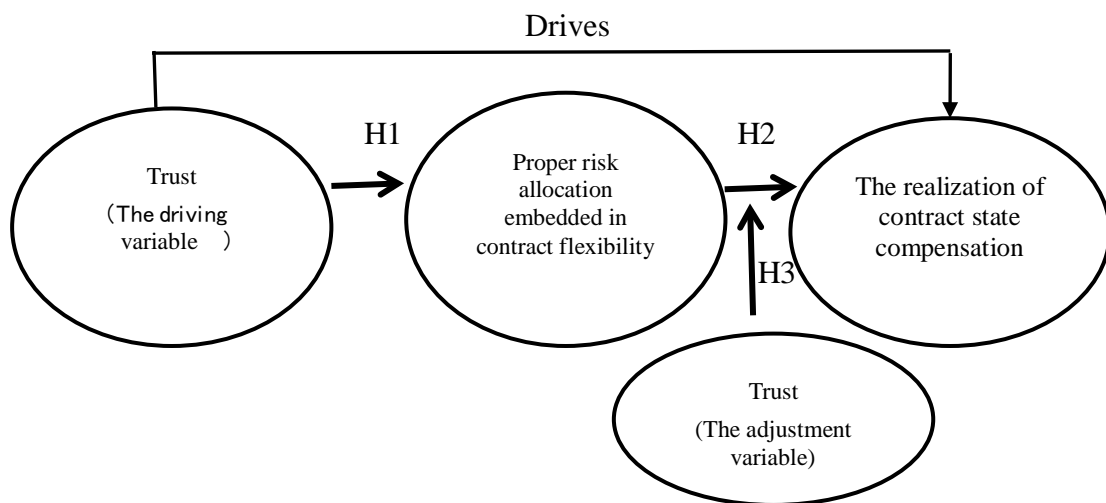
According to a series of research, trust is a situational factor constraining the effect of contract flexibility on contract state compensation. The outcomes delivered by contract flexibility vary with different relationships. Research by Haarala and Nari (2010) found that the infusion of contract flexibility terms depends on good partner relationship and mutual cognition, and its positive influence on the compensation effect is related to the closeness of the contracting parties, where contract flexibility without trust is usually poorly carried out. When PPP project participants trust each other, contract flexibility can be carried out at low frictional costs, optimized compensation strategy for uncertain risks is easier to achieve, and the approaches to maintain or even increase project values are expanded. However, in the situation where trust is lacking, the initial contract flexibility terms may be useless or even destructive, where disputes in repeated games might distort the nature of contract flexibility, which may prevent the realization of project success compensation effect. (B.Klein, 1996)

Concerning the design of flexible terms for PPP projects, research by Laure and Stephane (2007) indicates that people should strike the balance between contract flexibility and relationship governance, and that contract flexibility requires certain degrees of trust. Too much flexibility may increase the probability of opportunistic behavior, while too little flexibility may narrow the approach to add value to the projects through re-negotiation. This point is stressed in the research on contract flexibility based on social exchange theories by Chiara and Kokkaew (2009). In fact, the adjustment function of relationship factors has been proved in industrial supply-chain projects, where Helena and Harry (2001) proved that relationship is an important adjustment factor in contract flexibility and management performances through regression analysis by collecting sample data from 195 British new technological innovation enterprises. They also found out that contract flexibility in a good relationship facilitates the innovation of technological development projects and improves the innovation performances of projects. It is to be noted however, compared to technological innovation projects, PPP projects stress less on technological innovation, and emphasizes more on the implementation of contract provisions. Therefore, it still needs

verification how relationship factors in PPP projects influence contract flexibility and contract state compensation. But based on the analysis before, the research can raise the idea that trust is an adjustment variable between contract flexibility and contract state compensation.

Based on the analysis above, this thesis is constructing hypothesis H3: trust among PPP project participants has adjustment function in proper risk allocation and the realization of the contract state compensation based on contract flexibility. The theoretical model is shown in Figure16.

Figure 16 Theoretical hypothesis models in this research



Chapter 5: Scale development, questionnaire design and empirical research

This thesis establishes the model of the influence of trust on risk allocation within unified structure, and conduct empirical research based on questionnaires. According to the logics of empirical research, we need to deconstruct the relevant core elements after establishing hypothesis models and make measurable terms on that basis. Therefore, this chapter contains the research conducted on scale development of core elements including trust, proper risk allocation and risk re-allocation based on state compensation, laying the foundation for the subsequent empirical research.

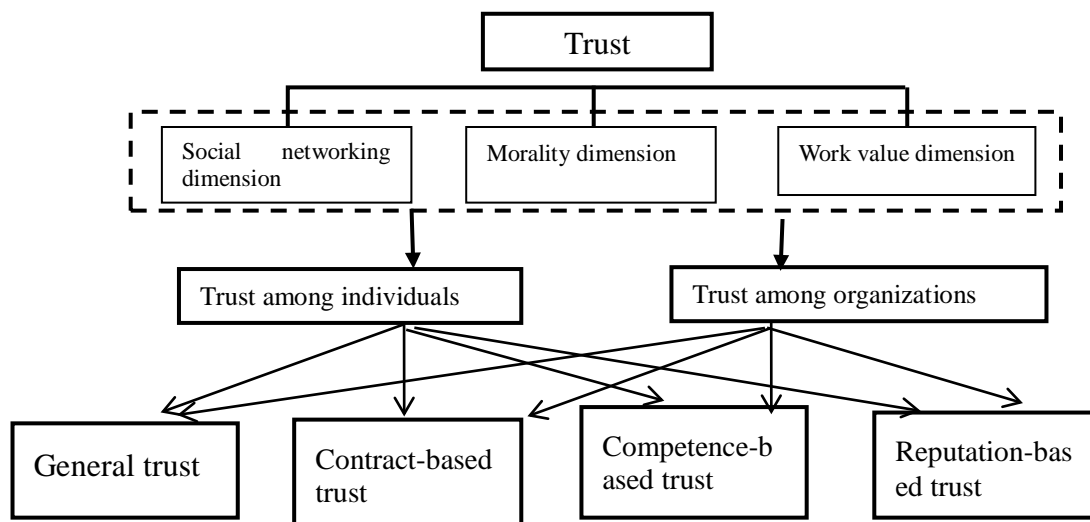
5.1 The formation of scale measurement dimensions

5.1.1 The formation of the measurement scale of trust in PPP projects

Lewick and Bunker (1996), Rousseau and Sitkin (1998) are among the first scholars to conduct research on the characteristics of trust and measurement, and their research results have been broadly studied and referred to. Lewick and Bunker established three types of trust, which, in a progressive order, are deterrent trust coming from sanctions in the case of breaching contracts, tentative trust based on expectancy for behaviors, and cognition-based trust coming from consecutive interaction and mutual understandings. On that basis, from the perspectives of both economics and sociology, Rousseau and Sitkin raised calculation-based trust based on rational behaviors, system-based trust based on law system regulations and relationship-based trust formed through social interactions. They pointed out that the initial trust is mainly calculation-based or system-based, but relationship-based trust would take the lead with the deepening of interactions of organizations. The research mentioned above can be seen as the foundation for dynamic analysis on trust in PPP project. Compared to traditional organizations, the organizations of PPP projects have the characteristics of

temporariness, unstableness, and disparity in the pursuit of interests. From the perspective of incomplete PPP project and information asymmetry, Hartman.F (2000) came up with the dynamic characteristics of trust suitable for PPP projects, which involved the capacity-based trust based on completed projects, integrity-based trust relating to protecting the interests of contracting parties, as well as intuition-based trust gradually formed thanks to interactions such as communication. Ellen Lau and Rowlinson (2011), Hong Kong scholars also stressed the importance of establishing and maintaining such trusting relationships in the environment of double organizations. Through analysis, they raised a trust model based on general trust, contract-based trust, knowledge-based trust and reputation-based trust. Such model able to measure the level of trust through the analytic hierarchy process, which is shown in Figure17.

Figure 17 Model of the measurement of trust



Source: Drawn from the literature

Wong and Cheung (2005), raised system-based trust, influence-based trust and cognition-based trust from the perspectives of cooperation and market reputation, where interest allocation, the effective cognition of communication systems, emotion investment are all crucial elements in the characteristics of trust. In addition, SEM empirical research has proved it is explainable in the engineering field in Hong Kong. The classification of trust in

typical research is shown in Table 20.

