# A RISK-BASED WILLINGNESS MODEL FOR STRATEGIC INVESTMENT OF THE PRIVATE SECTOR IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION INFRASTRUCTURE PROJECTS IN VIETNAM

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# แบบจำลองความพร้อมซึ่งอาศัยความเสี่ยงสำหรับการลงทุนเชิงกลยุทธ์ของภาคเอกชนในโครงสร้างพื้นฐานด้านการขนส่งแบบความร่วมมือระหว่างรัฐและเอกชนในประเทศเวียดนาม

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรดุษฎีบัณฑิต
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ความต้องการที่เพิ่มขึ้นอย่างรวดเร็วและความไม่มีประสิทธิภาพในการจัดหาทุนสำหรับโครงการโครงสร้างพื้นฐานด้านการขนส่งก่อให้เกิดปัญหาหลายประการสำหรับประเทศเวียดนามในช่วงหลายทศวรรษที่ผ่านมา เนื่องจากงบประมาณของประเทศไม่เพียงพอสำหรับการลงทุนในโครงการโครงสร้างพื้นฐานที่จำเป็นทั้งหมด ดังนั้นรัฐบาลเวียดนามจึงได้เชิญชวนภาคส่วนเศรษฐกิจอื่น ๆ โดยเฉพาะอย่างยิ่งภาคเอกชนมาร่วมพัฒนาโครงสร้างพื้นฐาน ความร่วมมือระหว่างภาครัฐและภาคเอกชน ซึ่งเรียกว่า Public-Private Partnership (PPP) มักจะต้องเผชิญกับความท้าทายมากมายทำให้ไม่เป็นที่ดึงดูดความสนใจของผู้ลงทุนเอกชน เหตุผลหลักประการหนึ่งคือผู้ลงทุนเอกชนจะต้องเผชิญกับความเสี่ยงที่วิกฤตอันเกี่ยวข้องกับสภาพแวดล้อมในการลงทุนหลายตัว สิ่งนี้เป็นงานอันท้าทายสำหรับรัฐบาลในการจัดการความเสี่ยงดังกล่าวอย่างเหมาะสมเพื่อเพิ่มความน่าสนใจในการลงทุนในโครงการ PPP สำหรับผู้ลงทุนเอกชน งานวิจัยนี้ศึกษาเกี่ยวกับข้อกังวล ปัจจัยเสี่ยง ความปรารถนาในการลงทุน (investment willingness) กลยุทธ์ในการตอบโต้ความเสี่ยง เครื่องมือช่วยในการตัดสินใจ ของผู้ลงทุนเอกชนเมื่อต้องลงทุนในโครงการโครงสร้างพื้นฐานด้านการขนส่งในรูปแบบ PPP ในประเทศเวียดนาม รายละเอียดของประเด็นเหล่านี้ได้ถูกรวบรวมเบื้องต้นโดยการทบทวนข้อมูลในอดีตอย่างละเอียด เพื่อสะท้อนลักษณะเฉพาะของโครงการ PPP ในเวียดนาม ผลจากการรวบรวมจะถูกทบทวนโดยกลุ่มผู้เชี่ยวชาญด้าน PPP จากภาครัฐและภาคเอกชนในเวียดนามโดยการสัมภาษณ์เชิงลึกและการสำรวจทางแบบสอบถาม นอกจากนั้นโครงการ PPP กรณีศึกษาในเวียดนามจำนวน 10 โครงการจะถูกวิเคราะห์เพื่อสร้างโพรไฟล์ของโครงการประเภทนี้ งานวิจัยพบว่าข้อกังวลที่สำคัญสำหรับผู้ลงทุนเอกชนคือ ความสามารถ (capacity) ของผู้ลงทุน ประเด็นความต้องการ ความเสี่ยงด้านกฎหมายและการเมือง รายได้ระยะยาว และแหล่งเงินทุน นอกจากนั้นงานวิจัยยังพบปัจจัยเสี่ยง 5 ประการซึ่งภาคเอกชนและภาครัฐเห็นแตกต่างกันอย่างมีนัยสำคัญ คือ ความเสี่ยงด้านการเมือง การเพิ่มความแข็งแกร่งของบริษัทในอุตสาหกรรม ความเสี่ยงในด้านการก่อสร้าง ประเด็นความต้องการ และความอยู่รอดทางการเงินของบริษัท ปัจจัยเสี่ยงในโครงการโครงสร้างพื้นฐานด้านการขนส่งที่ถูกระบุก่อนหน้านี้ได้ถูกประเมินเชิงปริมาณโดยอาศัยความน่าจะเป็นและระดับผลกระทบของพวกมัน เราพบว่าปัจจัยเสี่ยงที่สำคัญ ได้แก่ การได้มาและการชดเชยเรื่องที่ดิน การขอรับรองและการขอใบอนุญาต การศึกษาความเป็นไปได้ที่ไม่เหมาะสม ตลาดการเงิน วิธีประเมินเชิงจิตวิสัย (subjective) และการเปลี่ยนแปลงของกฎหมายและข้อบังคับต่าง ๆ จากนั้นงานวิจัยใช้วิธี factor analysis เพื่อจำแนกปัจจัยเสี่ยงที่สำคัญเหล่านี้ออกเป็นสี่กลุ่ม คือ (1) กระบวนการประกวดราคา (2) ประเด็นการเงิน (3) กฎหมายและข้อบังคับ และ (4) ประเด็นการประเมินโครงการ ข้อมูลที่ได้จากการสำรวจโดยอาศัยแบบสอบถามได้ถูกวิเคราะห์โดยวิธี structural equation model (SEM) จากนั้นแบบจำลองเพื่อประเมินความปรารถนาในการลงทุนโดยอาศัยความเสี่ยง (Risk-based Investment Willingness Assessment Model, RIWAM) ได้ถูกพัฒนาขึ้นเพื่อวิเคราะห์ความสัมพันธ์ระหว่างปัจจัยเสี่ยงต่าง ๆ ที่มีผลกระทบต่อโครงการ ความปรารถนาในการลงทุน และกลยุทธ์การตอบสนองความเสี่ยงของภาคเอกชน ผลวิจัยได้บ่งชี้ว่า การเงินและกระบวนการในการประกวดราคาและความเป็นไปได้ของโครงการมีความสำคัญต่อความปรารถนาในการลงทุนของภาคเอกชนในโครงการ PPP ดังนั้นจึงเป็นปัจจัยกำหนด (determinants) การดึงดูดผู้ลงทุนเอกชน นอกจากนั้นยังพบว่าประเด็นด้านการเงิน ความสามารถของผู้ร่วมลงทุน และความปรารถนาในการลงทุนของภาคเอกชนมีอิทธิพลอย่างมากต่อกลยุทธ์การตอบโต้ความเสี่ยงของพวกเขา งานวิจัยนี้ได้ระบุเกณฑ์เกี่ยวกับความปรารถนาในการลงทุน 28 ตัวซึ่งถูกนำไปใช้ในเครื่องมือการประเมินการตัดสินใจโดยวิธี FAHP และ TOPSIS เพื่อช่วยผู้ลงทุนเอกชนในการระบุโครงการ PPP ที่เหมาะสมที่สุดจากโครงการทั้งหมดที่มี

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ลายมือชื่อนิสิต .....
ลายมือชื่อ อ.ที่ปรึกษาหลัก .....
ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

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SY TIEN DO: A RISK-BASED WILLINGNESS MODEL FOR STRATEGIC INVESTMENT OF THE PRIVATE SECTOR IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION INFRASTRUCTURE PROJECTS IN VIETNAM. ADVISOR: ASSOC. PROF. VEERASAK LIKHITRUANGSILP, Ph.D., CO-ADVISOR: ASST. PROF. MASAMITSU ONISHI, D.Eng., 319 pp.

The rapidly increasing demand and the inefficacy of financing transportation infrastructure project investments have contributed to various challenges for Vietnam in recent decades. Since the country's budget is inadequate for investing in all necessary infrastructure projects, the Vietnamese government has been inviting other economic sectors, especially the private sector, to participate in infrastructure development. The cooperation between government agencies and private entities, called public-private partnership (PPP), must encounter various challenges leading to difficulties in attracting private investors. A main reason is that private investors must deal with critical risks concerning PPP investment environments. It is a challenging task for the government to optimally manage such risks to enhance the attractiveness of PPP projects for private investors. This research investigates concern factors, risk factors, investment willingness, risk-responsive strategies, and decision support tools for private investors when promoting investment capitals in the PPP transportation infrastructure projects in Vietnam. Details of these issues were preliminarily compiled by comprehensive literature review. To reflect unique characteristics of PPP projects in Vietnam, the compiled results are reviewed by a group of PPP experts from both public and private sectors in Vietnam through in-depth interviews and questionnaire surveys. In addition, ten PPP project case studies in Vietnam are analyzed to derive the profile of PPP transportation projects. The results shows that the most concern factors of private investors are their own capacity, demand issues, legal and political risks, long-term income, and financial sources. There are five risk factors that represent a significant difference between the private sector and the public sector's perceptions are political risks, enhancement of company's strength in its industry, construction risks, demand issues, and financial viability of the company. The risk factors of PPP transportation infrastructure projects in Vietnam previously identified are quantitatively assessed based on their probabilities and impact levels. The critical risk factors are land acquisition and compensation, approvals and permits, inadequate feasibility studies, finance market, subjective evaluation methods, and change in laws and regulations. By performing factor analysis, these critical risk factors are grouped into four categories: (1) bidding process, (2) finance issues, (3) laws and regulations, and (4) project evaluation issues. The data attained from a questionnaire survey is analyzed by the structural equation model (SEM) approach. A risk-based investment willingness assessment model (RIWAM) is developed to examine the relations of different risk factors affecting PPP projects, investment willingness, and risk-responsive strategies of the private sector. The results indicates that bidding finance, bidding process, and project feasibility are critical to the investment willingness of the private sector in PPP projects. Thus, they are determinants for attracting private investors. Finance, partners' capacity, and investment willingness of the private sector have strong influence on their risk-responsive strategies. Twenty-eight investment willingness criteria are identified and applied to a decision-making assessment tool (DMAT) through FAHP and TOPSIS approaches to support private investors to identify the optimal PPP projects among all potential PPP projects.

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| Field of Study: | Civil Engineering | Advisor's Signature | ---------- |
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# CHAPTER 1
# INTRODUCTION

## 1.1 Background

Vietnam is currently a South-East Asian country with an abundant growth of the construction industry. However, national infrastructure systems have been underdeveloped for many decades. The transnational road systems have been overloaded and degraded without appropriate maintenance due to the nation's financial inadequacy. The government has allocated approximately 10 to 11 percent of the country's gross domestic product (GDP) annually for infrastructure investment between 2010 and 2020 (WB, 2007). For transportation infrastructure projects, Vietnam will need 75 billion USD (an average of 15 billion USD or 315 billion VND per year) between 2010 and 2015, (Decision 1327, 2009).

In recent years, infrastructure projects have been mainly funded by state budgets, government bonds, official development assistance (ODA), and the private capital. The private investment in infrastructure projects has been in various forms of Public-Private Partnership (PPP) such as Build Operate Transfer (BOT), Build Transfer (BT), and Build Transfer Operate (BTO). The World Bank estimated that the total of infrastructure investment in Vietnam reached 9.4% of GDP between 2001 and 2008 (Hoang and Xuan, 2012) or approximately 39.4 billion USD (an average of 4.9 billion USD per year). The distribution of infrastructure project financing schemes was ODA (37%); state budget, government bonds, and state-bank lending (27%); the private sector, including international investors and local enterprises (21%); users in the form of fees for services or taxes (14%); and other sources (1%) (WB, 2007).

The current situation of infrastructure financing is worrisome. The financial market in Vietnam was also threatened by inflation, which approached 20 percent in 2011, double of that in 2010 (Schwab and Sala-i-Martín, 2012). To alleviate this problem, the State Bank of Vietnam tightened its monetary policy, which made access to credit more difficult. Because Vietnam has been excluded from underdeveloped-countries list, ODA fund is limited. Attracting investment through government bonds is also

ineffective due to a low rate of return and illiquidity. In order to address such challenge, the government has called for the participation of different economic sectors, especially private investors. Private capital (i.e., foreign direct and domestic capital investment) has been the primary source for funding infrastructure development.

Vietnam has been attempting to attract both domestic and overseas private investors to capitalize in infrastructure projects in a business form called public-private partnership (PPP). Theoretically, PPP can address the nation's financial inadequacy by exploiting the private sector's resources such as capital, work experience, technology, and innovation. In past decades, PPP has been widely used in many countries around the world and has been considered an effective method to capitalize infrastructure . PPP yields various benefits, including being able to access private capital (ADB, 2000), increasing the value of money, completing a project on schedule (Bing et al., 2005) and improving the quality of service (Akintoye et al., 2003). PPP can also help improve the economy of several countries (e.g., Hensher and Brewer (2000); Raisbeck, 2009). However, infrastructure PPP projects often involve many political, legal, economic, environmental issues with several risks and uncertainties. In fact, lack of government's experience, different expectations between public and private sectors, lack of clear objectives and commitment of government, and inadequate legal frameworks (Kwak et al., 2009).

The global financial crisis in 2008 created many challenges for funding transportation projects leading a significant decline of world PPP markets. However, PPP quickly recovered and returned to the point before the crisis (WB, 2010). PPP is still considered one of the appropriate solutions to deal with current instability (Ion, 2009; Mazars, 2009).

Since 1993, a number of infrastructure projects in Vietnam, especially transportation infrastructure, have been developed in different forms of PPP such as Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), Build-Transfer (BT), PPP pilot (introduced in 2010), and PPP (introduced in 2015). The legislations regarding BOT, BTO, and BT projects were issued at the end of 2009 (Decree108, 2009) and revised in early 2011. The government also introduced PPP pilot regulations (Decision71, 2010), which were implemented in some projects. The latest law about PPP has just been

issued in April 2015 and is quite new for both public and private sectors (Decree 15, 2015).

It is evident that the PPP transportation projects in Vietnam have encountered with various problems such as lack of transparency in the business environment, inadequate legal framework, complex procurement procedure, and problems to attract potential investors. Since the number of previous research works on this issue is extremely limited, this research aims to uncover concern factors, risk factors, investment willingness, responsive strategies, and decision-making assistant tool for private investors when they would like to promote investment capitals in the PPP transportation projects in Vietnam.

Since 2012, the Vietnamese government has launched several pilot PPP projects, but some failed by attracting the participation of private investor. Stemming from this reason, plus the urgent demands to develop transportation infrastructure, more than 80% from their current transportation needs of passengers and goods throughout the country, a suitable PPP form for transportation projects is a necessary method to attract more investors.

### 1.2 Problem statement

PPP has been used as one of the main approaches to develop infrastructure systems worldwide. If it is well established and strictly managed, PPP can yield many benefits for the public sector such as increasing a financial capital of infrastructure projects, transferring risks from the public sector to the private sector, and increasing the value for money for infrastructure services by providing more efficient, inexpensive, and useful services. However, experience of government about PPP is greatly confined. Many PPP projects must be held on or canceled due to many reasons such as wide expectation gaps between the public and the private sector, a lack of clarity of the commitments and policies of the government, complex processes of approvals and permits, inadequate legal framework, poor risk management system, underdevelopment financial market, and a lack of transparency and competition (Kwak et al., 2009). These risks, which adversely affect the private sector's perceptions, and inappropriate policies

of government made PPP projects unattractive in developing countries such as Vietnam (Toan and Ozawa, 2008).

There have been numerous empirical studies on PPP worldwide. A lot of specific studies have confirmed that there is no standard form for PPP projects in over the world. Clearly, each country has its strategic options of context, institution, funding, and nature of PPP projects (Li et al., 2005; Ward and Sussman, 2005). They particularly stressed that the PPP projects would succeed at the countries that have strong state institutions with a complete and transparent legal framework (Maluleka and Commerce, 2008). Kwak et al. (2009) and Akintoye et al. (2003) have concluded that there was no difference in these factors between developed countries and developing countries for factors affecting the success of the PPP projects. After the financial crisis of 2008, the relationship between the PPP and the crisis became an interesting topic. Significant studies included those research by (Garvin, 2009), Ion (2009), Iyer and Sagheer (2010), and Xu et al. (2010a). The evidence from these studies confirms that the current market conditions do not exclude the PPP. This has created opportunities for countries to develop PPP more sophisticated and consistent with the change in the economic environment after the crisis. In addition, the previous research works on PPP of international economic institutions (e.g., the International Monetary Fund, World Bank, Asian Development Bank) are varied in terms of valuable scientific applications in particular which can draw lessons from the practices of developing countries that share many similarities with Vietnam.