Table 20 Analysis on the types of trust in typical cases

Scholar	Classification	Explanation
Lewick and Bunker	Deterrent trust Understanding-based trust Cognition-based trust	Trust comes from the fear of sanctions for breaching contracts Trust comes from the predictability of the other party's behavior. Trust comes from mutual recognition after knowing each other quite well
Rousseau and Sitkin	Calculation-based trust Relationship-based trust Institution-based trust	Trust comes from the conviction that opportunistic behavior is unlikely to happen, since it would hardly benefit the other party. Trust comes from a relatively stable relationship where both parties recognize each other through consecutive interactions. Trust comes from the legal system, cooperation relationship and professionalism.
Hartman and Zaghoul	Capability-based trust Integrity-based trust Intuition-based trust	Trust comes from the projection that the other party has the capacity of realizing the objectives. Trust comes from the recognition in the other party's professional integrity, where it would defend the interests of relevant parties. Trust comes from the intuition based on communication.

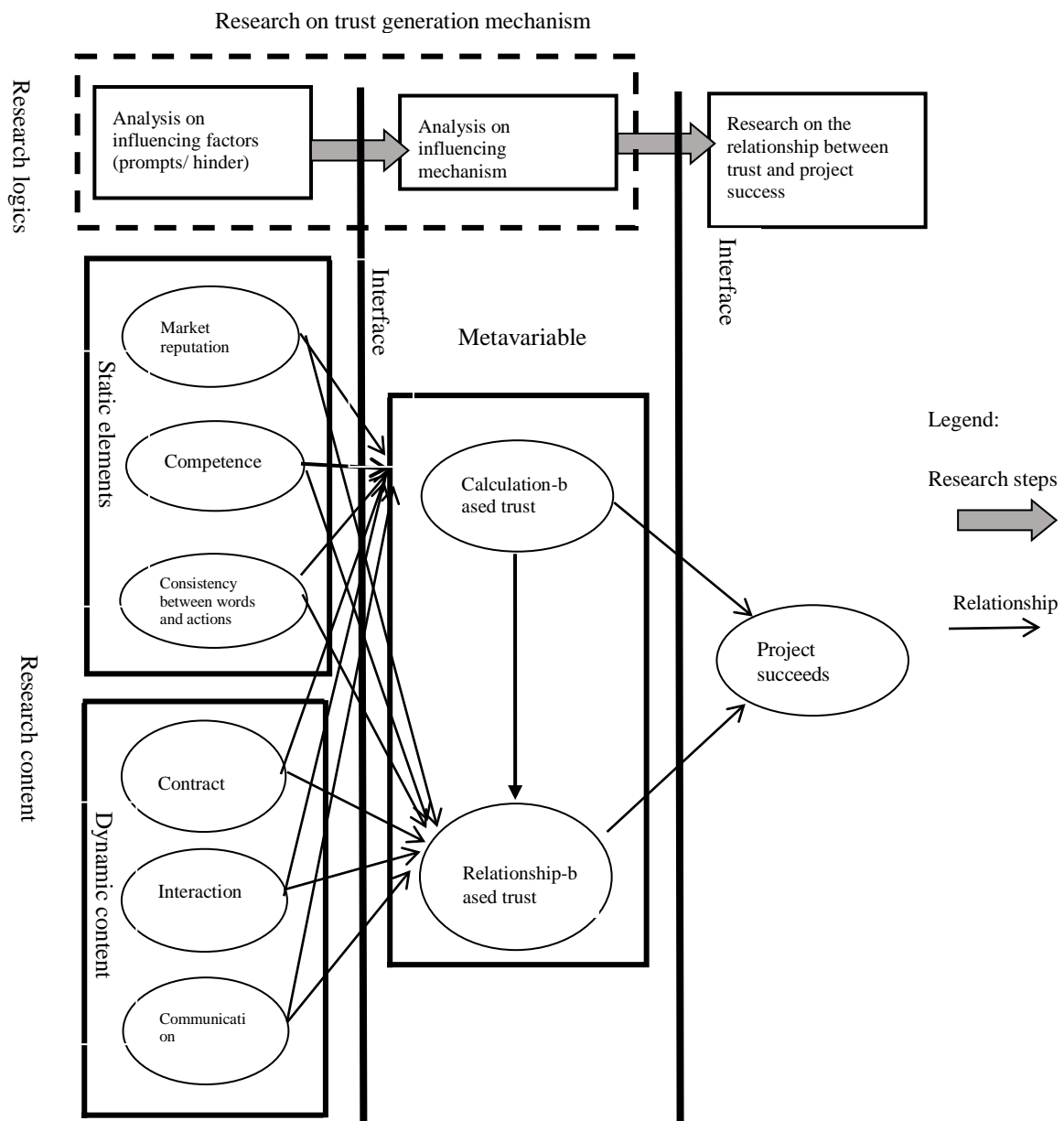
Source: Drawn from the literature

A series of research indicates that trust among the participants of PPP project does not remain the same. The kind of trust changes with the cycle of projects. PPP projects involve bidding, contract negotiation and contract implementation, where the dynamic characteristics of trust and risk allocation are both embedded. Based on the research results above, this research divides trust into three progressive dimensions: tentative trust in the phase of bidding, relationship-based trust in the phase of the formation of contract negotiation and cognition-based trust due to consecutive interaction in the phase of contract implementation.

YunLe (2010) and Weiping Jiang (2011), scholars from Tongji University were the first in the field of construction management in China to quantitatively analyze the trust between

developers and contractors. They divided trust in construction projects into calculation-based trust and relationship-based trust, the former of which includes reputation, capacity and consistence in capacity and actions, and the latter of which includes communication, reciprocity and contract terms. Based on the quantitative analysis above, the research conducted path analysis relation to the effect of various elements on trust through SEM, which verified the hypothesis. The research content and steps are shown in Figure18.

Figure 18 Trust-project success mechanism models



Source: Drawing from research by YunLe (2010) and Weiping Jiang (2011)

Taking the research above and the relationship-based social economic environment in China into consideration, this research divided trust of the participants in PPP projects into three types: the first is trust based on market reputation, the second is trust based on systems, and the third is trust based on cognition.

5.1.2 The formation of the measurement dimension of proper risk allocation of PPP projects

1. The current research outcomes relating to the measurement of proper risk allocation of PPP projects

(1) Research on the measurement of proper risk allocation from the perspectives of project governance

Shuibo Zhang and Bo He (2003) are among the first scholars who studied the measurement of PPP risk allocation, raised a series of principles including the principle of non-regulation, the principle of proper risk transferring, the principle of matching responsibilities with benefits, the principle of risk management efficiency, from the perspective of proper risks benefiting controls and equality in interests. They also pointed out that the implementation of risk allocation principles might also depend on the humanity environment, such as the interdependence in the contracting parties, and the necessity that all parties shall have a clear understanding on the risks of the project and the possible outcomes of the risks. With these premises missing, risk management of the projects can hardly be improved even if good risk allocation theories have been properly applied to the contracts. In addition, they also analyzed how the International Federation of Consulting Engineers (FIDIC) classified risks in projects and how the risks were allocated, consequently built a quantitative risk allocation model based on variables such as risk allocation capacity and the prices of accepting the risks.

YongjianKe and Shouqing Wang (2008) analyzed the failure of risk allocation of Anglo-French channel tunnel project and summarized a series of guidance relating to risk allocation of PPP projects, such as; risk allocation cannot exceed the control ability of the

bearer. This has been proven by research conducted by Thomas (2003) and other scholars, who analyzed risk allocation of highway BOT projects within India and found out that the general principal that risks should fall on the shoulders of the party with the strongest tolerance of risks may not necessarily be followed due to the contracting parties' different understandings in risk control capacity.