Moreover, to achieve the most objectives throughout PPP forms, the government has implemented a series of reforms related to forms of investment include: completing the legal framework (Boyfield, 1992; Kwak et al., 2009), supporting policies of the government (Zhang and Wang, 1998), stable macroeconomic conditions and sound economic policy (Dailami and Klein, 1998; Li et al., 2005), developing capital markets (Akintoye et al., 2003), selecting the qualified partners (Tiong, 1996; Qiao and Robert, 2001; Kwak et al., 2009), carrying out a feasibility study/analysis of cost-benefit (Hambros et al., 1999), reasonable risk allocation (Sader, 2000; Qiao and Robert, 2001; Nisar, 2007), and competitiveness of bidding process (Vickram, 2009). Based on the empirical research of previous studies, generally critical success factors of PPP focused

on four main factors: (1) role of government, (2) private partner selection, (3) risk allocation, and (4) funding structure of PPP projects. Consequently, the evidence showed that the level of impact of these factors to the success or failure of the PPP projects varies, depending on the characteristics of each PPP project, and the socio-economic conditions of these countries. The developed countries pay much attention to risk allocation and funding structure (Li et al., 2005). However, for developing countries, it focuses on the four factors mentioned above.

A recent study by Toan and Ozawa (2008) concluded that a high risk in developing countries as Vietnam in private sector's perceptions and inappropriate policies of the government made it difficult to attract the private sector. When planning investment decisions on PPP schemes, the private sector shall not lose sight on the external factors (e.g. government policies, social expectations, and political environment) (Piyatrapoomi et al., 2004; Zhang, 2005b; Ng et al., 2010) and project-specific factors (e.g. profitability, risk sharing) (Schaufelberger and Wipadapisut, 2003). Therefore, addressing expectations and specifying the evaluation criteria for investment decision of the private sector are critical requirements for decision makers in PPP projects. Simultaneously, the appropriate responsive strategies are essentials to determine the success of the private sector when deciding to invest in PPP projects.

Previous research works showed that an objective, reliable, and practical risk assessment model is essential to the successful implementation of PPP projects (Xu et al., 2010). In recent years, various analytical studies including a risk assessment for international projects (Hastak and Shaked, 2000); an investment decision model for international project (Han and Diekmann, 2001); a framework for investment decision-making under risk and uncertainty (Piyatrapoomi et al., 2004); a fuzzy synthetic evaluation model (Xu et al., 2010); a interpretative structural modeling (Iyer and Sagheer, 2010); a risk-based decision-making framework (Demong and Lu, 2012) have been proposed for assessing risks of investment environment. The investors, financiers, lenders and stakeholders were concerned about investment risk assessment related to PPP projects. Based on the results of risk assessment, decision makers will then consider whether investment decisions or not (Piyatrapoomi et al., 2004; Demong and Lu, 2012).

Ho and Liu (2002) stressed the importance of demonstrating the financial viability of a PPP scheme when the initial feasibility study was conducted. Moreover, investors might not be interested in committing to a project without the attractiveness (e.g. low rate of return) (Schaufelberger and Wipadapisut, 2003). Hence, various analytical techniques including net present value-at-risk method (Ye and Tiong, 2000); return on equity, debt/cover ratio, cash-flow analysis (Tánczos and Kong, 2001); the option valuation model (Ho and Liu, 2002); and analytical hierarchy process technique (Salman et al., 2007) have been proposed for assessing the financial attractiveness of PPP projects. Besides, Ng et al. (2010) have used structural equation modeling (SEM) to establish a comprehensive framework for evaluating the initial feasibility for PPP project that would satisfy all the stakeholders. Also, when a PPP project was not viable or was too risky to be undertaken by the private sector, an important practice was that the government may grant loan guarantees to a PPP project (Ozdoganm and Birgonul, 2000; Ho and Liu, 2002). The non-viability of projects will be reflected in the bank's unwillingness to provide loans without government guarantees. Thus, it is important to private investors and the public sector to evaluate the value of the loan guarantee before to make investment decisions. A decision support framework was studied by Ozdoganm and Birgonul (2000) as used in the planning stage of a hydropower plant project in Turkey to check project viability based on some predefined critical success factors, risk sharing scenarios, and effective risk mitigation strategies. Many countries such as UK, France, Germany, and Australia used scenarios for the investigation of the effects of risk and uncertainty to project investments (Piyatrapoomi et al., 2004). Political, social, environmental, as well as economic and other related risk issues, have been addressed and included in decision-making frameworks (e.g. a multi-criteria decision-making framework). Risk-based decision-making concepts and applications have been explored by many researchers (Piyatrapoomi et al., 2004). It was found that many decisions were made based on analyzing of risk factors, then weighting, calculating and selecting the best options corresponding with the high-performance index. However, little research has been done on how to incorporate risk into willingness to invest and responsive strategies for the private sector in transportation PPP projects.

Currently, the investment environment in Vietnam cannot attract private investors to PPP transportation projects due to many challenges such as legal issues, problems related to government incentives, financial matters, pre-construction issues (e.g., feasibility studies and land acquisition and compensation), macroeconomics (Do and Veerasak, 2013; Do et al., 2015). As we know, PPP is not a new business form in Vietnam, especially for infrastructure investment. Since 1993, there have been several PPP infrastructure projects developed in the form of Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), Build-Transfer (BT), and PPP contracts (Figure 1-). The current legislation regarding BOT, BTO, and BT projects (BOT/BTO/BT) was issued at the end of 2009 (Decree 108, 2009) and revised in early 2011. Besides, the government has issued the PPP pilot regulations (Decision 71, 2010) as a basis to implement some projects and has further improved mechanisms, policies, and regulations on investment in PPP projects. In order to bridge a potential funding gap, the government turned to the PPP pilot. While the existing BOT/BTO/BT legislation was designed primarily for private investors, the PPP pilot was intended for the collaborative capital between the public and the private sector. The PPP pilot legal framework sought to attract non-governmental investment in a wide variety of public projects and created a framework for government supports where a funding viability gap exists. Moreover, it supported a better implementation of feasibility studies, which form the basis for determining the amount and form of government support, as well as for determining a risk sharing mechanism among the relevant parties before the selection of a project investors. The PPP pilot had been implemented in parallel with the existing BOT/BT/BTO legislation. The legal framework for the pilot projects was expected to form the basis for a more comprehensive PPP model (Ashurst, 2012). However, the newest regulations about PPP (combined BOT/BT/BTO and PPP pilot regulations) (Decree 15, 2015) have just been issued in April 2015 and were not well known by both public and private sectors.

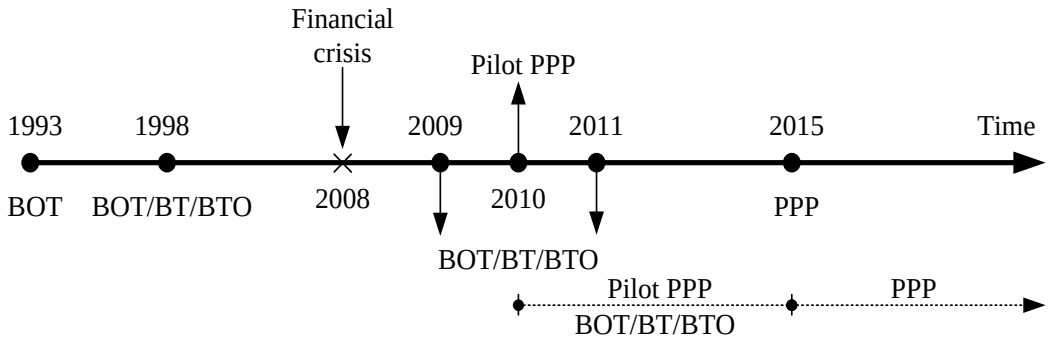



Figure 1-1 Evolution of PPP form in Vietnam

Moreover, administrative procedures were quite cumbersome, for example, many BOT/BT/BTO projects took over four years for finishing negotiation process (e.g., Binh Trieu II Road Bridge). The government incentives were not reasonable and insufficient. Moreover, the nation's knowledge about PPP was quite limited, resulting in an inaccurate assessment of the effectiveness of PPP projects. Ineffective project management has also repealed private investors. Especially, the most critical issue for PPP projects in Vietnam was a lack of information related to PPP projects for investors such as planning for economic development, transportation planning, tax information, interest rates, investment incentives, and labor recruitment details.

A tight national budget along with a decline in ODA for developing countries has significantly limited the performance of the government. In an effort to stem inflation, the State Bank of Vietnam tightened its monetary policy, thus making access to credit more difficult, contributing to a small investment by the private sector. As a result, the Vietnamese government is focusing on the implementation of investment projects under various PPP forms to solicit capital resources, initiatives, experience and financial sources from the private sector, reduce public loans, speed up the projects and reduce implementation cost and time of PPP projects.

However, more than 20 PPP pilot public service and infrastructure projects have been slowly implemented, and many projects have been stalled. Recently, Dau Giay-Phan Thiet, 100-km expressway (62 miles) from Ho Chi Minh City to the coastal Phan Thiet City was assigned as the first PPP pilot project in Vietnam. Since 2007, the Bitexco Group has been appointed as the first investor without tendering process, but since then has not been able to find other investors for this project. It is hard to call investors due

to the incomplete legal framework and unattractive of investment environment for PPP transportation projects in Vietnam.

In this study, PPP forms in Vietnam include every type of project with the participation of the private and the public sectors, namely, BOT, BT, BTO, the previous PPP pilot form (issued in 2010) and the new PPP form (issued in 2015). Since PPP in Vietnam has just been established, it is difficult to determine and predict all impact factors and to attain profitability expectations. This leads to the greatest challenge of PPP in Vietnam: **"how to draw investment from the private sector to PPP projects?"**

### 1.3 Research objectives

The main objectives of this research are:

(1) To identify and quantify concern factors of private investors when investing in PPP transportation projects

(2) To determine and evaluate risk factors affecting the performance of the private sector by analyzing past PPP transportation projects in Vietnam

(3) To establish a risk-based investment willingness assessment model (RIWAM) that assists the private sector in selecting appropriate responsive strategies while deciding to participate in PPP transportation projects in Vietnam

(4) To establish a decision-making assistant tool (DMAT) that supports private investors to make investment decisions in the tendering process of PPP transportation projects in Vietnam

(5) To investigate strategies for the private sector when investing in PPP transportation projects

### 1.4 Scope of the research

In this research, the respondents in our data surveys are a group of experts in PPP transportation project in Vietnam. A brief summary of such investigations is as follows

(1) The respondents were or have been members of BOT, BT, BTO and PPP pilot transportation projects in Vietnam.

(2) Pilot test: there are seven experienced professionals participated in the pilot test

(3) Questionnaire survey: There are 123 respondents (in total of 320 deliver questionnaires) in the large-scale questionnaire, including as follows

- The public sector: officers in relevant government departments
- The private sector: local and international industries, including
  - Sponsors, lenders, financiers, private investors
  - Contractors, sub-contractors, consultants, designers, etc.…

(4) The in-depth interview (FAHP): There are 17 experienced experts (in total of 30 consulted experts) in the comprehensive interview process of FAHP method, including

- The private sector: promoters (investors), lenders (banks, financial bodies), consultants and so on
- Experts about PPP projects such as professors, experts.

(5) The in-depth interview (Case studies): there are three experts participated in the in-depth interview for choosing potential PPP projects - case studies

- The private sector: promoters (investors), lenders (banks, financial bodies), consultants and so on
- Experts about PPP projects such as professors, experts.



### 1.5 Research methodology

In this research, the investigation of research framework process of PPP transportation projects is illustrated by Figure 1-2 which consists of four rows and five columns. The first row shows the organizations, here, the PPP transportation projects in Vietnam. The second row shows the five typical phases that a proposed research process has to go through: (1) concern identification; (2) risk identification, (3) investment willingness attributes identification, (4) decision-making process, and (4) validation. The third row shows the assessment methodology of the proposed research framework process to identify the concern factors, risk factors, to analyze the investment willingness attributes using the structural equation modelling (SEM), to investigate responsive

strategies throughout in-depth interview, and then to support decision-making process via multiple attribute decision-making (MADM). The fourth row shows the suitable strategies corresponding with such research phases. Finally, validation is performed to check consensus among the respondents. This research proposes a useful tool for both private investors and the public sector. The tool assists the private companies in making decisions regarding (1) their participation in the PPP transportation projects and (2) possible strategies that can be taken to decrease project risk and enhance the likelihood of having a successful concessionaire. It is also helpful when the government considers the policies to attract the private sector to invest in PPP transportation projects.

The model, called ***Willingness Assessment Model (WAM)***, is developed in this study. Its structure is shown in Figure 1-3, consisting of four major areas:

**(1) Risk perceptions:** The first area of the model consists of 33 risk factors.

**(2) Investment willingness:** The second area of the model consists of six willingness attributes, namely financing, profitability, legal framework, partner selection, risk sharing, and macroeconomics.

**(3) Responsive strategies:** The third area of model consists of four groups of reactive strategies, namely cooperation, financing preparation, evaluation strategies, and suggestions for a government.

**(4) Decision-making assistant tool**: The fourth area of a model is a semi-quantitative tool for supporting the private sector making an investment decision in the tendering process for PPP transportation projects.

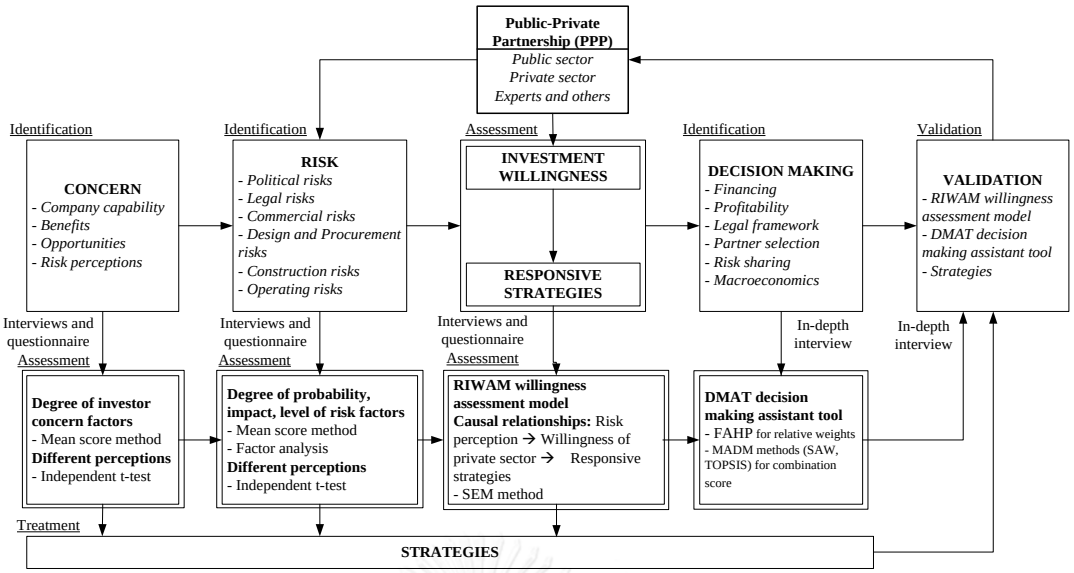



Figure 1-2 Summarized research framework of PPP transportation projects

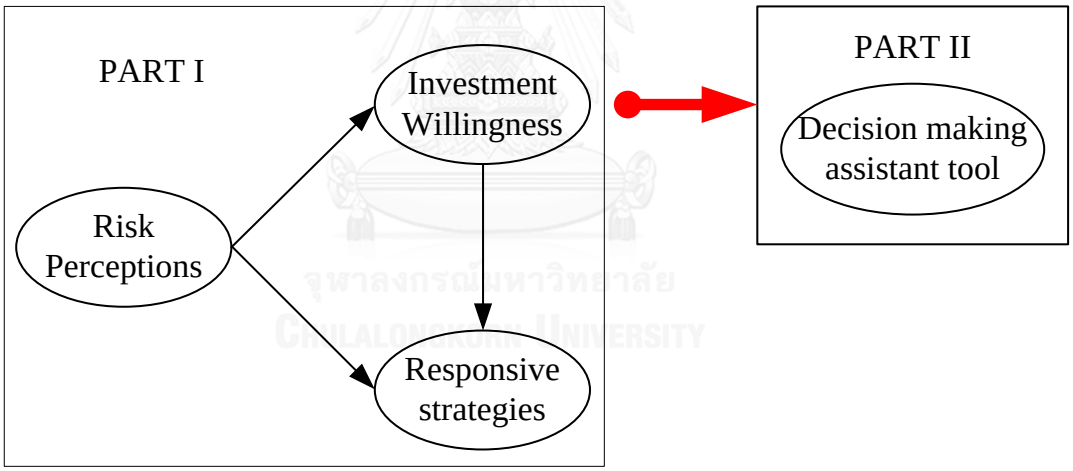



Figure 1-3 Willingness assessment model (WAM)

The research methodology process (Figure 1-3) consists of six detailed steps as follows.

**(1) Do literature review**

The first step is to examine relevant knowledge from academic journals, textbooks, reports, and websites by focusing on the following issues:

- Fundamental concepts of concern/expectation factors, risk factors, risk management process in PPP projects.