Arndt and Henry (1998) stressed validation attribute. They analyzed the successful case of the risk allocation scheme of Melbourne City Link project, which, according to them, indicates that the same risks in different types of tasks in different environments might have various ways of allocation; depending on the situation. This is consistent with the idea raised by Shuibo Zhang (2003) that risk allocation has uncertain forms. From the angle of information economics, the nature of risks is the uncertainty, which is fundamentally due to insufficient information. Therefore, the party capable of obtaining more risk-related information could manage risks more efficiently. If there is no way of observing or measuring risks, information fee can be used to replace risks, since the idea that unpredictable future is a form of risk means that it costs a lot to obtain information about the future. If one party could obtain information relating to certain risks with comparatively lower fees, the same party shall assume the risks. If the costs of both parties to obtain information are equally high, they shall assume the risks together. (Ju Peng, 2008) Li Bing, A. Akintoye and Edwards (2005) analyzed the risk allocation situation of PPP/PFI project in England and pointed out that risk allocation mechanism is the negotiation process about the contract, where the reasonability of risk allocation has direct influence over the bidding quotation of the contractors. Re-negotiation would begin when the contractor refuses the risk allocation plans.

In recent years, from the perspectives of project governance, scholars Yilin Yin (2013), Zhao Hua (2011), Yan Ling (2008), Du Yaling (2012) and Xin Wang (2014) did relevant research. They made preliminary quantitative research and made some progress, where quantitative indicators were employed concerning the analysis on the influencing mechanisms of risk allocation to project management performances, research on the

interacting relationship between trust and risk allocation and research on the influence of social capital on risk allocation in the two dynamic phases of risk allocation. The theories they employed were consistent, which were relating to measurement of risk allocation, so that the research team could avail itself of the earlier research outcomes. In the academic community, risk allocation is mainly manifested in construction contracts relating to risks made in the phase of bidding, where the measurements were mainly conducted from the angles of the completeness of risk allocation terms, enforceability and stimulation, which is shown in Table21.

Table 21 The Scale dimensions and measurement indicators of risk allocation

Measurement dimensions	Measurement indicators
Completeness	The comprehensiveness, how detailed they are, ways of handling disputes
Enforceability	Whether they are reasonable, adjustable, projectable for renegotiation, agreeable on the range of risk re-allocation
Incentive	The matching between risks and control power of the project, and between risk allocation and profits. The effectiveness of the punishment for default.

Source: Drawn from the literature

(2) Analysis on proper risk allocation based on FIDIC standard contract examples

Based on FIDIC contract, Abrahamson M.W (1978) raised standard concepts and formulas relating to risk control power, the effectiveness of risk control, and transferred proper risk allocation as depicted in Table22. In *The FIDIC Forms of Contract*, Nael G. Bunni (2000) said that “the ultimate goal of optimal risk allocation is to promote project implementation on time and on budget without sacrificing quality to obtain the greatest value for money. The goal for a repeat employer should be to minimize the total cost of risk on a project, not necessarily the cost of either party.”

In addition, four criteria of risk allocation are mentioned in this book: the fault standard:

cost and time impacts of risks caused (or not avoided) through the fault of a party should be borne by that party; the foresee ability standard: he who is best able to foresee the risk is allocated that risk; the management standard: he who is best able to control and manage the risk is allocated that risk; the incentive standard: risks should be placed on the party most in need of incentive (presumably already with the ability) to prevent and control them.

Table 22 Standardized concepts of proper risk allocation

Key elements of risk allocation terms	Revelation	Notes
Risks are in the control of one party	The occurrence of that risk is attributed to the misconduct or the lack of proper effectiveness or cautions of that party	It is not easy to strike a balance in practice among the principles above, but those universally recognized rules provide basis for contract terms.
Risks may be transferred	Risks are transferred through insurance, and premium is taken into consideration in the transaction with the other party	
The attribution of claim for profits of risk management	The profits coming from the management of that risk mostly belong to that party	
The order of risk control efficiency	It may improve the efficiency (including plans, incentives and innovation) and the long-term development of construction industry if risks are assumed by that party.	
The responsibility to assume loss in risk management	In case of the occurrence of risks, if the party that shall firstly bear the risks attempt to transfer the risks to the other party, extra expenditures and uncertainty would be caused, and mistakes may be made.	

Source: Drawn from the literature

2. The embedding of contract flexibility supplements of the measurement scale of proper risk allocation.

However, a large amount of practical research and theoretical research on literature show that the current contracts of PPP project risk allocation include an enormous number of exemption terms, while contract fixation makes the future changes in contract state limited. Adding flexible terms with the effect of adjustment to risk allocation plans is conducive to the management of the project between the contracting parties.

Studies in the literature about the measurement and presentation of contract flexibility in various fields such as enterprise management, supply chain management and project management show a lack in targeted measurement of flexibility in current literature, where most measurement of flexibility was conducted by analyzing quantitative changes from the perspective of analog simulation. Based on analysis on real management cases and relevant literatures, the research found that the measurement of contract flexibility is relating to the drive to project management (the issue of scheduling), the mechanisms to handle risk allocation disputes (the issue of interest allocation), and the contingency mechanism against different states (the issue of handling the risks).

The representatives of the current literature on the measurement of contract flexibility to some extent consistent with PPP project situations are the research by Audley Harris and Larry (1998). Based on incomplete contract and transaction cost economic theory, they pointed out five elements of contract flexibility, which are price flexibility, re-negotiation flexibility, contract period, the flexibility of early termination of contracts and incentive contract. The comparison between detailed descriptions about the contract flexibility measurement by Harris (1998) and management practices of PPP projects is shown in Table23.

Table 23 Description of the characteristics of contract flexibility

Characteristics of the embedding of contract flexibility	Description	Examples of actual cases (from interview-like data)
Price flexibility	Initial contract price may rise or drop in transaction. The parties can re-negotiate the price in the form of conference or postpone the final decision of the price.	Attention may be paid to price adjustment range or rate under price fluctuation.
Re-negotiation flexibility	Partial or all contract contents may be altered in the whole cycle of contracts.	Proper and flexible terms should be designed for complex projects to reserve the outlet for contract management.
Flexibility of incentive terms	The payment of the sellers and the performances of the users are collected by the contract.	Risks are involved in geology issues, inaccurate graphic representation, deviation in work amount, and price adjustment. What contractors value most is whether proper compensation could be made in case of accidents
Flexibility of early termination of contracts	Terms allowing for early termination of the contract are included.	It's difficult to continue the projects, where the design of termination terms is proper.

Source: Drawn from the literature

The embedment of contract flexibility makes it possible for comparatively fixed risk allocation terms to achieve the state of Pareto optimality. With uncertain project costs, the participants must assume certain risks. In the allocation of risks, risk acceptance level and the effectiveness of random cooperation countermeasure should be taken into consideration, and a dynamic risk allocation adjustment mechanism should be built to achieve the effectiveness of risk allocation. Pareto optimality is achieved when risks stopped transferring among the participants. As been pointed out by Anderson (2005), the ideal risk allocation of Pareto is when the risk acceptance levels of the two parties are taken into consideration, and dynamic

adjustments are made.

Keeping the analysis above and PPP project management practices in China in mind, this thesis mainly draws on the research outcomes of Audley Harris, Giunipero, Hult (1998), Oliver Hart and Moore X (2008) preliminarily organizes the measurement terms according to literature induction and deduction. It makes a detailed draft of measurement clauses considering characteristics of PPP contracts and the regulations of contract terms and decides on the measurement indicators after the discussions and generalizations from experts.

In conclusion, the scale of proper risk allocation embedded in contract flexibility includes completeness, enforceability, price flexibility, re-negotiation flexibility and the flexibility of incentive terms.

5.1.3 The formation of the measurement scale of risk allocation under contract state compensation of PPP projects

Zhao Hua (2011) has illustrated the measurement research of risk allocation in his doctoral thesis, where it represents the research achievements concerning risk re-allocation applied to PPP management practices in China. His research raised the contract re-negotiation or adjustment processes in risk re-allocation corresponding to the construction contract implementation, which, to be more specific, are risk management actions including engineering change, price adjustment and claim for compensation.

Based on state compensation for value realization/ risk occurrence, Tomoichi Sato and Masahiko Hirao (2012) built a risk-based project value model RPV from the perspective of risk allocation. The core idea is to re-allocate the project value (risk losses) through dynamic optimization and give the parties proper compensation. Their model verified the possibility of dynamic adjustment after changes in contract state.

Based on non-advocacy state compensation, the research conducted by Robbins and Stephen (2010) showed that non-advocacy is an important factor influencing state compensation. The contracting parties have different understandings of proper risk allocation,

which may influence the success of the projects. They asserted that the foundation of proper risk re-allocation is non-biased adjustment policies that both parties agree upon. Such adjustment strategies are the keys in maintaining long-term cooperation, which might improve the performances of projects. It is wrong to assume that the more risks contractors bear the better, because this means more costs from the contractors due to the matching principle of responsibilities and rights, and the performance of project management would be compromised if the risks exceed the risk management tolerance of the contractors.

Based on incentive state compensation, research conducted by Bon gang Hwang and Xianbo Zhao (2013) showed that engineering contracts fall into the category of incomplete contract. In the implementation of contract, alterations and adjustments should be made to the contents of the contract. Contractors should be supervised and controlled to monitor their performance. Therefore, when choosing contract modes, the developers should consider not only the risk allocation characteristics of different contracts, but also execution costs and incentive effects.

In conclusion, risk re-allocation terms under contract state compensation are constituted by compensation scale, the rationality of compensation objectives, and the efficiency of compensation process, and compensation incentives, which is shown in Table24.

Table 24 The scale dimensions and measurement indicators of risk re-allocation under contract state compensation

Measurement scale	Measurement indicators
The scale of compensation	Times of risk re-allocation negotiation, price adjustment, adjustment to time limit for contracts, the range of risk re-allocation
The rationality of compensation objectives	Project-oriented, balanced interests, feasibility
The efficiency of compensation process	Negotiation costs, recognition of re-allocation plans, information sharing in re-negotiation, resolution of disputes
Compensation incentives	The incentive of compensation ways to project management behaviors

5.2 The design, distribution, collection and descriptions of questionnaires

This research uses questionnaires for data collection. Based on the role of the project personnel in accordance to proper risk allocation and other elements in PPP practice from the perspectives of trust and contract flexibility, the research decided on the criteria for respondents based on focus group. To guarantee the reliability of the research, the PPP projects that the respondents participated in all have two years or more history, and the implementation of those projects are somewhat uncertain, which is because that risk allocation has more obvious influence on the improvement of performances in uncertain project situations. As a result, the criteria we set were conducive in controlling the interference of amount of the variability to independent and dependent variables hence improving the accuracy of hypothesis testing.

5.2.1 Questionnaire corrections based on small sample pretests

To guarantee the credibility of the research, we gave preliminary questionnaires to 60 professionals as a small-scale pretest before conducting large-scale questionnaire research. We deleted and corrected certain items according to the revised correlation coefficient CITC, taking advice from the professionals that the scale was too broad, and made the final questionnaires. The final questionnaires were given out to people who directly participated in bidding, contract negotiation, signing, management and re-negotiation, had been engaged in PPP contract management and risk management practices for a long time and had profound understanding about the revised topic of the measurement items, which guarantee the credibility and representativeness of the data.

From the small-sample pretest, a group of experts thought that flexibility of early termination of contract, one of the characteristics of contract flexibility did not comfort to the management practices in China and removed the item. In addition, concerning the overlapping between the flexibility of incentive terms embedded in contract flexibility and the incentives in the measurement system of proper risk allocation, the experts discussed and decided to combine the two into one item: flexibility of incentive terms.

5.2.2 Demographic and criteria of respondents

We chose Beijing, Shenzhen, Guangzhou some other cities to conduct the survey, for the following three reasons: first, these cities are economically highly developed, and relish better PPP project system and environment; second, large-scale investment have been made in these cities, providing ample data for the analysis on complicated sample projects; third, personal academic ties in these cities thus better channels for data collection.

5.2.3 The distribution and collection of questionnaires

The questionnaire research was conducted between December 2015 and September 2016, where 500 questionnaires were handed out, among which 372 were collected, 233 were valid, accounting for 47% of overall result which is shown in Table 25. We conducted descriptive statistical analysis to all measurement terms of the sample through statistical software called SPSS20. All absolute values of the skewness of entire sample data were smaller than three, with the absolute value of Kurtosis smaller than ten, which means that the general sample data fell into the category of normal distribution. This result laid the foundation for data analysis.

Table 25 Statistics from valid questionnaires

Characteristics	Category	Number	Percentage%
The region of the sample projects	Tianjin	53	22.73
	Beijing	47	20.13
	Jiangsu	33	14.29
	Shenzhen	70	29.87
	Wuhan	30	12.98
Investment scale of sample projects (Yuan)	10-100 million	101	43.44
	100-300 million	71	30.32
	300-1000million	31	13.44
	Over 1000 million	30	12.8
Contract type	Gross price contract	103	44.16
	Unit price contract	130	55.84

Statistics indicated that the respondents are evenly distributed in public and private

departments as in the principal of PPP modes, which prevented the convergence of data due to a high proportion of one party. The position, education level and work time of the respondents met the pre-set requirements quite well, guaranteeing the reliability of the statistics of the questionnaires. The background of the respondents is shown in Table 26.

Table 26 The backgrounds of the respondents

Characteristics	Category	Number	Percentage%
The departments the respondents work in	Public department	114	48.99
The roles of the respondents in the project	Private or third-party department	119	51.01
The professional level of the respondents in the projects	Senior manager	93	39.74
	Mid-level manager	140	60.26
Education background of the respondents	Doctor	3	1.30
	Graduate	29	12.34
	Undergraduate	145	62.34
	Others	56	24.02
Working period in risk management/ contract management of the respondents	Over 10 years	42	18.18
	8~10 years	114	48.96
	5~8 years	77	32.86
Type of projects the respondents work in	Medical service	91	38.31
	Municipal administration	52	22.73
	Road	42	18.18
	Railway	30	12.99
	Water conservancy and hydropower	18	7.79

5.3 The reliability and validity testing of scales

5.3.1 Scale reliability testing

This thesis involves three important variables: trust between the developers and contractors of engineering projects (T scale), proper risk allocation embedded in contract flexibility (FRA scale) and risk re-allocation based on contract state compensation (R scale). T scale comprised of trust based on market reputation (T1), trust based on systems (T2), and

trust based on cognition (T3); FRA scale is composed of completeness (FRA1), enforceability (FRA2), price adjustment flexibility (FRA3), re-negotiation flexibility (FRA4) and incentive term flexibility (FRA5); R scale constituted of scale compensation (R1), reasonable objective compensation (R2), effective compensation (R3) and incentive compensation (R4).

I adopted Cronbach's a coefficient for reliability testing on the critical value. The results showed the reliability are above 0.7, indicates that the variables in this research are all reliable, which is shown in Table27.

Table 27 Item description and factor analysis

Variables measured	Brief description of the scale items	Load factor	Cronbach's a
Proper risk allocation embedded in contract flexibility	Flexible and fast re-negotiation procedures are included in the contract.	0.774	0.849
	Response procedures for a wide range of unforeseeable incidents are included in the contract.	0.838	
	Stipulations that prices can be adjusted according to real situations are included in the contract.	0.789	0.781
	Feasible mechanisms to postpone handling controversial prices are included in the contract.	0.712	
	Terms relating to benefiting from the final performances are included in the contract.	0.758	
	Certain autonomous management power to handle risks is included in the contract.	0.616	0.754
	Flexible incentive mechanisms are included in the contract	0.737	
Trust	The other party is competent enough in terms of management	0.807	0.757

	to complete the project.		
	The other party has experience of completing similar projects well.	0.711	
	The accredited clerk from the other party is competent enough.	0.647	
	The other party will strictly abide by the contract.	0.785	
	The other party will act according to the code of ethics of the market.	0.763	0.817
	The other party will take initiative to exchange information according to the regulations.	0.665	
	The other party is a trustworthy project partner.	0.810	
	The other party shows integrity in project management.	0.829	0.872
	The other party will not harm its partner's interests in project management.	0.751	
Risk re-allocation under contract state compensation	The adjustment range to achieve agreement in the re-negotiation due to changes in contract state	0.800	
	The scale of re-negotiation caused by design defects of terms in contract implementation	0.787	
	In decision-making of state compensation, the two parties take the real situation into full consideration and adjust initial terms.	0.692	0.759
	The contracting parties shall not focus on the gains and losses of one party, rather they shall decide state compensation according to the value of the	0.853	

	project and balance in interests.		
	The contracting parties fully share information in re-negotiation, without shuffling	0.775	
	The level of satisfaction to the final compensation plans of the contracting parties, and the level of the plan's incentive.	0.733	

5.3.2 Validity testing of the scale

The measurement tools in this research were finalized after multiple literature reviews and expert pre-testing considered having good content validity and criterion validity, which leaves the key issue in validity testing of the measurement tools in constructing validity. Currently, contrast validity is usually measured by means of confirmatory factor analysis in the academic community. KMO (Kaiser-Meyer-Olkin) measure and Bartlett' test was conducted to test the sample data of the trust scale, the scale of proper risk allocation embedded in contract flexibility and risk re-allocation scale under contract state compensation in this thesis. The KMO values of which are respectively 0.792, 0.788, 0.733, is conforming to the rule that $KMO > 0.7$. The statistics are shown in Table28.