- Definitions of PPP and risks related to PPP projects in previous research
- Definitions of investment willingness evaluation of the private sector
- Evaluation models related to risk, investment willingness, and strategies.
- Review of responsive strategies of private investors to cope with PPP projects

**(2) Collect data for research**

The second step is to gather data for this research throughout data collection tools, such as questionnaire survey and in-depth interview. Selecting public and private sectors in PPP transportation projects in Vietnam is very critical. The data collection consists of three phases:

- **The first phase (pilot survey):** Literature review and several in-depth interviews for collecting concern factors, risk factors, investment willingness attributes, and responsive strategies for PPP projects in Vietnam.
- **The second phase (large-scale survey):** Questionnaire and in-depth interview for identifying and analyzing concern factors, risk factors, investment willingness attributes, and responsive strategies for PPP projects in Vietnam.
- **The third phase (validation survey):** In-depth interview for validating and verifying the research results based on the impression of the respondents.

**(3) Identify the concern factors, risk factors, and investment willingness attributes**

This step is to identify concern factors of private investors, the risk factors affecting the performance of PPP transportation projects in Vietnam and attributes that affecting the investment willingness of the private sector in PPP projects. Based on the collection data previously, we identify the concern factors, the risks of PPP projects, including groups, and factors through HBS. After the risks are arranged based on the activities of PPP projects from feasibility to operation and own (transfer), the accuracy and suitability of the risks are proved by questionnaires and interview.

Moreover, we identify the willingness attributes of the private sector in PPP projects, comprising the willingness attributes and willingness criteria.

**(4) Analyze concern factors, risk factors, and willingness attributes**

Descriptive statistics, sample and independent t-test, confirmatory factor analysis (CFA), structural equation modeling (SEM) and multiple attributes decision-making assistant tools (MADM), (i.e., FAHP, TOPSIS method) techniques are applied. The critical concern factors, risks, critical willingness criteria are analyzed according to their ranking values. Moreover, the different perceptions of stakeholders are also assessed by using the Spearman's rank correlation test and independent t-test technique. The RIWAM and DMAT models are established throughout the SEM, FAHP, and TOPSIS method.

**(5) Suggest responsive strategy**

In this research, the responsive strategies are identified from the literature review and discussions with respondents who are familiar with the implementation of PPP transportation projects in Vietnam in the pilot survey. After analyzing the data provided by the experts, we analyze their thinking or their thought about which strategies that they use to cope when investing in PPP projects. Furthermore, the opinions of respondents when investing of PPP projects in Vietnam are established. The adverse consequence could be controlled by selecting the appropriate responsive strategies. The responsive strategies in this research include (1) Cooperation strategies, (2) Financing strategies, (3) Evaluation strategies, and (4) Suggestion strategies for the government.

**(6) Validation**

Experts through case studies of PPP projects in Vietnam verify the risk-based investment willingness assessment model (RIWAM), decision-making assistant tool (DMAT) and responsive strategies for this research. The RIWAM, DMAT, and responsive strategies have been sent to the experts groups to get their feedbacks and ideas. Finally, the final of willingness assessment model (WAM) are established.

## 1.6 Outcomes

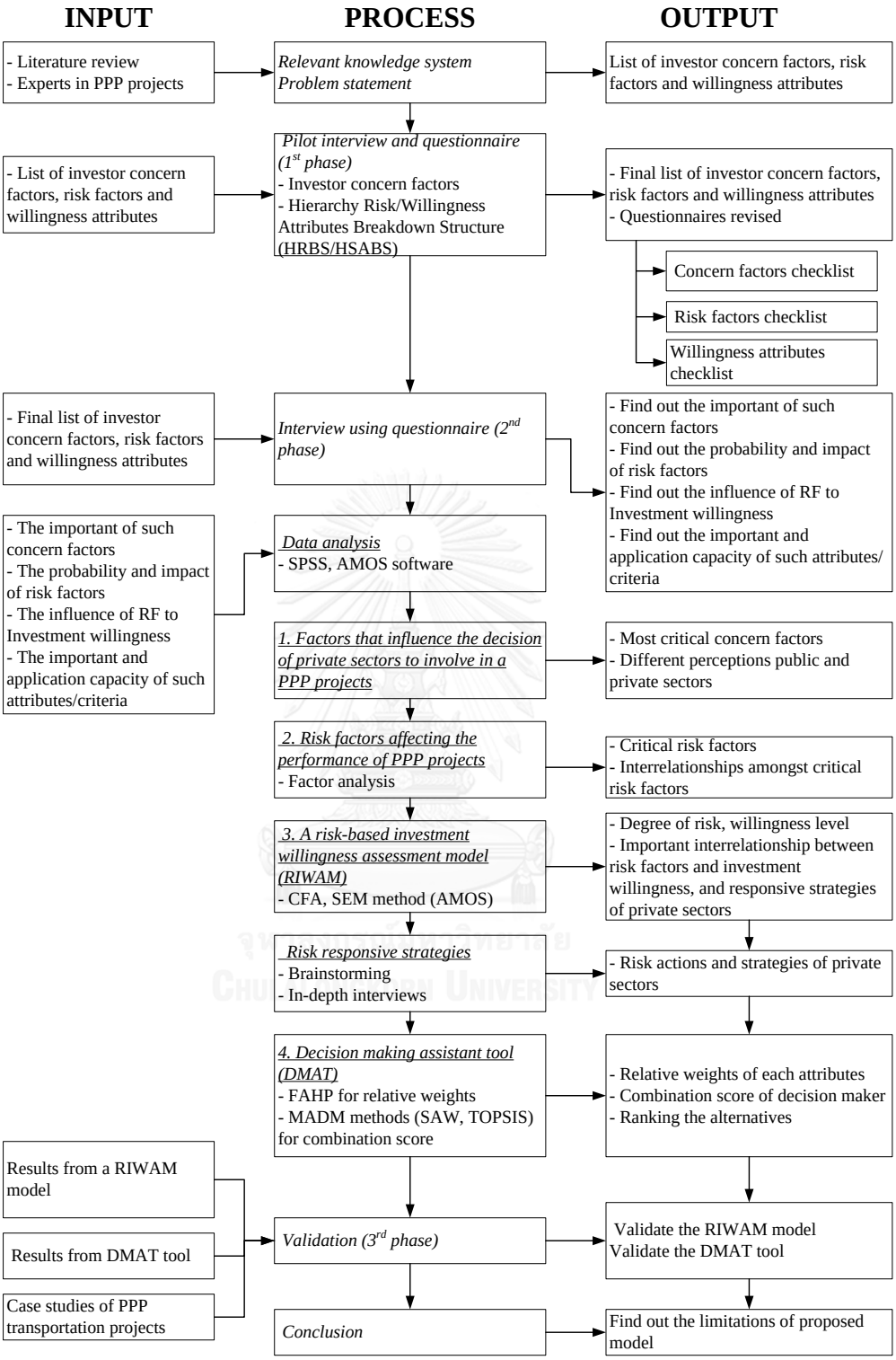
The main results from this research are to explore the concern factors of private investors, risk factors affecting the up-to-date PPP transportation projects in Vietnam. Moreover, this study tries to assess the investment willingness attributes of the private sector when investing PPP projects in Vietnam. Besides, a willingness assessment model will be established to assess the effect of risk awareness to the willingness and strategies of the private sector when investing PPP projects in Vietnam. Finally, responsive strategies for the private sector need to adopt when investing in PPP projects as well as applicable policies of the Vietnamese government to attract the private sector to invest in infrastructure projects are investigated.

## 1.7 Contributions

The contributions of this research are:

(1) This research can assist the private sector in identifying the risk factors when forming PPP with the public sector. The private sector can realize weaknesses, strengths, opportunities and threats when investing in Vietnam PPP transportation projects. Moreover, this research provides a willingness assessment model to support the private sector's investment decision-making. In addition, the private sector can also suggest some appropriate policies for the public sector to improve the investment environment of PPP transportation projects.

(2) This research can help the public sector to understand clearly the concern factors and expectation for investment willingness of the private sector when investing in PPP transportation projects in Vietnam. Throughout the results of this research, the government will improve legal framework, laws and regulations, procedures as well as supporting incentives to enhance the attractiveness for private investors.




*Note*
*PPP: Public Private Partnership*
*CFA: Confirmatory Factor Analysis*
*SEM: Structural Equation Modeling*
*MADM: Multiple Attribute Decision Making*
*SAW: Simple additive weighting*
*TOPSIS: The Technique for Order of Preference by Similarity to Ideal Solution*

Figure 1-4 Proposed research framework process of PPP transportation projects

# CHAPTER 2
# LITERATURE REVIEW

This chapter provides the basic knowledge and theory about Public-Private Partnership (PPP), concern factors, risk and risk management system, investment willingness assessment model, and responsive strategies in PPP projects. The first section illustrates the fundamental concepts of PPP forms in the infrastructure projects. The next section demonstrates the situation of PPP projects in Vietnam. The third section explains the definition of concern/expectation factors of private investors in PPP projects. Then, the definition of risk and risk factors affecting the implementation of PPP projects is described in the fourth unit. The fifth and sixth section describe the investment willingness attributes and models in PPP transportation projects. Finally, the last section focuses on the responsive strategies of stakeholders to cope with a situation of PPP transportation projects.

## 2.1 Overview on Public-Private Partnership (PPP)

### 2.1.1 Definition of PPP

Public–Private Partnership (PPP) expresses a sort of possible relationships among public and private sectors in infrastructure projects and other services. PPP presents a framework that while engaging the private sector, the character of the state in guaranteeing that social requirements are met, and successful sector reforms and public investments has been achieved (Asian Develop Bank, 2008). Moreover, KPMG (2011) defined PPP as the relationship between a long-term partner of the public sector and the private sector in the provision of services. It is a relatively new approach to the government to increase the participation of the private sector in providing public services. Thus, the PPP form has been a significant approach in providing public facilities and services in many countries in over the world. PPP term has not to be clearly defined, although it has been used widely. There are different visions about PPP in the world (Skelcher, 2005; Decision 71, 2010; KPMG, 2011; FHA, 2009; Canadian Council for PPP). Thus, the perspective towards one aspect should be emphasized in

the characteristics of PPP presented in Table 2-1. The three most important purposes of applying PPPs to the enhancement the performance of state are: (1) to attract capital investment from the private sector; (2) to increase efficiency and use available resources more efficiently; and (3) to reform the public sector through the allocation of roles, incentives, and accountability.

Table 2-1 Definitions of PPP

| Sources | Definitions of PPP |
|---|---|
| **Asian Development Bank (Skelcher, 2005)** | "Public–Private Partnership (PPP) describes a range of possible relationships among public and private entities in the context of infrastructure and other services." |
| **(KPMG, 2011)** | "PPP refers to the relationship between long-term partner of the public sector and the private sector in the provision of services. It is a relatively new approach by the government to increase the participation of the private sector in providing public services." |
| **Canadian Council for PPPs (Council, 2004)** | "A cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards." |
| **Federal Highway Administration (Act and Fees, 2004)** | "Public-private partnerships (P3s) are contractual agreements formed between a public agency and a private sector entity that allow for greater private sector participation in the delivery and financing of transportation projects." |
| **Vietnam: Clause 1, Article 2 of (Decision 71, 2010)** | "Investment in PPP is understood in Vietnam means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts." |



### 2.1.2 Types of PPP contract

Different forms of PPP can be introduced, depending on the level of private participation in PPP projects. When the level of personal involvement in the project moves, a different form of PPP regarding financing and ownership of assets appears. There are five types of PPP: (1) Operation-Maintenance (OM), (2) Design-Build-Operate (DBO), (3) Design-Build-Finance-Operate, (4) Build-Operate-Transfer, and (5) Build-Own-Operate (BOO) (Kwak et al., 2009). These reflect the degree of private involvement shown in Figure 2-1. The descriptions of five types of PPP are shown in Figure 2-2. It should be noted that in this research, the authors merely focused on the concession-typed PPP. According to the World Bank, a concession agreement is defined as "an arrangement whereby a private party leases assets for service provision

from a public authority for an extended period and has responsibility for financing specified new fixed projects during the period. The new assets revert to the public sector at expiration of the contract.''

Similarly, KPMG (2011) has launched four forms of PPP, based on the increasing level of participation of the private sector, namely joint venture, BDO/DBFO, BOOT, and BOO. These are new approaches to facilitate finance for infrastructure projects.

However, as the definition of UNESCAP (2011) cited by Karim and Alkaf (2011), the PPP models can be divided into five broad categories, including (1) Supply and management contract, (2) Turnkey, (3) Afterimage/Lease, (4) Concessions Private, and (5) Private ownership of assets and PFI type. The characteristics of these PPP models are shown in Figure 2-3. Each of the PPP models is different in terms of the capital asset ownership, investment responsibilities, risks allocation and contract duration.

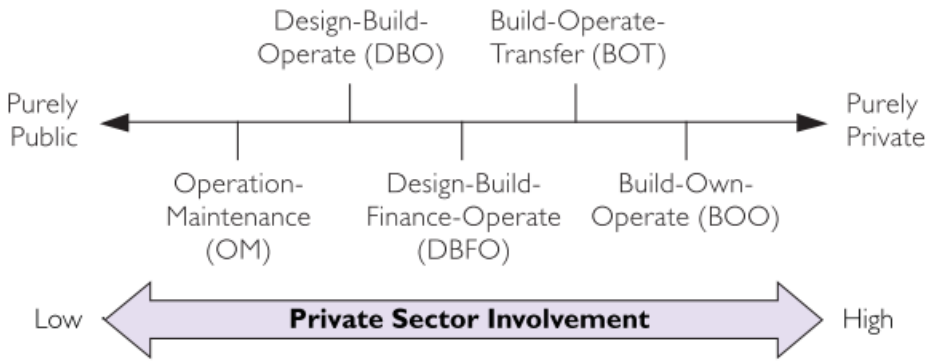



Figure 2-1 Types of PPP (Kwak et al., 2009)

| Types of PPP | Descriptions |
|---|---|
| Operation-Maintenance (OM)[a] | • The private sector is responsible for all aspects of operation and maintenance.<br>• Although the private sector may not take the responsibility of financing, it may manage a capital investment fund and determine how the fund should be used together with the public sector. |
| Design-Build-Operate (DBO)[b] | • The private sector is responsible for the design, construction, operation, and maintenance of a project for a specified period prior to handling it over to the public sector. |
| Design-Build-Finance-Operate (DBFO)[c] | • The private sector is responsible for the finance, design, construction, operation, and maintenance of a project.<br>• In nearly all cases, the public sector retains full ownership over the project. |
| Build-Operate-Transfer (BOT)[d] | • The private sector is responsible for the finance, design, construction, operation, and maintenance of a project for a concession period.<br>• The asset is transferred back to the government at the end of concession period, often at no cost. |
| Build-Own-Operate (BOO)[e] | • Similar to a BOOT project, but the private sector retains the ownerships of the asset in perpetuity.<br>• The government only agrees to purchase the services produced for a fixed length of time. |

Figure 2-2 Descriptions of types of PPP (Kwak et al., 2009)

| Broad category | Main variants | Ownership of capital assets | Responsibility of investment | Assumption of risk | Duration of contract (years) |
|---|---|---|---|---|---|
| Supply and management contract | Outsourcing | Public | Public | Public | 1-3 |
| | Maintenance management | Public | Public/Private | Public/Private | 3-5 |
| | Operational management | Public | Public | Public | 3-5 |
| Turnkey | | Public | Public | Public/Private | 1-3 |
| Affermage/Lease | Affermage | Public | Public | Public/Private | 5-20 |
| | Lease *(BLT) | Public | Public | Public/Private | 5-20 |
| Concessions | Franchise | Public/Private | Public/Private | Public/Private | 3-10 |
| | *BOT, BTO, BOOT, BROT | Public/Private | Public/Private | Public/Private | 15-30 |
| Private ownership of assets and PFI type | *BOO/DBFO | Private | Private | Private | Indefinite |
| | *PFI | Public/Private | Private | Public/Private | 10-20 |
| | Divesture | Private | Private | Private | Indefinite |

Figure 2-3 Classification of PPP models (Karim and Alkaf, 2011)

### 2.1.3 Legal, Administrative structure of PPP

PPP projects are usually very large and complex. A large number of parties, including government, investors, special purpose vehicle (SPV), sponsors and shareholders, experts, financiers, and customers are associated with the PPP projects. The relationship and information streams among the participants are very complicated. Special purpose vehicle is a project company accredited by investors. After its establishment, SPV shall sign a project contract to join the investors in forming a party for the project contract. Regan et al. (2010) investigated the typical PPP capitalization in Australia as shown in Figure 2-4. Furthermore, another study of KPMG (2011) illustrated the relationship between stakeholders in the structure of a PPP contract. The characteristics is shown in Figure 2-5. The typical structure of project financing of PFI is also illustrated by Takim et al. (2008) (Figure 2-6).

Additionally, based on the research of Dias and Ioannou (1996), the contractual and financial structure of a concession-financed project is shown in Figure 2-7. It consists of the contractual obligations and flow of capital among participants of the privately promoted infrastructure projects.

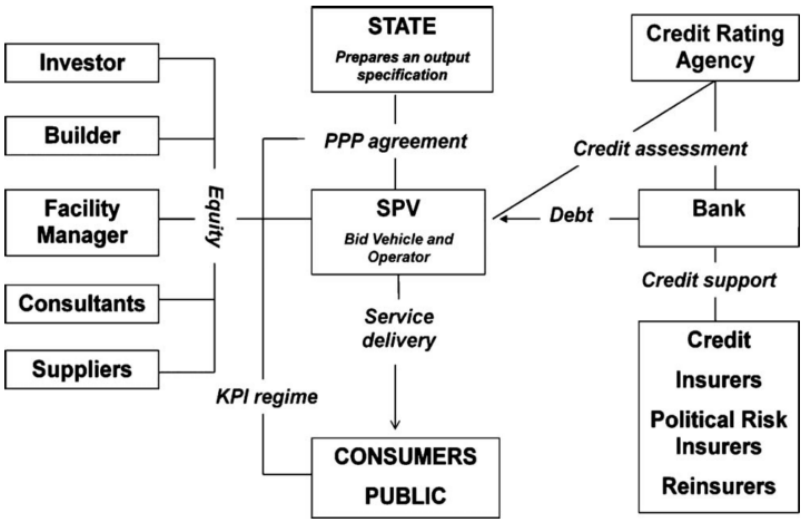



Figure 2-4 Typical PPP capitalization in Australia (Regan et al., 2010)

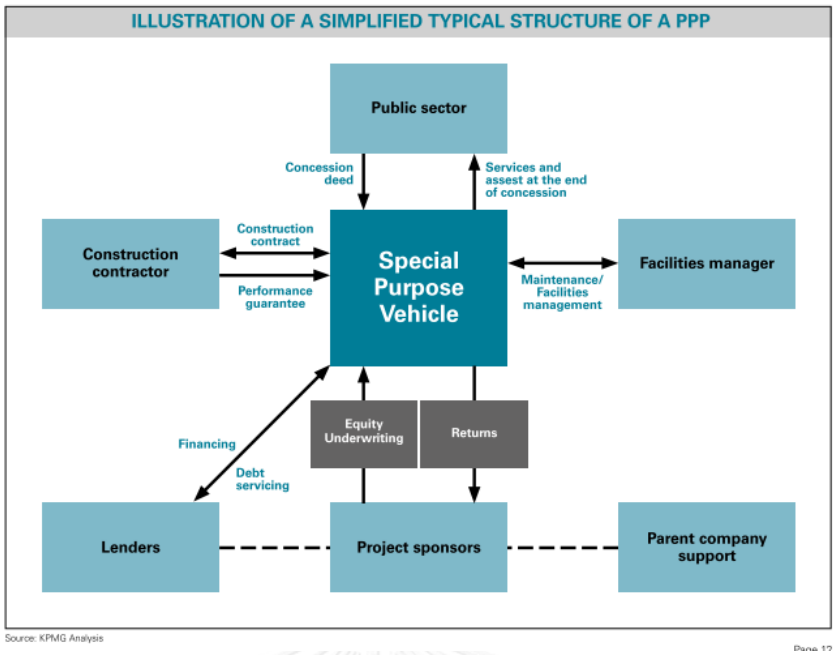



Figure 2-5 Relationship among stakeholders of a PPP (KPMG, 2011)

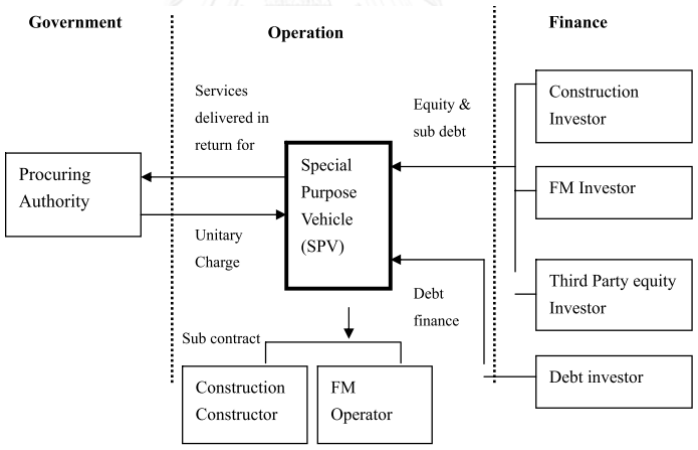



Figure 2-6 Typical structure of project financing for PFI (Takim et al., 2008)

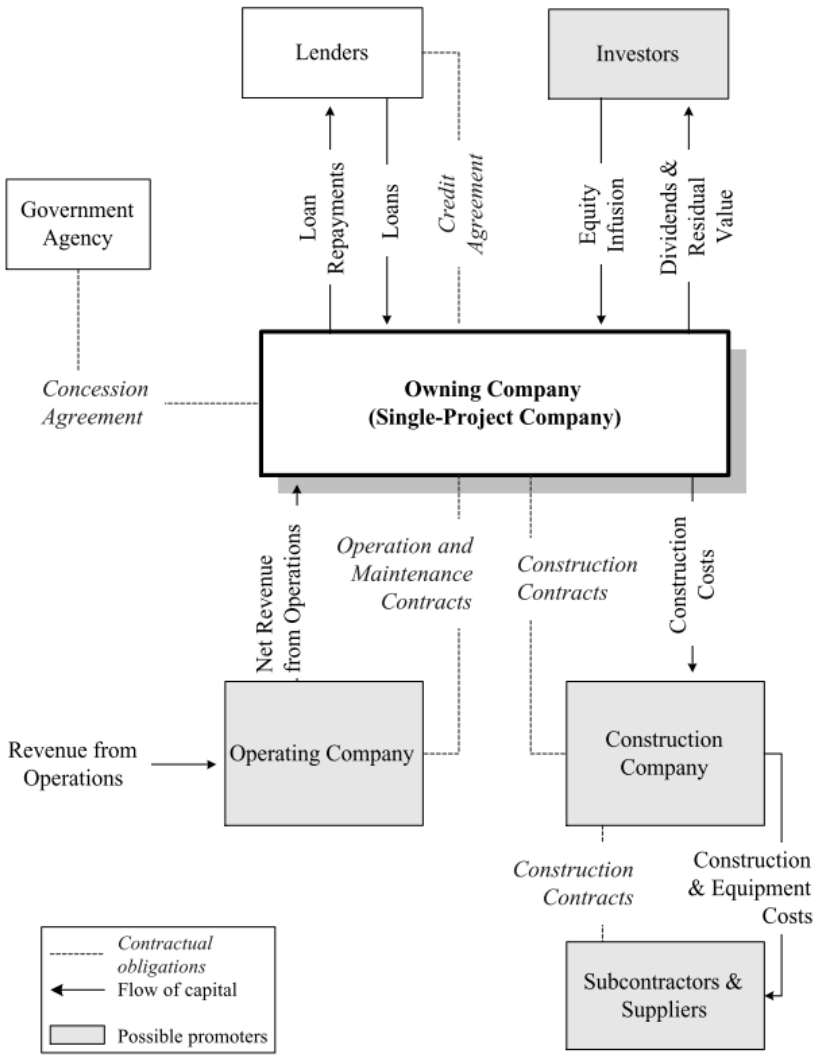





Figure 2-7 Contractual and financial structure of a concession-financed project (Dias and Ioannou, 1996)

## 2.2 PPP projects in Vietnam

The framework for PPP arrangements varies from one country to another due to their legal, administrative, cultural and social conditions. Some countries issue generic PPP laws to promote PPP arrangement and set for private participation in infrastructure. Whereas in other nations, PPP schemes are regulated sector or specific PPP laws, government policy and additional arrangements such as the establishment of PPP units or other governing bodies providing assistance to public and private negotiations (such aid is principled consistently with government efficiency, stability, and consistency in

facilitating the procurement and delivery of PPP). In Vietnam, the knowledge of PPP is continuously developed. There is still not a single framework model which is treated as the most advanced and appropriate for PPP arrangement in Vietnam (Hoang and Xuan, 2012).

However, investment in PPP in Vietnam can be understood as follows: the State and investors jointly implement projects on the development of infrastructure or provision of public services on the basis of project contracts (Clause 1, Article 2 of Decision 71, 2010). The PPP pilot regulation is the Decision 71/2010/QD-TTg dated 11/9/2010 on the issuance of pilot investment regulations form of PPP. In essence, Decision 71 presents PPP as only a special case of BOT, BTO and in fact the contents of the 71 Decision is based on the content of Decree 108/2009/ND-CP dated 27/11/2009 on investment under BOT, BTO and BT with certain provisions not specifically oriented to create favorable conditions to attract more investors to cooperate with the State on infrastructure construction over the previous two forms of BOT and BTO. Then, the newest regulation about consistent PPP form is the Decree 15/2015/ND-CP on investment in the form of Public-Private Partnership. The main aim of Decree 15 (2015) is to unify BOT/BT/BTO and PPP pilot regulations.

The PPP schemes that have been adopted for infrastructure project development in Vietnam can be summarized as follows:

**Build-Operate-Transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State (Decree 108, 2009).

**Build-Transfer-Operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits (Decree 108, 2009).

**Build-Transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract (Decree 108, 2009).

**Public–Private Partnership (PPP)** means that the State and an investor jointly implement projects on development of infrastructure or provision of public services by project contracts (Decision 71, 2010).

**Public–Private Partnership (PPP)** investment form means an investment form to be implemented based on a contract between an authorized state agency and (an) investor(s) and the project enterprise to implement, manage, and operate an infrastructure project and to provide public services. (Decree 15, 2015). Project contracts consist of many type of contracts such as Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), Build-Transfer (BT), Build-Own-Operate (BOO), Build-Transfer-Lease (BTL), Build-Lease-Transfer (BLT), and Operate-Manage (O&M) contract.



## 2.3 Concern factors of private investors when investing PPP projects

### 2.3.1 Definitions of concern factors

Private investors, when investing in any PPP projects, have their great expectations about investment environment, government's incentive policies, PPP projects' feasibility, investment period, and profits from the projects. Firstly, investment climate such as legal framework, government policies, financial market, transparency and competition are the common concerns of the private investor. Then they will look at the potential projects based on their capabilities. Finance, risks, opportunities issues are also key problems that need to be evaluated before their investment in PPP projects. Indeed, research by Sader (2000) has identified some potential investors' expectations including operating profitably, finding trustworthy partners, diversifying risk, reducing uncertainty, stability legal framework and avoiding contingent liabilities. Moreover, a

study by Demirag et al. (2011) has found some financial and non-financial criteria that affecting the decisions to participate in a PFI project. The most critical financial criteria are an interest rate of return and return on equity, whereas reputation and familiar relationships with industry are the most common cited non-financial criteria. Besides, private investors have opportunities to penetrate new international markets for their own business (Ozdoganm and Birgonul, 2000; Alquier et al., 2002). Therefore, if overall expectation conditions appear to be advantageous, private investors would then be quite willing to invest. The understanding of these expectations will help the government or state agencies to enhance investment environment to attract the investment from the private sector. Moreover, failing to address the critical expectations of stakeholders involved has resulted in many project failures (Li et al., 2013).

### 2.3.2 Concern factors of private investors in PPP projects

Several attempts have been made to assess the concerns or expectations of private investors in PPP projects (e.g., Ozdoganm and Birgonul, 2000; Grimsey and Lewis, 2002; Schaufelberger and Wipadapisut, 2003; Cuttaree, 2008; Kwak et al., 2009; Ng et al., 2010; Demirag et al., 2011). However, most of these studies have just concentrated on a single concern factor or a limited number of them. In order to understand the perceptions of private investors into PPP projects efficiently, concern factors have to be identified and categorized. Research of Demirag et al. (2011) focused on the factors that cause the financiers to take part in a PFI projects. These factors were separated into two core groups: financial criteria and non-financial criteria. Financial criteria are the financial factors that concerned by financiers, such as internal rate of return (IRR), return on equity, equity payback period, availability of debt finance, whereas the non-financial criteria related to financiers' themselves, including reputation and relationships. To classify concern factors based on their sources and the hierarchical structure is a common method of considering the significant level of expectation or concern factors. It is proposed that the concern factors be categorized into four main groups as shown in Figure 2-8: (1) Company profile; (2) Finance; (3) Opportunities; and (4) Risk perceptions. (Table 2-2)

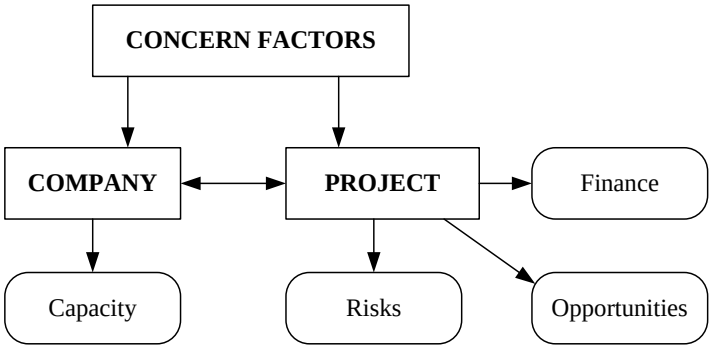



Figure 2-8 Concern factors groups of private investors

**Group 1 - Company profile:**

Factors related to company profile are issues regarding their capability, such as management capacity, financial viability, resources and experiences of their partners in SPV consortium (partners join to establish SPV). As we know, the financial and technical strength of the consortium was regarded as the most important critical success factors in PPP projects (Tiong, 1996). Also, the ability of private investors can arrange flexible and attractive financial package is a very critical factor leading to the success in winning the tendering process in BOT projects in China of consortium (Kwak et al., 2009; Qiao et al., 2001). Besides, in order to increase the success of PPP projects, private investors often combined together into group of multidisciplinary companies. Actually, in this consortium, all participating entities have to work together, make decisions collectively, sharing risks and responsibilities, getting profits, and collaborate to solve the conflict situation (Kwak et al., 2009). Therefore, companies with good management, financial as well as abundant resources are considered to cooperate. Additionally, experiences in various areas/fields of the consortium can reduce the risk related to future investment projects, meet contractual commitments in an efficient manner as well as gain profit necessary. Finally, concern factors related to the company profile can summarize into four main factors, namely, management capacity of the company (CP1), financial viability of the company (CP2), the company's resources about labor, machinery, engineering (CP3), and the company's experience with same project before (see Table 2-2).

Table 2-2 Concern factors of the private sector

| No. | Code | Factors | Literature review |
|---|---|---|---|
| **I** | **CP** | **COMPANY PROFILE** | |
| 1 | CP1 | Management capacity of the company | Tiong (1996), Sader (2000), Qiao et al. (2001), Ahadzi and Bowles (2004), Nisar (2007), Kwak et al. (2009), Mustajab (2009) |
| 2 | CP2 | Financial viability of the company | Kwak et al. (2009) |
| 3 | CP3 | The company's resources about labor, machinery, engineering | Tiong (1996), Sader (2000), Qiao et al. (2001), Ahadzi and Bowles (2004), Nisar (2007), Kwak et al. (2009), Mustajab (2009) |
| 4 | CP4 | The company's experience with same project before | Kwak et al. (2009), Demirag et al. (2011) |
| **II** | **FP** | **FINANCE OF PPP PROJECTS** | |
| 1 | FP1 | Return on equity investment | Demirag et al. (2011) |
| 2 | FP2 | Possibility of long-term income | Grimsey and Lewis (2002) |
| 3 | FP3 | Project cash flows | Kwak et al. (2009) |
| 4 | FP4 | Availability of financing sources | Kwak et al. (2009), Demirag et al. (2011) |
| 5 | FP5 | Tax/tariff issues | Thomas et al. (2003), Thomas et al. (2005), Demirag et al. (2011) |
| 6 | FP6 | Demand issues | Valentine (2008), Ashuri et al. (2012) |
| **III** | **OP** | **OPPORTUNITIES OF PPP PROJECTS** | |
| 1 | OP1 | Assess/seek to new markets | Alquier et al. (2002) |
| 2 | OP2 | Enhancing relationship with lenders | Demirag et al. (2011) |
| 3 | OP3 | Enhancing relationship with contractors, project management, or operator companies | Demirag et al. (2011) |
| 4 | OP4 | Enhancement of company's strength in its industry | Demirag et al. (2011) |
| 5 | OP5 | Value of image to other investors | Demirag et al. (2011) |
| 6 | OP6 | Need for work | Alquier et al. (2002) |
| **IV** | **RP** | **RISK OF PPP PROJECTS** | |
| 1 | RP1 | Politics risks | Kwak et al (2009), Ng et al. (2010), Chan et al. (2010) |
| 2 | RP2 | Law risks | Dias and Ioannou (1996), Zhang and Wang (1998), Qiao et al. (2001), Ward and Sussman (2005), Mustajab (2009), Cuttaree (2008) |
| 3 | RP3 | Commerce risks | Toan and Ozawa (2008), Xu et al. (2010), Karim (2011), Ke et al. (2011), Hwang et al. (2013), Ezeldin and Badran (2013) |
| 4 | RP4 | Design and procurement risks | Xu et al. (2010), Karim (2011), Ke et al. (2011), Hwang et al. (2013) |
| 5 | RP5 | Construction risks | Toan and Ozawa (2008), Xu et al. (2010), Iyer and Sagheer (2010), Karim (2011), Ke et al. (2011), Hwang et al. (2013), Ezeldin and Badran (2013) |
| 6 | RP6 | Operation risks | Dias and Ioannou (1996), Thomas et al. (2003), Toan and Ozawa (2008), Xu et al. (2010) |

**Group 2 - Finance of PPP projects:**

Regarding the PPP projects, private investors do care about finance issues of these projects. For instance, return on equity (ROE), long-term income, cash flow, financing sources, tariff, and demand issues were mainly concerned by private investors (see Table 2-2). The total investments of PPP projects are so large that private investors must prepare appropriate financing policies. Due to research by Kwak et al. (2009), early involvement with the financial institutions is one of the most important tasks to enhance the ability to win the tender for PPP project. Revenue risk is another concern of the private sector when they make a decision to participate in PPP projects (Grimsey and Lewis, 2002). Revenues or incomes of PPP projects depend on many factors such as return on equity, long-term income, and cash flows of these projects (Grimsey and Lewis, 2002; Kwak et al., 2009; Demirag et al., 2011). Toll/tariff levels need to be adequate for private's point of view to compensate investors and lenders (Qiao et al., 2001). However, this toll/tariff levels should not rise too high, which could be consistent with the affordability of users or customers.