Table 28 KMO measure and Bartlett's test of the scale

		T scale	FRA scale	R scale	Overall
KMO measure		0.792	0.788	0.733	.755
Bartlett's test	Chi-square value	913.966	283.315	435.873	1846.867
	Degree of freedom	66	21	28	276
	Statistical significance	.000	.000	.000	.000

5.4 Data fitting analysis on theoretical hypothesis model

5.4.1 Selection of the data processing method of theoretical hypothesis models

1. Selection of the data processing method

The situational variable (trust) in this thesis can perform not only as the driving element of independent variable (proper risk allocation embedded in contract flexibility), but also as a coordinator impacting the relationship between independent and dependent variables. Since the theoretical hypothesis model this thesis builds cannot only test driving effects but also coordination effects, deliberations were made over the selection of empirical analysis approach based on the reliability and enforceability.

After comparing the processing approaches of structural equation modeling and regression analysis, the research by Luo Shengqiang (2010) clearly showed that the most universal way of testing adjusting effect is by implementing modulated multiple regression. In addition, research conducted by Farh and Earley (1997) showed that situation can be the driving element of independent variables and can also be the modulation variable changing the relationship between independent variables and dependent variables. Their research showed that different cultural situations are the antecedent variables. In contrast however, Individual tradition in the cultural situation is the modulation variable between citizen behaviors and integrity of an organization. They used modulated multiple regression to verify the effectiveness of theoretical models and hypothesis in the research. Furthermore, Li Dayuan and Baohua Xiang (2009) also used the same data approach of regression analysis when analyzing the modulation effect of environmental uncertainty on the dynamic competency of enterprises.

2. Decision on the driving/ modulation effect test procedure

According to Sharma's (1981) modulation testing procedure based on regression analysis, this research first applies significance test on the interaction item of trust

(hypothesis modulation variable) and proper risk allocation embedded in contract flexibility (independent variable), where positive result indicates valid modulation effects. If the result is negative, correlation test is required between trust (hypothesis modulation variable) and risk re-allocation under contract state compensation (dependent variable) or proper risk allocation embedded in contract flexibility (independent variable). There are two analysis approaches: if they are correlated, it means that there is no modulation effect; if they are not, package detection shall be conducted, and significant differences among the RZ values indicate valid modulation effects, and vice versa.

According to the analysis on test procedures above, the theoretical hypothesis model in this thesis are tested in the sequence of “H1-H3-H2”.

5.4.2 Theoretical hypothesis model testing and data analysis

1. Test on the correlation between trust and proper risk allocation embedded in contract flexibility (driving effect).

Hypothesis H1 assumes that trust has positive influence, in another term, the driving effect on proper risk allocation embedded in contract flexibility. As shown in Table29, trust based on market reputation, systems or cognition are positively related to proper risk allocation, which confirms H1. Data analysis indicates that high level of trust may increase the probability of abandoning opportunistic behaviors and moral hazard expectancy. The parties may spontaneously make more flexible contracts about proper risk allocation or framework agreements in accordance with the uncertainty level of the projects in the process of making contracts. This is to ensure that they can make proper adjustments as the situation changes for a better deal on future risks. From the perspectives of behavior projection, research conducted by Zaghloul and Hartman (2003), Wong and Cheung (2005), Lau and Rowlinson (2010) showed the driving effect of trust on proper risk allocation embedded in contract flexibility where trust, either based on systems or based on market reputation, to some extent offsets people’s terror brought by information asymmetry, which help the formation of flexible terms, and softens the failure of risk projection due to limited rationality.

Although trust may prompt the formation of proper risk allocation embedded in contract flexibility, it only accounts for 18.7% of the variation. This shows that there are other elements besides trust that promote the formation of proper risk allocation. Granting that trust is a relationship governance element where to some extent conducive to contract flexibility, it does not mean that contract flexibility can take shape spontaneously. Somewhat, it is also affected by the contracting parties' consistency in understanding of flexibility mechanisms and proper risk allocation as well as regional regulations and standard contracts. Principally, the contracting parties need to form the mechanism of information sharing or transmission and reach consensus in contract flexibility based on their trusting relationship. In conclusion, proper risk allocation plans embedded in contract flexibility are the results driven by inter-organizational trusting relationships and mutual information sharing and fermenting.

Table 29 Regression analysis on trust and proper risk allocation embedded in contract flexibility

Variable type		Proper risk allocation embedded in contract flexibility	
		Model 1	Model 2
Control variable	The complexity of projects	0.143*	0.032
	Time limit for the projects	0.091	0.105
Trust (independent variable)	Trust based on market reputation	-	0.213*
	Trust based on the systems	-	0.244*
	Trust based on cognition	-	0.177*
Regression analysis	Overall model F	4.146*	11.882***
	ModulatedR ²	0.03	0.187
	Standard deviation	0.621	0.547

2. Correlation test on trust between proper risk allocations embedded in contract flexibility and risk re-allocation under contract state compensation (the modulation effect).

This thesis adopted the testing approaches and procedures above, and substituted variables including proper risk allocation embedded in contract flexibility, trust based on

market reputation and trust based on systems into the equation, hence conducted regression analysis on the equation into which the interaction terms of centralized proper risk allocation embedded in contract flexibility and trust were substituted, so that the significance of interaction terms could be observed. According to the regression analysis, as is shown in Table30, the interaction terms of trust and proper risk allocation were insignificant (the interaction term of proper risk allocation and trust based on market reputation is insignificant, $\beta=0.013$). According to the procedure, test on the correlation between trust and risk re-allocation under contract state compensation is needed. With variables significant to contract state compensation such as proper risk allocation controlled, data showed that trust among cooperation organizations of PPP projects and risk re-allocation under compensation for contract state changes are positively related (trust and performances based on market reputation $\beta_1=0.137$, $p<0.05$; trust and performances based on systems $\beta_1=0.120$, $p<0.05$; trust and performances based on cognition $\beta_1=0.122$, $p<0.05$). Therefore, hypothesis H3 is invalid, in other words, trust is not a modulation variable of proper risk allocation embedded in contract flexibility and risk re-allocation under contract state compensation. Empirical tests showed that no kind of relationships PPP project participants are in, in terms of long-term and complicated projects, existing contract flexibility terms always have positive influence on the realization of state compensation, which is consistent to the conclusion of hypothesis H2 (the influence of risk allocation with infusion of contract flexibility on state compensation).

The non-adjusting effects of trust on proper risk allocation and contract state compensation probably caused by the following factors: the reflection of the function of contract flexibility comes from the response to uncertainty in the phase of contract implementation (as it realizes the compensation for contract state through the realization of flexible proper risk allocation terms), but the scale of effect and flexible proper risk allocation designs such as procedures, risk allocation re-construction and price adjustment have been fixed in the initial contract terms in the phase of contract design, where the adjustment of trust far outweighed by the legal force of contract terms. In addition, as a psychological perception

and expectancy for economic behaviors, trust is relatively stable in the limited period when the projects are in implementation. Therefore, the adjusting function of trust is moderately limited, and trust may have more driving effect, as shown in the research conducted by Thomas Fischer and Huber (2011)

Additionally, similar conclusion has already been made by research that trusts and risk re-allocation under contract state compensation are positively related. Trust performs as a form of driving factor and activates the soft elements of project governance and management. For example, trust improves the efficacy and effectiveness of risk re-allocation by improving the satisfaction of contractors and developers to their work relationship, promoting information sharing and fermenting in the projects, as well as improving the efficiency of communication in multi-organizational projects. However, notably, compared to system-based trust, the correlation between trust based on market reputation and performances is weaker. This indicates that the PPP projects in China, the formation and spread of market reputation are to some extent suppressed, where the problem of information distortion exists, and the effectiveness signaled by market reputation is yet to be improved.