**Group 3 - Opportunities of PPP projects:**

Ward and Sussman (2005), and Cuttaree (2008) argued that the primary objective of private investors be to seek profit from the provision of services. Besides, the private sector also would like to have opportunities in the new market, especially for foreign investors (Ozdoganm and Birgonul, 2000). Moreover, private investors sometimes could accept a lower profit contribution with a greater probability of winning (Alquier et al., 2002). For instance, they just accept to participate some projects due to their need for work.

The participation in PPP projects may help private investors have more opportunities to enhance the relationship with lenders (financial institutions), with contractors, consultants, operators companies, as well as with its construction industry (Kwak et al., 2009). Furthermore, based on research by Demirag et al. (2011), reputation and familiarity with industry and client relationships are the most common cited non-financial criteria for decisions to participate in a PFI project. The list of concern factors (see Table 2-2) related to opportunities involves six key factors, including assessing/seeking new markets (OP1); enhancing relationship with lenders (OP2);

enhancing relationship with contractors, project management, or operator companies (OP3); enhancing company's strength in its industry (OP4); Value of image to other investors (OP5); and need for work (OP6).

**Group 4 - Risk of PPP projects:**

PPP transportation projects have a complex financial and organizational structure. The projects are also influenced by the socio-economic-environmental of a country. It leads to an assessment of the level of risk as a very crucial step for investors before making a decision to participate in PPP project. For instance, PPP transportation projects are also under the strong influence of the socio-economic environment of a country. It leads to an assessment of the level of risk in PPP transportation projects is a very important step for investors before footsteps join this project. According to the perceptions of investors, consideration the feasibility of PPP projects political and legal is essential before submitting a concession proposal (Ng et al., 2010). Indeed, the unstable political and social environment (frequent changes in the government cabinet) may lead to the failure of the rail projects or cancel many new infrastructure projects under PPP approach in Bangkok (Chan et al., 2010). Therefore, private investors need to understand all the risks and have plans to cope with them accordingly. Their proposals must be adaptable to many circumstances and government demands. For example, private investors must select appropriate strategies to deal with projects risks, the conditions for the project, and the availability of financial resources (Schaufelberger and Wipadapisut, 2003). In summary, the concern factors related to risk of PPP projects are included in two main categories: general risks (politics, law, and commerce risks) and project-specific risks (design and procurement, construction, and operation risks) (see Table 2-2).

## 2.4 Risk factors affecting PPP projects

### 2.4.1 Risk factors in PPP projects

PPP infrastructure projects always encounter with challenges and critical risks that affect projects in various aspects, including project performance, organization, and an environment. Moreover, risks in the PPP infrastructure development can be analyzed

by risks related to investment associated with investment in new infrastructures, such as expanding the existing networks, building new facilities or renovating existing facilities; and operation-related risks regarding the operation and maintenance services.

Several research works have investigated different issues and problems contributing to the implementation of PPP infrastructure projects, and related to all participants of projects performance. In order to manage better risk governance, risk factors can be identified and categorized. Merna and Smith (1996) divided the risks of PPP projects into two main groups: systematic risk and unsystematic risk. Systematic risk is the risk beyond the control of the project participants, including political risk, legal, and economic environment. Unsystematic risks related to the project itself, as the risk of construction, design, operation, finance, and revenue. Major risk attribute groups that affect PPP projects have been identified, namely, political, construction, legal, economic, operation, market, project selection, relationship, project finance and natural. Ke et al. (2010) identified 37 risk factors by thoroughly analyzing 16 past PPP projects of China. These risk factors were divided into seven groups, including political, construction, operation, legal, market, economic, and other.

Xu et al. (2010b) investigated 37 risk factors associated with construction projects in China. By using factor analysis, the most critical of these 17 critical risk factors (CRFs) was further analyzed and six critical risk groups (CRGs) were discovered, including: (1) macroeconomic, (2) construction and operation, (3) government maturity, (4) market environment, (5) economic viability, and (6) government intervention. Among the 17 critical risk factors, the most important ones are government intervention, poor public decision-making process, government corruption, financing risk, inadequate law, and supervision system (Xu et al., 2010b) (Xu et al., 2010). The results of the research were pointed out the overall risk level of PPP highway projects in China is between “moderate-risk” and “high-risk”. Hence, it could be concluded that investment in PPP highway projects in China may be considered as risky. Moreover, the Delphi survey respondents perceived that the order ranking of CRGs: government intervention ($1^{st}$), government maturity risk ($2^{nd}$), economic viability risk ($3^{rd}$), market environment risk ($4^{th}$), construction and operation risk ($5^{th}$), and “macroeconomic risk” ($6^{th}$). These

findings exposed that intervention of government and corruption issues might be the main barriers to the success or failure of PPP highway projects in China.

Moreover, several critical risks of PPP in Thailand were reported by Ongipattanakul (1999). In this study, major participants in the sponsoring consortium left the project due to disputes with the granting authority regarding user fees. Additionally, the government delayed increase of toll fee, and the low revenue caused insufficient cash flow problems, which contributed to debt repayment rescheduled.

Risks associated with BOT projects can be divided into two broad categories, such as general risks and project-specific risks (Toan and Ozawa, 2008). General risks can be defined as factors related to the macro-environment factors of the host country such as the politics, economic, the legal framework, tariff, or fluctuations in currency exchange rate. These general risks can be subdivided into political, commercial, and legal risks. Unlike the general risks, project-specific risks can be controlled by the stakeholders. These risks can be identified and analyzed when classified in according with the phases of the performance of projects which are development, construction and operating phases. The results of this research were illustrated that BOT infrastructure projects in Vietnam would be highly risky due to 45 of 62 risks are considered critical by all stakeholders. Furthermore, these authors conclude that the private partner rather than the public partner would review the BOT projects in Vietnam riskier. The domestic partner considered BOT projects riskier than the foreign private partner. Besides, the foreign investors concentrated on critical risks as general risks. It would be the cause of the problem that the BOT infrastructure projects in Vietnam were less attractive to foreign investors. Consequently, the local investors should be attractable for small BOT projects whereas the foreign investors should be focused for huge infrastructure projects.

The researchers have not confirmed a list of fixed risks for all PPP projects. The risks of PPP transportation projects are often affected by the characteristics of the project, and type of PPP contract. Furthermore, the degree of the importance level of a particular risk varies between projects and these countries, such as political risk is greater in developing countries (ADB, 2008).

Based on reviewing many previous studies such as Dias and Ioannu (1995); Thomas et al. (2003); Ng and Loosemore (2007); Toan and Ozawa (2008); Xu et al. (2010); Iyer and Sagheer (2010); Karim (2011); Ke et al. (2011); Hwang et al. (2013); and Ezeldin and Badran (2013), list of 38 risk factors (Table 2-3) relevant to the performance of PPP schemes were drawn up

Consequently, the previous studies exposed six main risk categories affecting the performance of PPP transportation projects in Vietnam:

**Category 1 – Politics risks:**

Politics risk governs the risk of actions by the government agencies which may jeopardize the project. These actions may occur in the central, provincial and local levels of the government (Wang et al., 2000). More specifically, primary politics risks include government's intervention, delay in project approvals and permits, corruption, expropriation and nationalization, and political instability. Thus, a lack of political support for the government is considered a potential barrier to PPP projects (Zhang, 2005a), and a PPP scheme may be turned down if it is politically sensitive. From the investors' perspective, consideration of a PPP project's political feasibility prior to submitting a concession proposal is essential, as any changes in the political environment would add to the uncertainties and increase the risk of failure in a project (Ng et al., 2010). The government plays a major role in reducing political risk and create a favourable investment environment for the development of PPP infrastructure projects as well as attracting potential investors for these project (Zhang, 2005b). However, it should be noted that the experience of the public sector has not always been positive with PPP forms (Kwak et al., 2009).

Table 2-3 Risk identification in PPP projects

| No. | Risk factors | Literature review | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J |
| 1 | Government's intervention | | | | ✓ | | | ✓ | ✓ | | ✓ |
| 2 | Delay in project approvals and permits | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ |
| 3 | Corruption | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 4 | Expropriation and nationalization | | | | ✓ | ✓ | | ✓ | ✓ | | |
| 5 | Political instability | | | ✓ | | | | | | | |
| 6 | Inadequate law and supervision system | | | | | ✓ | ✓ | | | ✓ | ✓ |
| 7 | Change in laws and regulations | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | Change in tax regulation | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 9 | Financial market risk | | ✓ | | | | ✓ | | ✓ | ✓ | |

| No. | Risk factors | Literature review | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J |
| 10 | Interest rate fluctuations | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 11 | Foreign exchange fluctuations | | | | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| 12 | Inflation | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 13 | Price change | | | | ✓ | ✓ | | | | | |
| 14 | Insufficient financial audit | | | | | | | | ✓ | | |
| 15 | Poor public decision-making process | | | | ✓ | ✓ | | | ✓ | | ✓ |
| 16 | Lack of transparency in the bidding | | | | | | | | ✓ | | |
| 17 | Subjective project evaluation method | | | | | ✓ | | | ✓ | | ✓ |
| 18 | Supporting incentive of government risk | | | | | | | | | ✓ | |
| 19 | Conflicting or imperfect contract | | | | | ✓ | | ✓ | ✓ | ✓ | |
| 20 | Unfair process of selection of the private sector | | | | | ✓ | | | | | |
| 21 | Inadequate allocation of responsibility and risk | | | | | | | ✓ | ✓ | ✓ | |
| 22 | Low capacity of concession company | | | | | | ✓ | | | | |
| 23 | Scope change of projects | | | | | | ✓ | | | ✓ | |
| 24 | Land acquisition and compensation | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| 25 | Problems due to partner's different practice | | | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| 26 | Lack of supporting infrastructure | | | | | ✓ | | ✓ | ✓ | | ✓ |
| 27 | Environmental protection risk | | | | | | ✓ | | ✓ | ✓ | |
| 28 | Force majeure risk | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 29 | Material/labor non-availability | | | | | ✓ | | | | | |
| 30 | Completion risk | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 31 | Early termination of concession by concession company | | | | ✓ | ✓ | | | | | ✓ |
| 32 | Toll fee issues | | ✓ | | | | | | | | |
| 33 | Payment risk | | | | | ✓ | | ✓ | ✓ | | |
| 34 | Demand risk | ✓ | ✓ | | | ✓ | | | | ✓ | ✓ |
| 35 | Operator inability | ✓ | | | | | | | | ✓ | |
| 36 | Residual assets risk (after concession period) | | | | ✓ | ✓ | | ✓ | | | |
| 37 | Cost escalation risks | ✓ | | | | | | | | | |
| 38 | Supply risk | ✓ | | | | | | | | | |

**Reference:** A = Dias and Ioannu, 1995; B = Thomas et al., 2003; C = Ng and Loosemore, 2007; D = Toan and Ozawa, 2008; E = Xu et al., 2010; F = Iyer and Sagheer, 2010; G = Karim, 2011; H = Ke et al., 2011; I = Hwang et al., 2013; and J = Ezeldin and Badran, 2013

**Category 2 – Law risks:**

Law risks concern problems or adverse factors caused by deficiencies in the legal and institutional framework. Inadequate law and supervision system (Xu et al., 2010), change in laws and regulations (To and Ozawa, 2008; Ke et al., 2009), change in tax regulation (To and Ozawa, 2008; Xu et al., 2010) are common legal risks that investors face when investing in PPP projects. Besides, large projects are always required to be approved by several administration levels (Thuyet et al., 2007). Bureaucratic

administration systems, poor law implementation and the incompetence of government staff are the main reasons leading to the failure of PPP projects.

**Category 3 – Commerce risks:**

Commerce risks are risks related to finance and commerce. Finance is indispensable in any large construction project, especially PPP transportation projects. Indeed, evaluating of their financial viability is the most common method to measure the capability of achieving its financial targets set by the stakeholders (Pantelias and Zhang, 2010). The more attractive the financial market, the higher possibility of PPP projects (Qiao et al., 2001). Financial market risk (Ke et al., 2010; Regan et al., 2011) and foreign exchange fluctuations (Toan and Ozawa, 2008; Xu et al., 2010; Ke et al., 2010) are adverse factors identified in previous work. Furthermore, inflation and interest rate are other common risks attributed to commercial risks. Indeed, the fluctuation of inflation and interest rate also led to the crisis in the construction industry. Unfortunately, these risk factors are considered macroeconomic conditions and are impossible to avoid. Instability of interest rate would cause the undesirable financial condition of all sectors in the projects in terms of potential profit or return on equity. Another barrier is that the private investors are unable to assess the project capital via loans from financial organizations (El-amm, 2003); and the private sector would also have to pay additional interest in case they are incapable of paying the loads on time they are unable to make the loan payments on time (Ozdoganm and Birgonoul, 2000).

**Category 4 – Design and Procurement risks:**

Design and Procurement risks display problems occurred into design and procurement phases of PPP projects. They include lack of transparency in the bidding, inefficient feasibility study, poor or incomplete project evaluations, poor decision-making process, conflicting or imperfect contract, breach of contract by the government, unfair process of selection of the private sector, inadequate allocation of responsibility and risk, and Low capacity of concession company (Xu et al., 2010; Ke et al., 2010; Toan and Ozawa, 2008; Dias and Ioannou, 1995) that related to bidding process and project evaluation issues. PPP contracts should be strictly applied the competitive bidding procedures. Bidding evaluation methods should also be transparent to ensure fair competition and to avoid inefficiency investors (Zhang, 2005b; Zhang and Chen, 2013). Moreover, for

attracting investors in PPP projects, the issues related to the supporting incentive policies and participation portion of government (Zhang et al., 1998; Wang et al., 2000; Zhang and Chen, 2013) are the main concerns must be focused on by private investors.

**Category 5 – Construction risks:**

Construction risks concern issues or adverse factors related to the construction phase of PPP projects. They include scope change of projects, land acquisition and compensation (Toan and Ozawa, 2008; Xu et al., 2010; Ke et al., 2010; Shen et al., 2006), problems due to partner's different practice (Toan and Ozawa, 2008; Kwak et al., 2009), lack of supporting infrastructure (Xu et al., 2010; Ng and Loosemore, 2007), environmental protection risk (Ke et al., 2010), force majeure risk (Toan and Ozawa, 2008; Xu et al., 2010; Ke et al., 2010), and material/labor non-availability (Xu et al., 2010).

**Category 6 – Operation risks:**

The operation risks are the major risks that would affect the future cash flows generated in the operation period (Ho and Liu, 2002). Payment risk, completion risk (Xu et al., 2010; Ke et al., 2010), early termination of concession by concession company (Toan and Ozawa, 2008), toll fee issues, demand risk, operator inability, cost escalation risks, and supply risks (Dias and Ioannou, 1995) are common factors for which project company or investors held responsible in literature.

Investment in the PPP transportation projects is subject to high risk, especially when there are a large number of uncertainty factors in the projects. Economic, political, social, construction, operational and other related risks issues have been recognized as crucial criteria for investment decision-making (Piyatrapoomi et al., 2004; Toan and Ozawa, 2008; Liu et al., 2014). Risk assessment has been widely used to make investment decisions by the private sector (Demong and Lu, 2012). Risk in investment environment under PPP projects was found to profound influence the private sector's investment willingness.

### 2.4.2 Risk response methods

Charoenpornpattana and Minato (1999) suggested that there are three methods to handle risk: risk control, risk retain and transfer risk. If retain risk, meaning that suffer losses caused by risks, transfer risks to other partners to minimize risk. In conclusion,

risks related to political environment (e.g., policy changes and government capacity), finance (e.g., inflation and interest rates) law (e.g., law changes and poor law enforcement), should be retained by the public sector (Charoenpornpattana and Minato, 1999). Most of the risks related to project (management and techniques risks) should be transferred, and others (supply and demand risks) should be shared between private and public. A significant contribution of the study of Li et al. (2005) identifies four principal risks which the public and private sector partners need to consider carefully when making risk allocation decisions. These risks are the level of public support, project approval and permit, contract variation and lack of experience. The whole point of the research is: risks related to the macro environment is retained, risks related to the project are transferred, and the risk lies in the control of both parties is shared. Besides, potential risks have to be identified to ensure reasonable allocation (Flanagan and Norman, 1993).

## 2.5 Attributes and criteria of the private sector's investment willingness

Obviously, without the participation of the private sector, PPP projects cannot be established and carried out (Sader, 2000). Thus, the identification of appropriate criteria for evaluating the investment willingness of the private sector is crucial for both public and private sectors. By reviewing several previous research works in this area, in-depth interviews and ten case studies in Vietnam, a total of six key criteria and 28 main attributes relevant to the investment willingness of investors (Table 2-4) were drawn up and described in the following:

Table 2-4 List of investment willingness attributes and criteria

| Investment willingness | | Literature review |
|---|---|---|
| **Wil1. Financing attribute** | | |
| **WF1** | Ability to supply capital for the project | Dias and Ioannou (1995); Ng et al. (2009) |
| **WF2** | Credibility to call loan for the project | Dias and Ioannou (1995) |
| **WF3** | Ability to fund initial project costs | Dias and Ioannou (1995); Ng et al. (2009) |
| **WF4** | Efficiency of domestic capital market | Akintoye et al. (2003) |
| **WF5** | Suitability of equity/debt ratio | Ng et al. (2009); Kwak et al. (2009); Schaufelberger and Wipadapisut (2003); Devapriya (2006) |
| **Wil2. Profitability attribute** | | |
| **WP1** | Revenues from operating the vicinity of project | Vickram (2009) |

| | | |
|---|---|---|
| **WP2** | Revenues from the services of project | Sader (2000); Vickram (2009); Akintoye et al. (2003); Ng et al. (2009) |
| **WP3** | Stability of project's cash flow | Kwak et al. (2009) |
| **WP4** | Ability of new markets' seeking and penetration | Ozdoganm and Birgonul (2000) |
| **Wil3. Legal framework attribute** | | |
| **WL1** | Transparency and adequacy of legal framework | Boyfield (1992); Vickram (2009); Qiao and Robert (2001) |
| **WL2** | Advantage of legal framework for investment | Ward and Sussman (2005); Vickram (2009) |
| **WL3** | Efficiency of State's incentive policies for investment | Zhang and Wang (1998); Mustajab (2009); Ward and Sussman (2005) |
| **WL4** | Clarity of State participant portion | Decision 71 (2010); Dias (1995) |
| **WL5** | Facilitation for procedures of land acquisition and compensation | Ogunlana and Abednego (2009); Long et al. (2004); ADB (2012) |
| **Wil4. Partner selection attribute** | | |
| **WS1** | Accessibility to reliable partners | Kwak et al. (2009) |
| **WS2** | Capacity of partners | Tiong (1996); Sader (2000); Nisar (2007); Kwak et al. (2009); Mustajab (2009); Qiao and Robert (2001); Ahadzi and Bowles (2004) |
| **WS3** | Favorable investment environment for seeking partners | Mustajab (2009) |
| **WS4** | Competitiveness and transparency of bidding process | Ahadzi and Bowles (2004); Estacle and De Rus (2000); Ward and Sussman (2005); Vickram (2009) |
| **Wil5. Risk sharing attribute** | | |
| **WR1** | Less risky in project | Schaufelberger and Wipadapisut (2003) |
| **WR2** | Efficient legal framework about project risk sharing | Flanagan and Norman (1993) |
| **WR3** | Clear risk allocation among parties | Sader (2000); Nisar (2007); Kwak et al. (2009); Qiao and Robert (2001) |
| **WR4** | Clear supporting condition about risk sharing by the State | Schaufelberger and Wipadapisut (2003); Ashuri et al. (2012); Liu and Cheah (2009) |
| **Wil6. Macroeconomics attribute** | | |
| **WM1** | Changes of macroeconomics policies | Dailami and Klein (1997); Kwak et al. (2009); Vickram (2009); Li et al. (2005); Qiao and Robert (2001) |
| **WM2** | Favorable conditions by the State for investment operation of the private sector | Decision71/2010/QD-TTg (2010); LOI (2005) |
| **WM3** | Attractiveness of investment environment | Sader (2000) |
| **WM4** | Efficiency of the monetary policy of the state | Ng et al. (2009); Liu et al. (2014) |
| **WM5** | Stability of macroeconomic indicators (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI...) | Dias and Ioannou (1996); Schaufelberger and Wipadapisut (2003); Cheung (2009) |
| **WM6** | Effectiveness of environmental impact assessment | |

**Attribute 1 – Financing attribute:**

Finance is indispensable in any large construction project, especially PPP transportation projects. Indeed, the evaluation of their financial viability is the most commonly used industry practice of assessing the potential of the project to achieve the financial targets

of its various stakeholders (Pantelias and Zhang, 2010). The more attractive the financial market, the higher possibility of PPP projects (Qiao et al., 2001). The investment willingness of the private sector on the financial aspects (Table 2-4) are assessed by many attributes, including ability to supply capital, credibility to call a loan, ability to fund initial costs, and efficient domestic financial markets (Dias and Ioannou, 1995; Akintoye et al., 2003; Ng et al., 2010). Furthermore, PPP projects often require a vast amount of capital, investors call for the investment cooperation from the partners/promoters or borrowing a loan from financial institutions (e.g., financiers, banks, and lenders). The higher debt may allow for higher rate of return to equity investors, too much can provide more risks to the project (Kwak et al., 2009). Besides, selection of appropriate equity/debt ratio and identification of adequate financing sources are also the importance attributes for assessing investment willingness of the private sector (Schaufelberger and Wipadapisut, 2003).

**Attribute 2 – Profitability attribute:**

Ward and Sussman (2005), and Vickram (2009) argued that the primary objective of investors seek to profit from the provision of services in an investment environment can predictable. Besides, strong value for money was also emphasized by Akintoye et al. (2003) to attract the participation of the private sector in the private finance initiative (PFI) projects. Moreover, the BOT model, one kind of PPP forms could be attracted for private investors because it might provide an opportunity to stay in the market during recession periods and it also creates many opportunities for investors to penetrate new international markets (Ozdoganm and Birgonul, 2000). Profitability attribute comprises a lot of criteria, such as revenues from operating the vicinity of project (Cuttaree, 2008); revenues from the services of project (Sader, 2000; Cuttaree, 2008; Akintoye et al., 2003; Ng et al., 2010); stability of project's cash flow (Kwak et al., 2009); and ability of new markets' seeking and penetration (Ozdoganm and Birgonul, 2000).

**Attribute 3 – Legal framework attribute:**

Government processes and procedures for BOT project implementation in Vietnam are still complicated, presenting obstacles to project performance such as non-transparency and inadequacy of legal framework, legal barriers to investment, complex procedures for compensation and site clearance (ADB, 2012). Favorable legislation and regulations

are essential for successful preliminary evaluation phase (Qiao et al., 2001). Moreover, to render projects attractive to investors despite these risks, the government has to raise user fees or provide special financial supports to projects throughout supporting policies (Dailami and Klein, 1998). These financial supports consists of preferential tax treatment, grants, and equity or subordinated debt contributions. Therefore, legal framework, incentive policies, state participation portion as well as administrative procedures are the key elements to assess the investment willingness of the private sector.

**Attribute 4 - Partner selection attribute:**

Development of PPP projects has encountered with critical challenges, particularly the enormous difficulties in attracting the right private investors. The private sector is responsible for the finance, design, construction, operation and maintenance of projects for a concession period. Due to its complexity, implementation of PPP projects often requires a large consortium or joint venture companies (Kwak et al., 2009). In such a consortium, all participating entities need to work cooperatively, share information, make decisions collectively, share benefits, take corresponding responsibilities, and resolve disputes. It would not be possible if there do not have trust between these participants. Moreover, early involvement with financial institutions before tender preparation process is also a good solution for private investors. Partner selection criteria (Table 2-4) comprises suitable investment environment for seeking partners, competitiveness and transparency of bidding process, accessibility to reliable partners, and ability of partners (Tiong, 1996; Estacle and De Rus, 2000; Sader, 2000; Qiao et al., 2001; Ward and Sussman, 2005; Nisar, 2007; Kwak et al., 2009; Mustajab, 2009; Cuttaree, 2008; Ahadzi and Bowles, 2004).

**Attribute 5 – Risk sharing attribute:**

The PPP projects cover numerous risk due to capital-intensive, long concession periods and diversity of participants (Nisar, 2007). The allocation of risks and rewards among participants is tough (Kwak et al., 2009). Therefore, private investors expect an appropriate distribution of risks to those best able to manage them instead of traditionally more to the private sector. Risk sharing criteria (Table 2-4) includes less risk in PPP transportation projects, efficient legal framework about risk sharing in PPP

transportation projects, clear allocation of risks among parties, and clear supporting conditions about risk sharing by the State (Flanagan and Norman, 1993; Sader, 2000; Qiao et al., 2001; Schaufelberger and Wipadapisut, 2003; Nisar, 2007; Kwak et al., 2009; Liu and Cheah, 2009; Ashuri et al., 2012).

**Attribute 6 – Macroeconomics attribute:**

Benefits of PPP projects positively correlated with the investment environment. Macroeconomics instability will have a bad effect on the performance of investors. Therefore, investors awaited the practical actions of the government to reduce uncertainty in investment. Dailami and Klein (1998) and Zhang (2005b) concluded that the governments with stable macroeconomic policies can attract private infrastructure investors more easily. Moreover, based on the research by Kwak et al. (2009) in order to improve the private sector's willingness to participate in PPP projects, the government should create the favorable investment environment with stable social, legal, economic and financial conditions (Qiao et al., 2001; Li et al., 2005; Cuttaree, 2008). Macroeconomics criteria (Table 2-4) consists of many criteria such as changes in macroeconomics policies (Dailami and Klein, 1998; Kwak et al., 2009; Cuttaree, 2008; Li et al., 2005; Qiao et al., 2001); favorable conditions by the State for investment operation of the private sector (Decision 71, 2010; LOI, 2005); attractiveness of investment environment (Sader, 2000); efficiency of the monetary policy of the state (Ng et al., 2010; Liu et al., 2014); stability of macroeconomic indicators (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI...) (Dias and Ioannou, 1996; Schaufelberger and Wipadapisut, 2003; Cheung, 2009) and effectiveness of environmental impact assessment.

## 2.6 Project investment decision models

Previous research works showed that an objective, reliable, and practical risk assessment model is essential to the successful implementation of PPP projects (Xu et al., 2010). In recent years, various analytical studies including risk assessment ICRAM-1 (Figure 2-9) for international projects (Hastak and Shaked, 2000); project investment decision model (Figure 2-10) for international project (Han and Diekmann, 2001);

framework for investment decision-making under risk and uncertainty (Piyatrapoomi et al., 2004); a fuzzy synthetic evaluation model (Xu et al., 2010); interpretative structural modeling (Iyer and Sagheer, 2010); risk-based decision-making framework (Demong and Lu, 2012) (Figure 2-11) have been proposed for assessing risks of investment environment. The investors, financiers, and stakeholders related to PPP projects are interested in the overall assessment of investment risks in these projects. Moreover, based on the results of risk assessment, decision makers will consider whether investment decision-making or not (Piyatrapoomi et al., 2004; Demong and Lu, 2012).

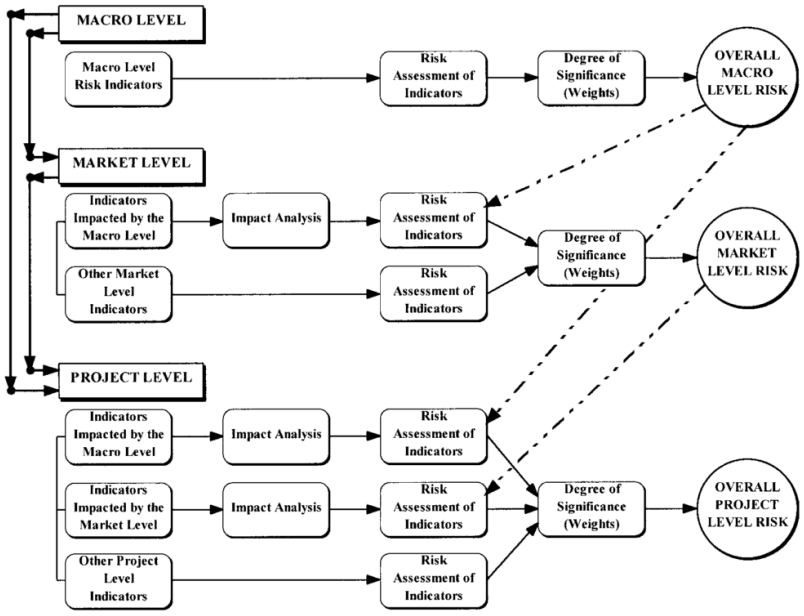



Figure 2-9 Framework of ICRAM-1 (Hastak and Shaked, 2000)

Ho and Liu (2002) stressed the importance of demonstrating financial viability of a PPP scheme when the initial feasibility study is conducted. For instance, investors will not be interested in committing to a project without the attractiveness (e.g., low rate of return) (Schaufelberger and Wipadapisut, 2003). Hence, various analytical techniques including the option valuation model (Ho and Liu, 2002), net present value-at risk method (Ye and Tiong, 2000), return on equity, debt/cover ratio, cash-flow analysis (Tánczos and Kong, 2001), analytical hierarchy process technique (Salman et al., 2007), etc. have been proposed for assessing the financial attractiveness of PPP projects. Moreover, Ng et al. (2010) has used structural equation modeling (SEM) to

establish a comprehensive framework for evaluating the initial feasibility for PPP project that would satisfy all the stakeholders **(**Figure 2-12**)**. Besides, when PPP project is not viable or is too risky to be undertaken by the private sector, an important practice is that the government may grant loan guarantees to a PPP project (Ho and Liu, 2002; Ozdoganm and Birgonul, 2000). The non-viability will be reflected by the bank's unwillingness to provide loans without government guarantees. Thus, it is important for the private sector, shareholder, and the government to evaluate the value of the loan guarantee before to make investment decisions. A decision support framework (Figure 2-13) was studied by Ozdoganm and Birgonul (2000) as used in the planning stage of a hydropower plant project in Turkey try to check project viability based on some predefined critical success factors, risk sharing scenarios and effective risk mitigation strategies.