Table 30 Analysis on the adjustment effect of trust on the correlation between proper risk allocation and state compensation

Viable measurement	β	β_1	Adjust R ²	Variance factor
The complexity of project	0.165*			1.413
Time limit of project	0.14			1.413
Proper risk allocation embedded in contract flexibility (a)	0.651***			1.252
Trust based on market reputation (b)	0.11*	0.137*	0.527	1.177
(a)x(b)	0.013		0.522	1.179
Proper risk allocation embedded in contract flexibility (a)	0.717***			1.121
Trust based on systems(c)	0.0721	0.120*	0.525	1.167
(a)x(c)	0.061		0.523	1.041
Proper risk allocation embedded in contract flexibility (a)	0.622***			1.151
Trust based on cognition (d)	0.10*	0.122*		1.166
(a)x(d)	0.011			1.131

3. The correlation between proper risk allocations embedded in contract flexibility and risk re-allocation under the compensation for contract state change.

According to hypothesis H2 and its sub-hypothesis, from the perspective of incomplete contract, there is potential correlation between proper risk allocation embedded in contract flexibility and compensation for contract state. This hypothesis was tested using moderated multiple regression analysis (as is shown in Table 31). With the controlled time limitation and complexity of projects, the incentive flexibility involved in proper risk allocation embedded in contract flexibility ($\beta=0.271$, $p<0.001$), flexibility in re-negotiation ($\beta=0.307$, $p<0.001$) and flexibility in price adjustment ($\beta=0.207$, $p<0.01$) are all related to the realization of compensation of contract state changes. Research conclusion of H2 indicate that in terms of complex and long-term projects, it is an effective strategy in preparation for future uncertainties to make flexible contract terms relating to proper risk allocation during bidding and contract negotiation phase, where flexible contracts endow the project themselves with the capacity of adjusting the environment under flexible mechanisms.

In fact, this conclusion is internally consistent with the former research on the correlation between initial risk allocation and risk re-allocation under the perspective of incomplete contract. Particularly, the impact of re-negotiation flexibility on risk re-allocation under contract state compensation indicate the compensation for or adjustment to initial risk allocation plans in the process of contract implementation, i.e., prompt ‘afterwards measures’ have visible effects on the realization of contract state compensation. Although Bajari Patrick and Steven (2001) raised doubts from the angle of the transaction cost in terms of flexibility adjustment, most respondents think that considering the improvement of performance indicators, the quick response to risk and the expansion of strategy space still outweigh the executor cost of contract flexibility.

Table 31 Regression analysis on proper risk allocation embedded in contract flexibility and risk re-allocation under contract state compensation

Variable type		Risk re-allocation under contract state compensation	
		Model 1 (β)	Model 2 (β)
Controlled variables	The complexity of projects	0.165*	0.052*
	Time limit for the projects	0.14	0.072
Proper risk allocation embedded in contract flexibility (independent variables)	Incentive flexibility	-	0.271***
	Re-negotiation flexibility	-	0.307***
	Price adjustment flexibility	-	0.207***
Regression analysis	Overall model F	8.066***	48.698***
	Adjusted R ²	0.059	0.519
	Standard deviation	0.695	0.492

5.5 Discussion of research results

This research analyzed the mechanism of how risk allocation embedded in contract flexibility of PPP projects realizes compensation for contract state changes, as well as trusts among the participants. The results of the empirical tests showed that with variables such as project complexity and time limit for the projects were controlled; the risk allocation plan embedded in contract flexibility has positive influence on the realization of compensation for contract state changes, where relationship is a driving variable instead of a moderation variable between contract flexibility and contract state.

Firstly, the contribution of this research is that it reveals the driving influence of trust relationship among PPP project participants on flexible terms in proper risk allocation plan, which is consistent with the ‘embeddedness view’ relating to economic activities by Granovetter (1985). In addition, according to Williamson O.E (2001), trust is a latent asset embedded in social relationship network, which does not necessarily work directly on performance in the project situation. Flexible terms in proper risk allocation plan are the medium for easing the cooperation dilemma, compensating for limited rationality and

information asymmetry. Although project contract governance behavior and the relationship situation of the contracting parties are intertwined, relationship situation should be an antecedent variable instead of modulation variable. By testing the modulation effect of trust to risk allocation embedded in contract flexibility and risk re-allocation under the compensation for contract state changes, this research found that the influence of risk allocation embedded in contract flexibility on the realization of contract state compensation is not sensitive to the relationship situation, since contract restraint makes it less flexible.

Secondly, trust and proper risk allocation embedded in contract flexibility both have positive influence on risk re-allocation under contract state compensation. This conclusion responds to and expands the heated discussion relating to the joint influence of relationship governance and contract governance on performances based on project governance theory, i.e., there is a third effect besides complementary effect and substitution effect. Based on the relationship between trust and contract flexibility, this thesis produces driving effect of relationship governance on contract governance, i.e. the “relationship governance, contract governance, performances” relationship. In addition, the current correlation studies relating to contract flexibility and contract state compensation mostly focused on theoretical deduction without empirical analysis. This research, however, relates contract flexibility with trust, and form a measurement scale by putting incentive flexibility, re-negotiation flexibility and price flexibility into practical situations, which preliminarily analyzed the relationship among proper risk allocation embedded in contract flexibility in PPP project, as well as trust and risk allocation under contract state compensation.

Chapter 6: Conclusion, limitation and outlook

6.1 Research conclusion

Firstly, empirical research shows that incentive flexibility, re-negotiation flexibility and price-adjustment flexibility are closely related to risk re-allocation with compensation to the changes of contract status. In the design of contract terms for PPP projects, dynamic incentives and flexible re-negotiation should be emphasized and entrenched term traps should be prevented. Correspondingly, proper risk allocation plans embedded in contract flexibility are made during the phase of contract design, while their effects are not manifested until the process of managing risks during the phase of contract implementation, where time and space mismatches exist.

Secondly, trust is the driving variable in the formation of proper risk allocation plans embedded in contract flexibility. According to the research, trust of PPP project participants is like a set of situational parameters, which has influence on the transaction process of projects embedded in it and the attitudes of both parties and does not easily change in short terms. Without the guidance of former cooperation experiences, pre-qualification is the only approach to select trustworthy cooperators for PPP projects, and the contract sample and terms can be decided accordingly. When there is high level of trust, the requirement for the completeness of initial contract can be loosened, and emphasis mainly on the design of afterwards supports systems. When trust is insufficient, initial contract terms are strictly and discreetly designed, to lower the expectancy for opportunistic behavior and moral hazards in the phase of contract implementation. However, research has found that in practice, excessive exemption terms are sometimes added in PPP projects due to the lack of trust. In fact, such action to avoid risks is obstructive for the performance of projects. This is because, contract without flexible adjustment mechanisms, exemption terms would certainly increase the bidding price of PPP projects, or even perhaps prompts the parties to take advantage of

loopholes, which may start a vicious circle of distrust, compromise project performances, and eventually result in the failure of projects. Zhou Yin, and Zhuang Guijun (2013) and some other scholars discussed the relationship situation of organizations and the association of opportunistic behavior from the perspective of relationship governance. In conclusion, the competition game caused by distrust may result in PPP project participants not being able to manage the project attentively, and the project situation not being in harmony, which may eventually prevent the governance performances of the projects from continuously improving.