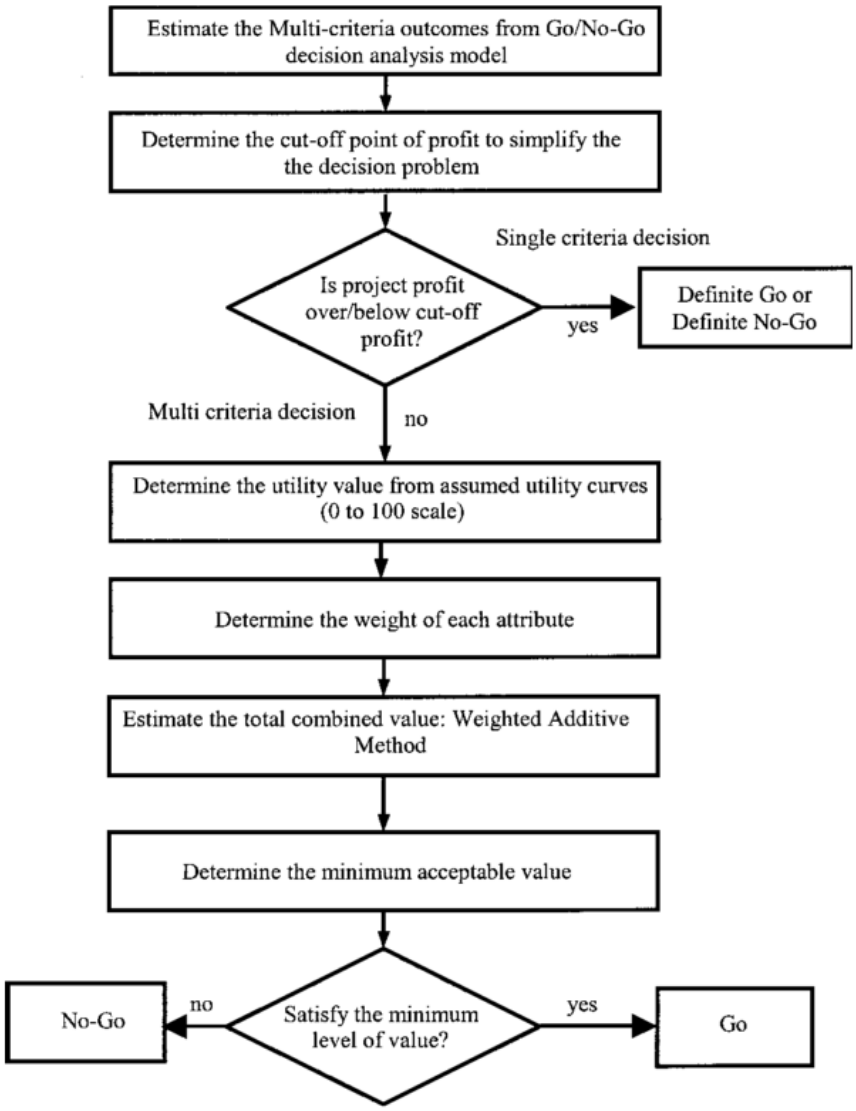



Figure 2-10 Go/no-go decision process model (Han and Diekmann, 2001)


Figure 2-11 Proposed risk-based decision-making framework (Demong and Lu, 2012)

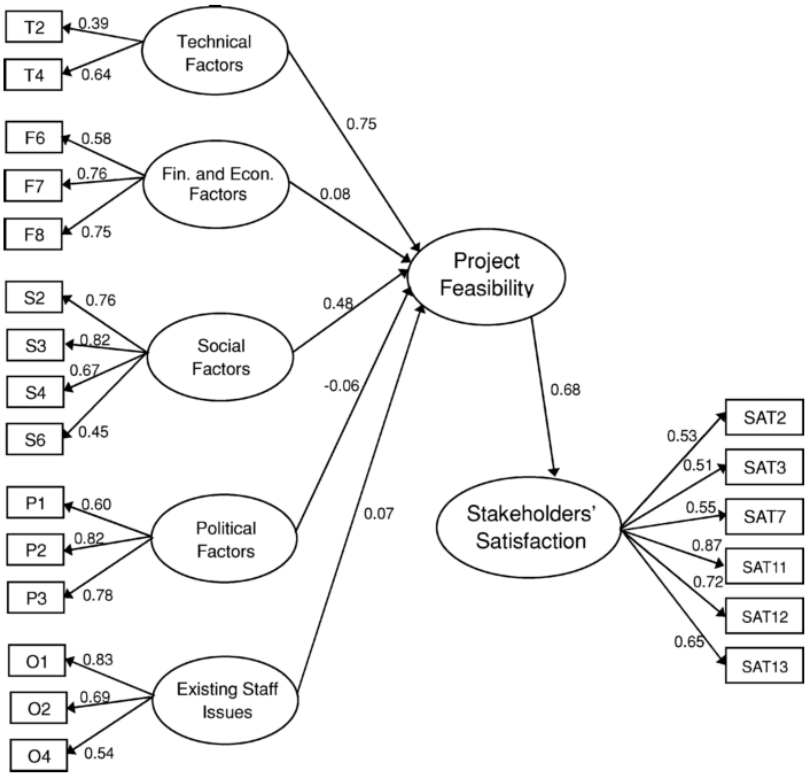



Figure 2-12 Standardized regression weights of final tripartite SEM (Ng et al., 2010)

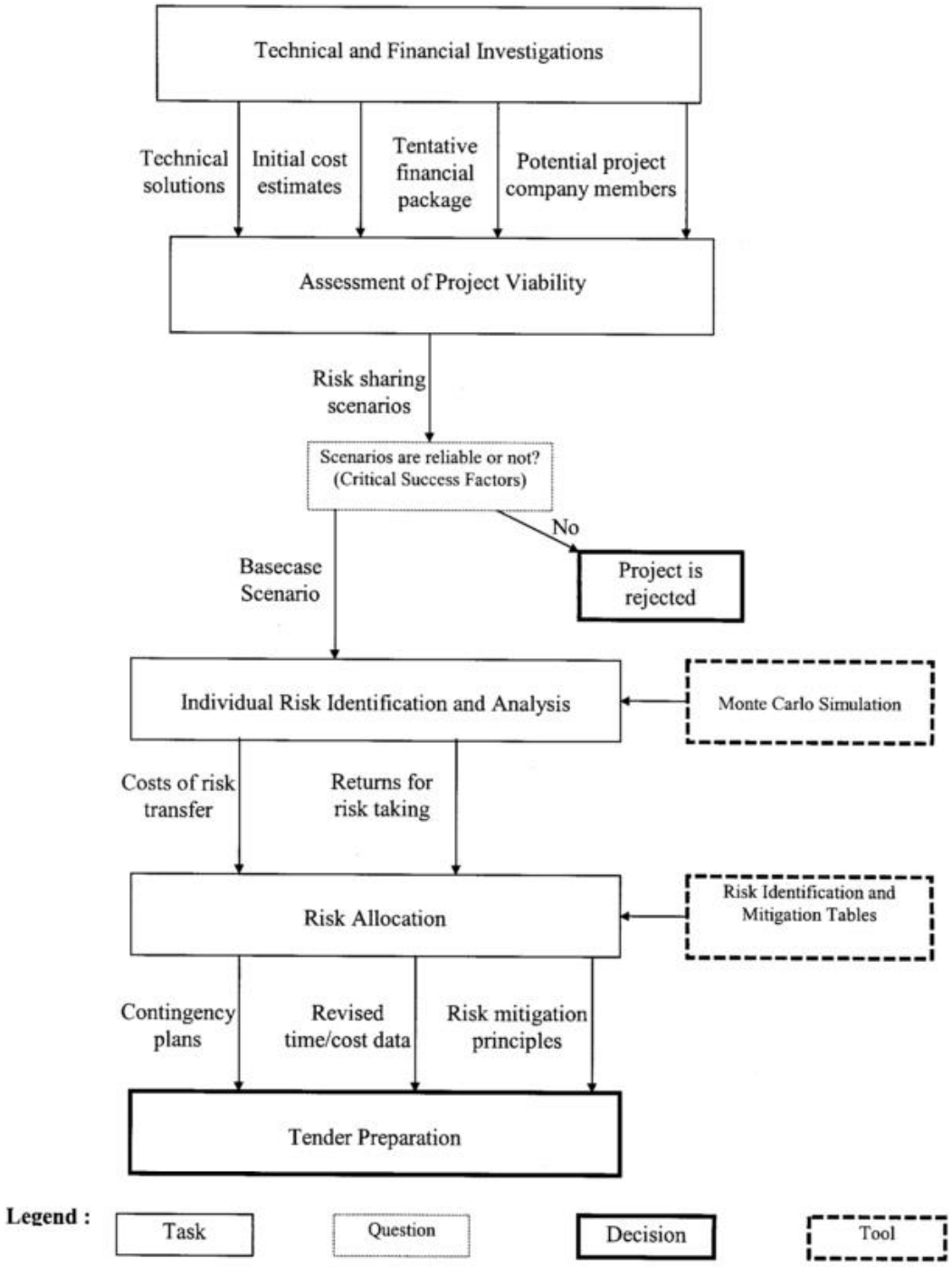



Figure 2-13 Decision support framework (DSF) in the planning stage of a BOT project (Ozdoganm and Birgonul, 2000)

Dias and Ioannou (1996) developed a so-called desirability model that assists companies in deciding about their participation in privately-promoted infrastructure projects. The three-level model illustrates multi-attributes of the private sector

desirability hierarchically which general and specific attributes are respectively located on the top and the bottom of the model (see Figure 2-14).

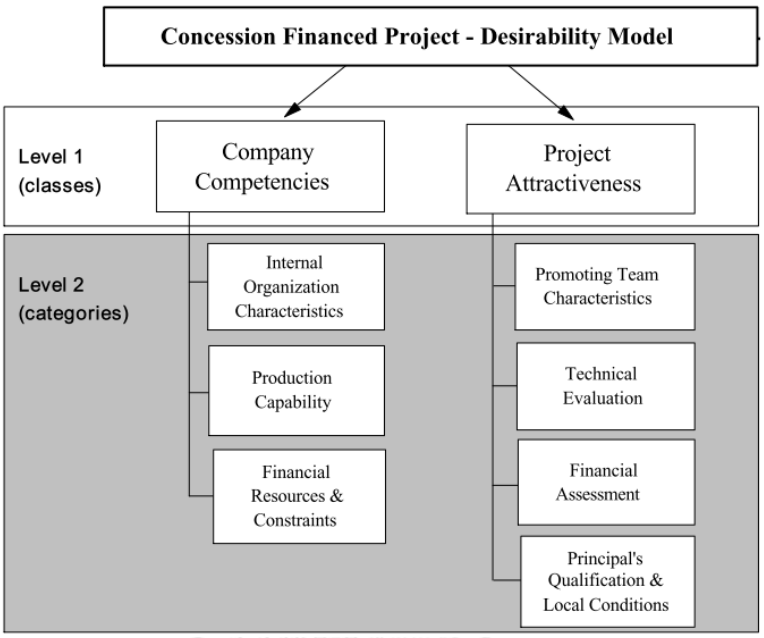



Figure 2-14 Hierarchical structure of the desirability model (Dias and Ioannou, 1996)

Many countries such as UK, France, Germany, Australia, etc. use scenarios for the investigation of the effects of risk and uncertainty to project investments (Piyatrapoomi et al., 2004). Political, social, environmental, as well as economic and other related risk issues have been addressed and included in decision-making frameworks, such as in a multi-criteria decision-making framework. Risk-based decision-making concepts and applications have been explored by many research works in the real estate industry (Piyatrapoomi et al., 2004). It was found that many decisions are made based on analyzing of risk factors, then weighting, calculating and selecting the best option based on the high performance index. However, little research has been made on how to incorporate risk into investment willingness and responsive strategies of the private sector in transportation PPP projects.

## 2.7 Responsive strategies

Risk management is a formal and orderly process for systematically identifying, analyzing, and responding to risks throughout the life cycle of a project to yield the

optimum degree of risk elimination, mitigation, and control (Wang et al., 2004). It can be divided into several steps, including risk identification, risk classification, risk analysis, risk response, risk review and risk control. Charoenpornpattana and Minato (1999) suggested that there are three methods to handle risk: risk control, risk retain and transfer risk. Based on the results of these authors, risks related to political environment (e.g., policy changes, government capacity), finance (e.g., inflation, interest rates), and law (e.g., law changes, poor law enforcement) should be retained by the public sector. Most of the risks related to project (e.g., management, techniques risks) should be transferred, and others (e.g., supply and demand risks) should be shared between private and public. Risk management strategies are rarely used alone to handle a particular risk; it is much more common to combine these strategies for such type of risks. Since then, the private sector can willing to get involved with PPP projects.

Responsive strategies of the private sector (Table 2-5) consist of four main strategies including cooperation strategies, financing strategies, evaluation strategies and suggestions for the government.

**Strategy 1 - Cooperation strategies:**

Cooperation strategies are the actions for which the private sector will try to seek assistance from influential individuals or organizations. Select a capable partners, maintain long-term relationships with industrial partners, maintain good relationship with local government and higher officials, and improve capacity of professionals involved are main strategies for which the private sector often performed in previous research (Akintoye et al., 2001; El-Amm, 2003; Ward and Sussman, 2005; Kwak et al., 2009; Awodele, 2012).

**Strategy 2 - Finance strategies:**

Appropriate finance strategies for a PPP project must be carefully selected by the private sector to cope with project risks, project conditions, and funding resources matter (Kwak et al., 2009). Establish detailed plan for loan capitals and long-term financing (Kwak et al., 2009), and evaluate carefully the incentive policies and the state participation portion (Liou et al., 2012; Sitruk, 2010; Liu and Cheah, 2009) are main strategies identified in previous work. Moreover, comprehensively assess the effects of

inflation, interest rate, foreign exchange issues (Cheung, 2009; Schaufelberger and Wipadapisut, 2003); and seek government support and guarantees (Schaufelberger and Wipadapisut, 2003; Ashuri et al., 2012; Liu and Cheah, 2009; Kwak et al., 2009) are other strategies carried out by the private sector.

**Strategy 3 - Evaluation strategies:**

Project evaluation and feasibility study assessment are crucial for any PPP transportation projects. For the private sector, assessing the viability of PPP projects could enable them to make better decisions to invest (Ozdoganm and Birgonoul, 2000). Therefore, evaluation strategies have a critical role in determining the success of the investment matter of the private sector into PPP projects. Develop a project evaluation tool (Ahadzi and Bowles, 2004); hire experienced consultants to assess the feasibility of the project (Unkovski and Pienaar, 2009); analyze appropriate allocation of responsibility and risk (Ng and Loosemore, 2007); and evaluate concession period for projects (Lv et al., 2014) are main strategies frequently cited in previous studies.

**Strategy 4 - Suggestions for the government:**

Based on research of Kwak et al. (2009), early feedback or suggestion from the private sector can be expected to improve the quality of the policies and increase the possibility of success for PPP projects. Moreover, two-way communication channels between public and private sectors such as hosting regular meetings to share updated information about PPP policies and potential projects need to be established to help the private sector can ready for PPP projects. Suggestions from the private sector for government consist of “acquire proposals from the private sector”; “suggest to build permanent contract during the concession period of the contract”, “the contract could be adjusted to fit economic, political, and social changes”; “establish adequate legal and regulatory framework”; “establish an inter-sector working team”; “develop a database for historical PPP projects”; and “adjust the appropriate risk allocation between the private and public sectors” (Akintoye et al., 2001; Ward and Sussman, 2005; Liou and Huang, 2008; Maluleka, 2008; Kwak et al., 2009; Xu et al., 2010a).

Table 2-5 Responsive strategies of the private sector

| 1. Response strategies | | Literature review |
|---|---|---|
| **Stra1. Cooperation strategies** | | |
| SC1 | Select capable partners (technical capacity and financial resources) | Ward and Sussman (2006); El-Amm (2003) |
| SC2 | Maintain long-term relationships with industrial partners | Kwak et al. (2009) |
| SC3 | Maintain good relationship with local government and higher officials | Kwak et al. (2009); Awodele (2012) |
| SC4 | Improve capacity of professionals involved | et al. (2001b) |
| **Stra2. Finance strategies** | | |
| SF1 | Establish detailed plan for loan capitals and long-term financing | Kwak et al. (2009) |
| SF2 | Evaluate carefully the incentive policies and the state participation portion | Liou et al. (2012); Sitruk (2010); Liu and Cheah (2009) |
| SF3 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | Cheung (2009); Schaufelberger and Wipadapisut (2003) |
| SF4 | Seek government support and guarantees | Schaufelberger and Wipadapisut (2003); Ashuri et al. (2012); Liu and Cheah (2009); Kwak et al. (2009) |
| **Stra3. Evaluation strategies** | | |
| SE1 | Develop a project evaluation tool | Marcus and Graeme (2004) |
| SE2 | Hire experienced consultants to assess the feasibility of the project | Unkovski and Pienaar (2001) |
| SE3 | Analyze appropriate allocation of responsibility and risk | Ng and Loosemore (2007) |
| SE4 | Evaluate concession period for projects | Lv et al. (2014) |
| **Stra4. Suggestions for the government** | | |
| SS1 | Acquire proposals from the private sector | Ward and Sussman (2006) |
| SS2 | Build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | Ward and Sussman (2006); Liou and Huang (2008) |
| SS3 | Establish adequate legal and regulatory framework | Kwak et al. (2009) |
| SS4 | Establish an inter-sector working team | Kwak et al. (2009); Khulumane (2008) |
| SS5 | Develop a database for historical PPP projects | Akintoye et al. (2001); Kwak et al. (2009) |
| SS6 | Adjust the appropriate risk allocation between the private and public sectors | Xu et al. (2010a) |

## 2.8 Research gaps

Since 1993, Vietnam has issued numerous BOT/BT/BTO, PPP pilot and PPP regulations, under which private investors can build infrastructure under certain

favourable conditions. Right up to 2015, Vietnam government has just issued Decree 15/2015/ND-CP, which promulgates the regulation on investment in the PPP form. The PPP form brings many advantages for participants such as public and private sectors. However, up to this time, Vietnam has not produced much research works about the implementation of PPP projects due to Vietnam is currently in the first stage of application of PPP model for construction projects and attempts to attract more investment from the private sector. In many reports on the investment in Vietnam, many issues are affecting the performance of PPP projects as follows:

- Lack of the adequate laws and regulations for PPP form

- Lack of transparency of investment environment

- Lack of attractiveness of PPP projects in Vietnam

- Lack of experience in the public sector in performance of PPP projects

- Hard for supplying capital for the project (financing market risks and lack of strong financial institutions)

- The investment unwillingness of the private sector.

Thus, the objectives of this study are (1) to understand the concern factors of private investors; (2) the risk factors are encountered; (3) how to improve investment willingness of private investors for PPP market; and especially (4) to establish decision-making supporting tool to help private investors when they would like to invest in PPP transportation projects in Vietnam.