6.2 Research enlightenment

PPP project participants should be fully aware that risk allocation exists throughout the whole project and is dynamic. The more intricate and longer a project is, the less likely the contract terms in initial risk allocation plans in the phase of contract design to reach perfection, and thus the design of future adjustment mechanisms becomes more crucial. Therefore, properly designed re-allocation mechanisms to prepare for risks such as price adjustment in the phase of contract implementation and alteration are not only an effective approach to compensate for contract status changes, but also a feasible way to optimize risk allocation dynamics. Hence, the following two points should be taken into consideration in the design process of PPP contract terms in practice: firstly, in the phase of contract design, PPP project participants shall enhance communication as they negotiate the initial contract terms, where they should pay critical attention to the design of the response time of flexibility effect in risk re-allocation, the response program of re-negotiation and the selectable strategies. They should establish support systems effective for afterwards governance, turn incomplete contracts into complete contracts, and not to deem flexibility contract as simplified contracts. Secondly, risk incidents in the process of contract implementation shall be designed by initial terms that are not rigorous, where compensation principles of contract status based on the contingency of project situations need to be highlighted. Particularly, for projects with complex situations and uncertain risks, targeted supplemental frame agreements

should be signed, to compensate for the low implementation rate of initial terms, realize effective compensation for changes in contract status, and prompt the governance cooperation between the contracting parties.

In the matter of trust governance, areas where potential conflicts of PPP projects exist shall be paid attention to, third-party engineers shall exert their full effects: (1) the deterioration of trusting relationships between PPP project participants and engineers; (2) the positioning of the role of engineers and their independence compared to PPP project participants; (3) the unilateral intention to transfer risks to the other party, especially when it concerns design; (4) the lack of complete legal systems and mutual trust between the parties.

It can be found through theories and empirical analysis that improving the level of initial trust among PPP project participants and maintaining high trust level in the phase of contract implementation are important factors to form effective proper risk allocation plans and realize follow-up contract status compensation. In standard contract governance system, improving high efficiency of relationship governance through contract design has become a factor to be considered in the design of all project contracts.

6.3 Research innovation

1. Establish the theoretical frame of the influencing mechanisms of trust on risk allocation, and provide a new perspective for risk allocation research in PPP projects

Former research on risk allocation of PPP project mainly focuses on allocation process and contract design, while this research inventively added the element of trust, which expands the existing theories; from the perspective of project practices, revealing the path of how trust influences risk allocation can provide proper risk allocation strategies based on trust for contracting parties, such as the pre-qualification in initial risk allocation and the improvement of bidding systems. It also provides relationship-based governance strategies for the risk re-allocation process which involves alteration and claims for compensation during contract implementation phase.

2. The combination of qualitative and quantitative analysis improves the reliability of data concerning trust and the reliability of this research

On the one hand, the design of semi-structured interview based on situation simulation level by level provides reliable data from PPP practices for the exploratory research on the influence of trust on risk allocation. In the holistic research design, exploratory research under the analysis of qualitative materials also provides theoretical approaches for follow-up research hypothesis and the deduction of theoretical models. On the other hand, the integration module of data collection, processing and analysis of interviewee focus groups based on optimal projection of PPP practices also makes the acquisition of data concerning trust more targeted.

6.4 Research limitations and outlooks

The limitations of this research lie in the following three aspects:

First, the lack of detailed empirical analysis about the influence of elements including industry attributes, project scales, and enterprise scales on the trust of contracting parties and contract flexibility, and the impact of the differences in industry characteristics and project characteristics on the outcome of the research has been ignored. Because the research samples and research design are not targeted enough, this research did not take the influence of control variables such as industry attributes and project attributes on the research outcomes into consideration, which is exactly the space for further exploration in the future.

Second, trust is a dynamic and process-focused conceptual system. To be more convincing and precise, it is better to respectively describe the level of trust at different points of time, namely during bidding, contract design and contract implementation, and then make correlation tests between trust levels and risk allocation at each point of time.

Third, the empirical research did not analyze the data by method of sample stratification, which means of the data were analyzed by public and private participants of PPP projects respectively and independently, consequently comparing them for differences. This is also where further research can explore.

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Appendix

Appendix A - Interview Outline

Appendix B – Questionnaire Form

Interview Outline

Hello,

My name is Meng Gongming, I am a PHD candidate of ISCTE-IUL. Currently a doctoral thesis is being written under the guidance of Professor Néilson António and Professor Virginia Trigo, this project is named as “the Mechanism research on the influence of trust of PPP Project on risk allocation”. The research purport of this thesis consists of three parts: (1)to analyze the feature elements of the formation of trust of PPP project’s participants;(2) the dynamic characteristic structures and proper representations of risk allocation of PPP projects from the perspective of incomplete contracts; (3)the mechanisms and paths of the influence of trust on risk allocation.

To complete this research thesis, I sincerely demand your help of providing opinions and suggestions. It will be grateful accepting a interview between us, which will not take longer than 90mins.The content of this interview is expecting you to provide your professional suggestions based on academic ethics and will not open to the public. The final analysis result is only for academic reference purposes. The relevant interview questionnaire is enclosed.

Thanks for your time. I wish you have a healthy body and all the best!

Topic (1): In term of your previous successful PPP projects, do you think the risk allocation scheme is reasonable in designing contract terms? What are the important features of a reasonable risk allocation term should have?

Topic (2): Do you think risk allocation terms in the contracts and the risk allocation incidents in contract implementation (such as negotiations concerning the risks that have not been agreed upon) are connected? If so, how are they connected?

Topic (3): What factors do you think will affect the risk allocation terms on PPP project participants? If the trust relationship is an important factor, how do you think this trust relationship is formed?

Topic (4): Will the trust relationship have a positive or negative impact on a reasonable risk allocation plan? For example, is a trust relationship either strengthened or weakened the pursuit of proper risk allocation terms?

Topic (5): In the process of contract implementation, how is the trust of PPP project participants influence the risk allocation adjustment process?

The original interview outline in Chinese

访谈提纲

您好！

我是 ISCTE-IUL 博士候选人孟恭明，目前在 **Nélson António and Virginia Trigo** 教授的指导之下，正在进行博士论文的撰写工作，题目为：PPP 项目中信任对风险分担的影响机制研究。本论文研究的主旨有三：（1）分析 PPP 项目合作伙伴信任形成特征要素；（2）不完全契约视角下 PPP 项目风险分担动态特征结构及合理性表征；（3）信任对风险分担的作用机理与路径为何？

对此，本论文亟需您提供宝贵意见以供研究，恳请，您在百忙中拨冗接受访谈中拨冗接受访谈，时间约略为一小时至一小时半。访谈内容依照学术研究伦理，并不对外开放，而资料最终的分析结果，亦仅供学术参考之用。随函附上相关访谈提纲。

并祝

身体健康 万事如意！

问题（1）：在您所参与的一项成功的 PPP 项目中，您认为合同条款设计中的风险分担方案合理吗？您认为合理风险分担条款应具备哪些重要特征？

问题（2）：您认为合同中的风险分担条款与履约过程中的风险分担事件（如对未约定的风险进行协商谈判）是否有联系、具有何种联系？

问题（3）：您认为何种因素会影响 PPP 项目合作伙伴的风险分担条款？如果信任关系是重要的影响因素，您觉得这种信任关系是如何形成的？

问题（4）：信任关系对合理风险分担方案是正向影响还是负向影响？例如，信任关系是强化了对合理风险分担条款的追求，抑或是降低？

问题（5）：履约过程中，PPP 项目合作伙伴信任是如何影响风险分担调整过程的？

The questionnaires of the influencing relationship between trust and risk allocation of PPP projects

Hello,

My name is Meng Gongming, I am a PHD candidate of ISCTE-IUL. Currently a doctoral thesis is being written under the guidance of Professor Néilson António and Professor Virginia Trigo, this project is named as “the Mechanism research on the influence of trust of PPP Project on risk allocation”. The research purport of this thesis consists of three parts: (1st) to analyze the feature elements of the formation of trust of PPP project’s participants from the elements of trust forming features;(2nd) the dynamic characteristic structures and proper representations of risk allocation of PPP projects from the perspective of incomplete contracts; 3) the mechanisms and paths of the influence of trust on risk allocation.

I sincerely demand your assistance of making time filling in this questionnaire by providing opinions and suggestions. All your answers to this survey are anonymous. The final analysis result is only for scientific statistical analysis. We will keep your information confidential under the statistical law of the People’s Republic of China; your answers will not have any adverse effects on you personally.

If you have any questions, please do not hesitate to contact me (Meng Gongming)

My cell phone: 13910520603

E-mail:mgm1968@126.com

Thanks for your cooperation!

A. Personal information (please tick in the right option)

1. Your gender: Male() Female()

2. Your age range: 1) Less than 30 year old 2) 30 to 40 year old
3) 40 to 50 year old 4) over50 year old

3. Your degree of education: 1) Doctor 2) Graduate 3) Undergraduate

4. Your job title: 1) Senior manager 2) Mid-level manager 3) Others

5. The length of working experience: 1) less than 1 year 2) 5 to 8 years
3) 8 to 10 years 4) over 10 years

6. The name of the unit you are working for (include city name):

7. Unit character: 1) Public department 2) Private department 3) others

8. Type of projects: 1) Medical service 2) Municipal administration 3) Road
4) Railway 5) Water conservancy and hydropower

9. Investment scale of projects (RMB): 1) 10-100million 2) 100-300million
3) 300-1000million 4) Over 1000million

10. Contract type: 1) Gross price 2) Unit price

B. The trust of PPP project (please tick in the grid you choose)

The following factors are considered to assess the success or failure of the trust of PPP project. Please relate to your own circumstance, identify and select the levels of importance on each factor.

Serial number	Description	Very important (5point)	Important (4 point)	Relatively important (3point)	Less important (2point)	Not important (1point)
1	The other party has sufficient management capability to complete the project					
2	The other party has excellent experience of similar projects in history					
3	Deployed personnel of the other party has sufficient capability					
4	The other party strictly abides and fulfill the contract					
5	The other party follows the ethics of the market					
6	The other party will positively carry out the information exchange according to the project system					
7	The other party is a trust-worthy project partner					
8	The other party has integrity in project management					
9	The other partner will not damage the interests of partners in the project management					

C. Reasonable risk sharing of contract flexibility (please tick in the grid you choose)

The following factors are considered to assess the success or failure of reasonable risk allocation regard to the process of embedding PPP project Contract flexibility. Please relate to your own circumstance, identify and select the levels of importance on each factor.

Serial number	Description	Very important (5point)	Important (4 point)	Relatively important (3point)	Less important (2point)	Not important (1point)
1	The terms of the contract design a flexible and quick react method to renegotiating					
2	The terms of the contract design a wide range of procedures in response as a precaution to unforeseen events					
3	The terms of the contract will be adjusted according to the actual situation in view of the price					
4	The terms of contract include a delaying mechanism in case of disputing price					
5	The terms of the contract are designed to benefit from the relevance of the final performance of the project					
6	The terms of the contract design a certain degree of independent management power to deal with specific risk					
7	A flexible incentive mechanism was designed in the terms of the contract					

D. Investigation on the effect of project investment (please tick in the grid you choose)

The following factors are considered to assess the success or failure of the risk allocation with a compensation of the PPP project contract status. Please relate to your own circumstance, identify the levels of importance of each factor.

Serial number	Description	Very important (5point)	important (4 point)	Relatively important (3point)	Less important (2point)	Not important (1point)
1	A negotiation from changes in the contract status and as result respectively agreed upon a range of adjustments					
2	There are renegotiation in the process of contract implementation due to the designed issues of the contact term					
3	In the state compensation decision, both parties take full account of the degree of the actual situation and adjust the initial clause if necessary					
4	Both parties of the contract do not focus on either one's own interests in any part of negotiation, whereas such issues are based on the value of the project and the balance of interests					

5	Both parties are expected to achieve information sharing agreement in the negotiations, more importantly, there is no prevarication.					
6	Both parties have a common degree of the satisfaction to the final compensation plan and the degree of the incentive scheme					

Thank you so much for your time!

The original questionnaires of the influencing relationship between trust and risk allocation
of PPP projects in Chinese

PPP项目信任与风险分担影响关系调查问卷

您好！

我是 ISCTE-IUL 博士候选人孟恭明，目前在 **Professor Nélon António and Professor Virginia Trigo** 的指导之下，正在进行博士论文的撰写工作，题目为：PPP 项目中信任对风险分担的影响机制研究。本论文研究的主旨有三：（1）分析 PPP 项目合作伙伴信任形成特征要素；（2）不完全契约视角下 PPP 项目风险分担动态特征结构及合理性表征；（3）信任对风险分担的作用机理与路径为何？亟需您大力协助拨空填写此份问卷，以提供宝贵意见进行参酌。您对本问卷的所有回答都是匿名的，问卷结果只用于科学统计分析，对您的个人资料，我们将根据《中华人民共和国统计法》予以保密，问卷回答不会对您个人产生任何不良影响。

填写问卷过程中如有疑问，请与我（孟恭明）联系：

个人电话：13910520603；

E-mail: mgm1968@126.com

谢谢！

一、 个人情况（请在符合的选项下划“√”，没有选项的请作答）

1您的性别：男（ ） 女（ ）

2您的年龄： 1) 小于30岁； 2) 30-40岁；
3) 40-50岁； 4) 50岁以上

3您的文化程度： 1) 博士； 2) 硕士； 3) 本科

4您的职务： 1) 高层管理人员； 2) 中层管理人员； 3) 其他

5您从事项目工作的年限： 1) 1年以下； 2) 5年-8年；
3) 8年-10年； 4) 10年以上

6您的单位名称（含城市名）是：

7单位性质： 1) 政府公共部门； 2) 私企 3) 其它

8 项目类型： 1) 医疗服务； 2) 市政； 3) 公路；
4) 铁路； 5) 水利水电

9 项目投资规模： 1) 1000万-1亿； 2) 1亿-3亿
3) 3亿-10亿； 4) 10亿以上

10合同类型： 1) 总价合同 2) 单价合同

二、PPP项目信任（请在符合的选项下划“√”）

以下因素被认为与PPP项目信任的成败有关，请您根据自身的体会，对各因素的重要程度予以标识。

序号	描 述	非常 重要 (5分)	重 要 (4分)	比 较 重 要 (3分)	不 太 重 要 (2分)	不 重 要 (1分)
1	对方有足够的管理能力完成项目					
2	对方曾经优秀的完成过类似项目					
3	对方派驻人员具有足够的的能力					
4	对方会严格遵守合同进行履约					
5	对方会遵守市场中的道德规范					
6	对方会依项目制度积极进行信息交流					
7	对方是值得信赖的项目合作伙伴					
8	对方在项目管理中具有正直性					
9	对方在项目管理中不会损害合作方的利益					

三、嵌入合同柔性的合理风险分担（请在符合的选项下划“√”）

以下因素被认为与嵌入合同柔性的合理风险分担的成败有关，请您根据自身的体会，对各因素的重要程度予以标识。

序号	描述	非常重要 (5分)	重要 (4分)	比较重要 (3分)	不太重要 (2分)	不重要 (1分)
1	合同条款设计了灵活快速的再谈判程序					
2	合同条款设计了较宽范围内的不可预见事件的响应程序					
3	合同条款针对价格进行了可依现实情景进行调整的规定					
4	合同条款设计了可行的价格争议延迟处理机制					
5	合同条款设计了受益于项目最终绩效的相关性					
6	合同条款设计了一定程度下的风险应对自主管理权力					
7	合同条款中设计了灵活的激励机制					

四、项目投资效果调查（请在符合的选项下划“√”）

以下因素被认为与合同状态补偿下的风险再分担的成败有关，请您根据自身的体会，对各因素的重要程度予以标识。

序号	描述	非常重要 (5分)	重要 (4分)	比较重要 (3分)	不太重要 (2分)	不重要 (1分)
1	因合同状态变化而进行的谈判，并达成一致的调整幅度					
2	合同履行中，因出时条款设计问题而引发的再谈判规模					
3	在状态补偿决策中，双方充分考虑现实羡慕情景状况的程度，并对初始条款做出调整					
4	合同双方不以一方得失作为谈判焦点，而是以项目价值及利益平衡性作为状态补偿的依据					
5	合同双方能够在再谈判中实现信息共享的程度，没有推诿现象					
6	合同双方对最终补偿方案满意程度，方案的激励性程度					

您辛苦了，谢谢您的合作！