# CHAPTER 3
# RESEARCH METHODOLOGY

This chapter presents the research methodology to identify and analyze concern factors of private investors, risk factors affecting the performance of PPP projects, and investment willingness attributes, as well as propose responsive strategies for the private sector when they would like to involve in Public-Private Partnership (PPP) projects in Vietnam. Moreover, this chapter illustrates how to assess the influence of risk perceptions affecting the investment willingness of the private sector and responsive strategies, and establishes a decision-making supporting tool to help decision makers make an investment decision in PPP projects.

## 3.1 Willingness assessment model of the private sector

In deciding to engage in the investment of PPP transportation projects, the private sector faces two fundamental questions:

1. Should the private sector seek involvement with investment environment for PPP projects?

2. Should the private sector be willing to participate in the tendering process of PPP projects?

Figure 3-1 shows the decision tree representing the decisions which the private sector could face when addressing their participation in this type of projects. The squares represent “decision nodes”, the circle represents “chance nodes”, p is the probability that the private sector is awarded the proposal. Similarly, 1-p (the complement of p) is the probability that the private sector is not accepted for its proposal.

The decisions for each stage are very complex as they are influenced by several parameters and most parameters have a subjective, non-quantifiable, nature. This study addresses the parameter evaluation of PPP transportation projects from the private sector’s point of view. The model, called ***Willingness Assessment Model (WAM)***, will be developed in this study. This model attempts to develop a composite model,

including (1) A risk-based investment willingness assessment model (RIWAM), and (2) Decision-making assistant tool (DMAT). Its structure is shown in Figure 3-2, consisting of two major parts:

**(1) Part I - A Risk-based Investment Willingness Assessment Model (RIWAM)**

The objective of the first part is to provide the essential interrelationship among risk perceptions, investment willingness attributes and criteria of the private sector and risk responsive strategies. In this part, the decision makers can assess the suitability of investment environment and consequently, the decision has in getting involved in the PPP projects or not.

**(2) Part II - Decision-making assistant tool (DMAT)**

To help the private sector could have a tool to support their decisions in the next step: "Should the private sector participate in the tendering process to promote infrastructure projects" though measuring the performance of such willingness criteria regarding potential PPP transportation projects.

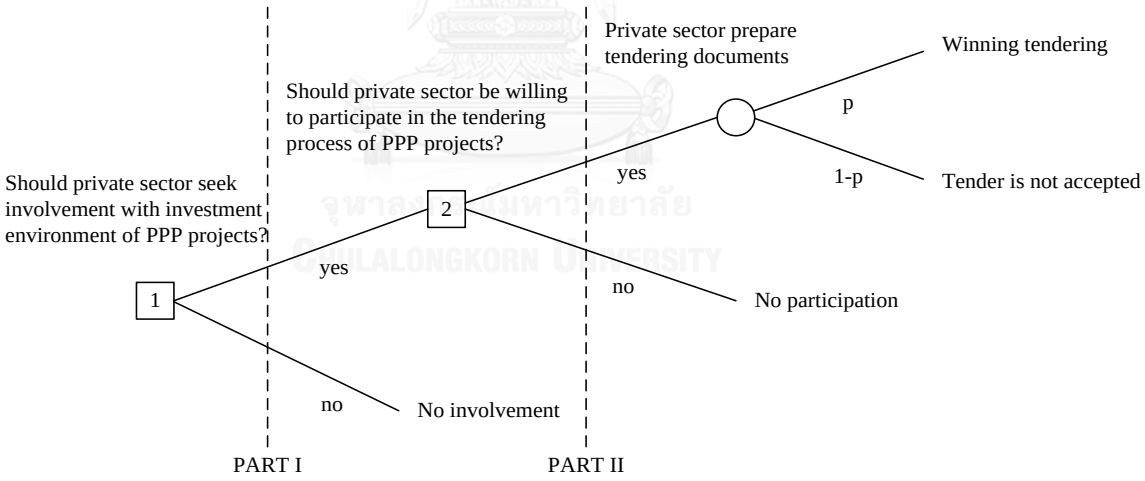



Figure 3-1 Decision-making process of the private sector in PPP projects

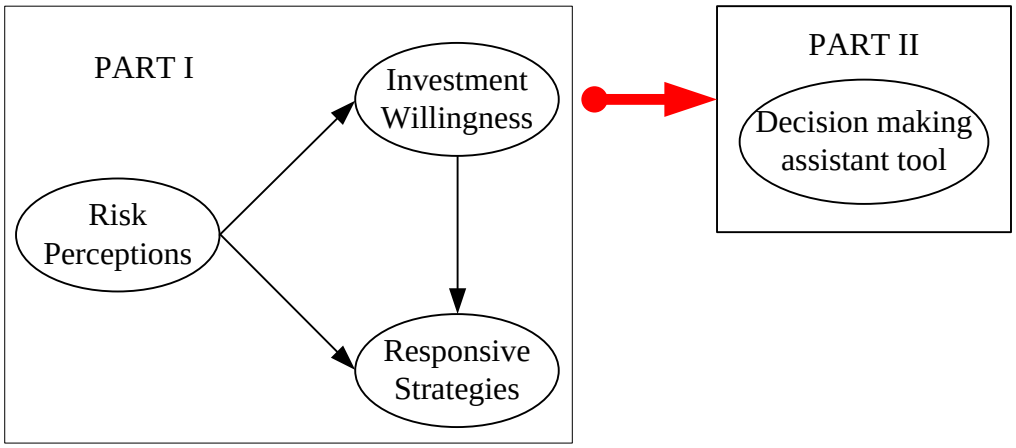



Figure 3-2 Willingness assessment model (WAM)

### 3.1.1 A risk-based investment willingness assessment model (RIWAM)

Structural equation model (SEM) was an alternative technique for exploring the interrelationship (direct and indirect relationships) among factors in multiple layers of linkages between variables. SEM proves effective statistical technique in developing the causal model for explaining a dependent variable with a high quality information (Tabachnick and Fidell, 2006; Hair et al., 2009). Besides, SEM is also referred as causal modeling, analysis of covariance structures, path analysis, dependence analysis, or confirmatory factor analysis (Ozorhon et al., 2007). Therefore, SEM approach is used to unveil the relationships among initial risk factors, the investment willingness, and responsive strategies for the private sector in PPP projects as it is considered as an efficient method for establishing the structural relationships among the latent variables, and for testing the hypothesis model. The influence of risk factors on the investment willingness of the private sector will be analyzed. The objective of this hypothesis model will help to explore the important interrelationships among risk factors, investment willingness, and responsive strategies of the private sector. In another word, the private sector will understand the critical risk factors faced in the investment in PPP transportation projects in Vietnam. An understanding of PPP projects risks is essential to the investment willingness of the private sector. The private sector can then answer the question: **"should the private sector get involved with the investment of PPP transportation projects"** for their investment decision. Results of SEM approach are

also to recommend risk management strategies that give better control and reduce the impact of project risks to the private sector participants.

The six groups of risk factors are mainly considered as main risk factors which might have an influence on the investment willingness of the private sector. These six groups (namely, factors related to politics, law, commerce, design and procurement, construction, and operation risks) will be considered as independent variables. In addition, this study will examine the relationship between these groups of independent variables. Then, some hypotheses will be proposed to test relationships between the risk factors groups, investment willingness, and responsive strategies of the private sector. The hypothetical model is shown in Figure 3-3.

**Hypothesis 1:** In PPP projects, the more unstable of politics environment, the less willingness of the private sector.

**Hypothesis 2:** In PPP projects, the more volatile of legal framework relating to PPP, the less willingness of the private sector.

**Hypothesis 3:** In PPP projects, the more unstable of commercial market relating to PPP, the less willingness of the private sector.

**Hypothesis 4:** In PPP projects, the more risk of design and procurement phase during the life cycle of PPP projects, the less willingness of the private sector.

**Hypothesis 5:** In PPP projects, the riskier of construction phase during the life cycle of PPP projects, the less willingness of the private sector.

**Hypothesis 6:** In PPP projects, the riskier of operation phase during the life cycle of PPP projects, the less willingness of the private sector.

**Hypothesis 7:** In PPP projects, the more unstable of political environment the more preparation for responsive strategies of the private sector.

**Hypothesis 8:** In PPP projects, the more volatile of legal framework relating to PPP, the more preparation for responsive strategies of the private sector.

**Hypothesis 9:** In PPP projects, the more unstable of commercial market relating to PPP, the more preparation for responsive strategies of the private sector.

**Hypothesis 10:** In PPP projects, the more risk of design and procurement phase during the life cycle of PPP projects, the more preparation for responsive strategies of the private sector.

**Hypothesis 11:** In PPP projects, the riskier of construction phase during the life cycle of PPP projects, the more preparation for responsive strategies of the private sector.

**Hypothesis 12:** In PPP projects, the riskier of operation phase during the life cycle of PPP projects, the more preparation for responsive strategies of the private sector.

**Hypothesis 13:** In PPP projects, the more investment willingness of private investors, the more preparation for responsive strategies of the private sector.

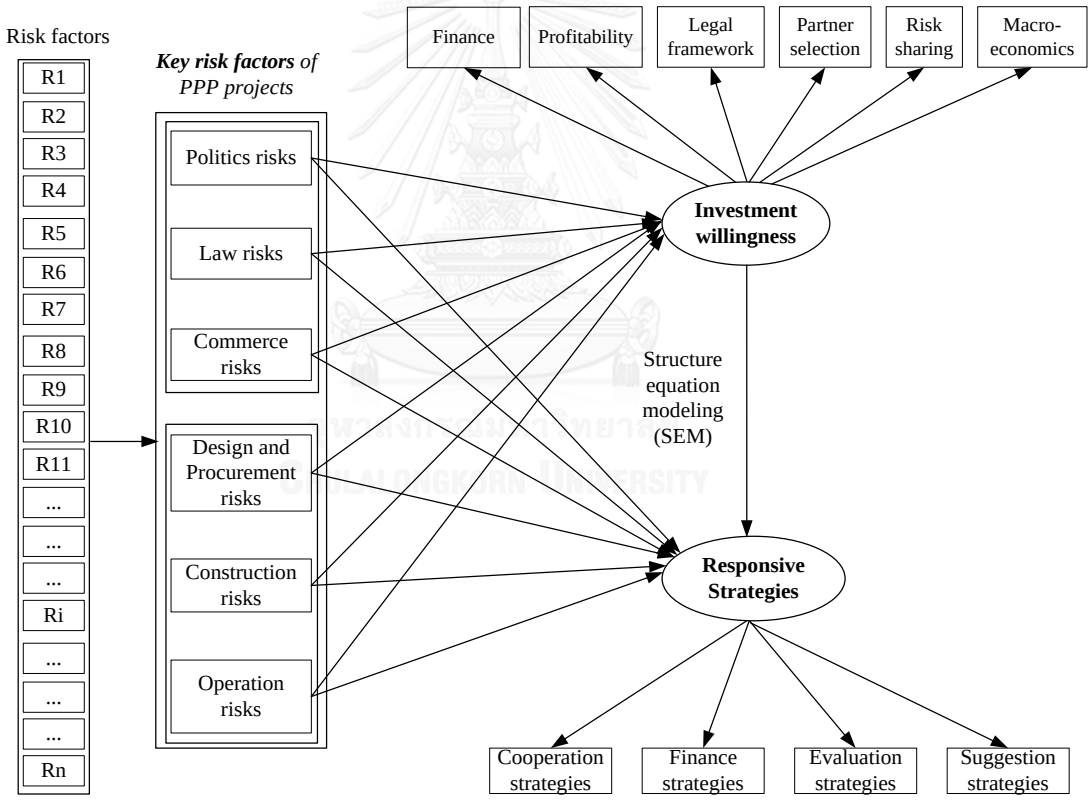



Figure 3-3 Proposed hypothetical model of the interrelationships among risk perceptions, investment willingness, and responsive strategies

### 3.1.2 A decision-making assistant tool (DMAT)

In this research, a decision-making assistant tool (DMAT) supports the private sector to answer the significant question: **'should the private sector willingness to**

**participate in the tendering process of PPP transportation projects".** The DMAT tool proposes the multiple attribute decision-making (MADM) method to conduct the evaluation of PPP transportation investment willingness alternatives. MADM method is a discipline aimed at supporting decision makers who are faced with numerous and conflicting alternatives to make an optimal decision. To achieve this purpose, the relative weights of all criteria and the preference structure of decision makers should be identified.

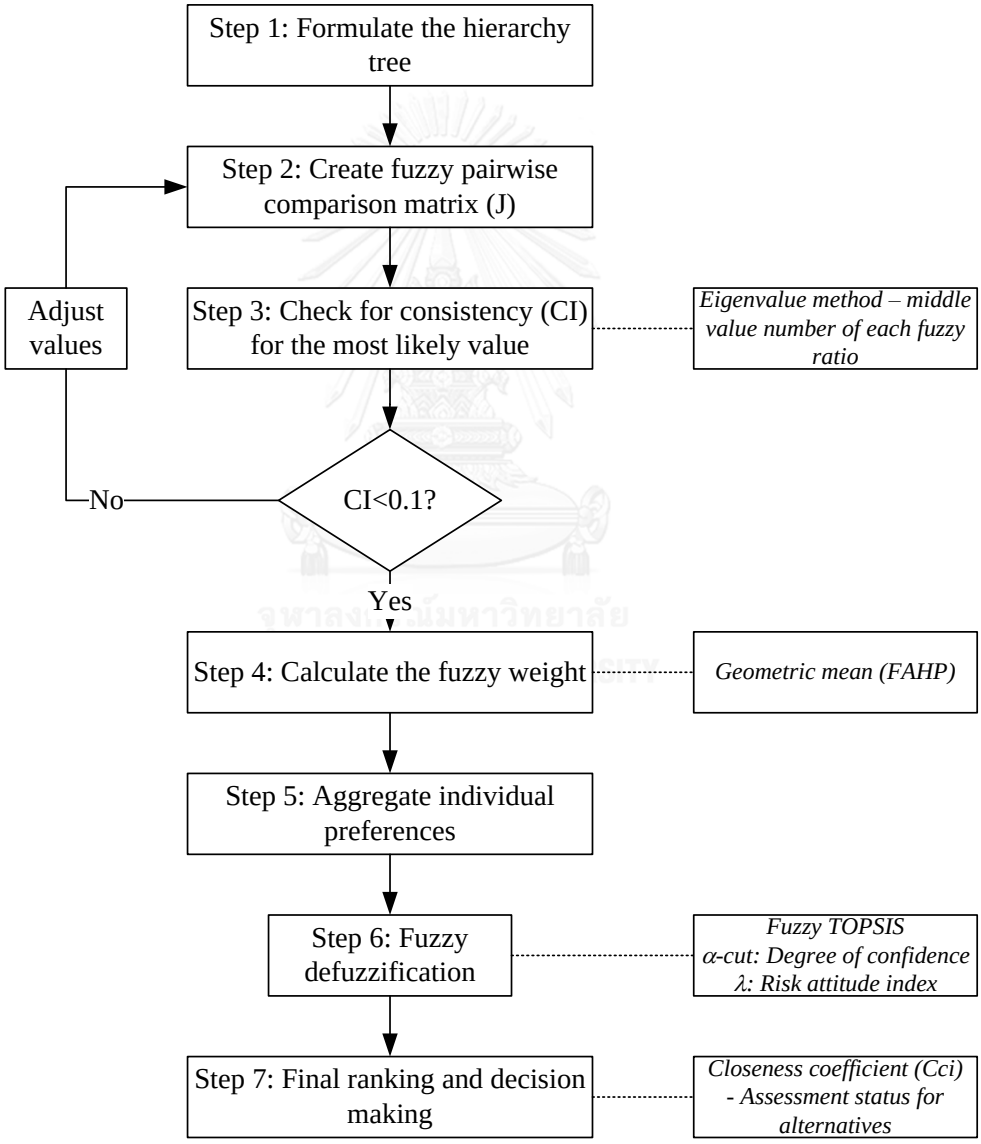



Figure 3-4 The proposed methodology for DMAT tool

The proposed methodology process of DMAT tool can be summarized in seven main steps in Figure 3-4 as follow:

*Step 1:* Formulate the hierarchy tree. Define the nature of the problem (Investment willingness attributes, criteria and project alternatives) and construct a hierarchy system for its evaluation

*Step 2:* Create fuzzy pairwise comparison matrix (J) of investment willingness attributes and criteria

*Step 3:* Check for consistency (CI) for the most likely value

*Step 4:* Calculate the fuzzy weight for each criterion of investment willingness.

*Step 5:* Aggregate individual preferences

*Step 6a:* Linear scale transformation
*Step 6b:* Fuzzy defuzzification

*Step 7:* Final ranking and decision-making. Determine the best alternative according to the ***synthetic utility values***, which are the aggregation value of relative weights, and performance scores corresponding to alternatives.

**Step 1: Develop the hierarchical structures**

The hierarchy structure adopted in this study to deal with the problems of PPP transportation projects investment decision is shown in Figure 3-5. The key attributes and criteria are derived through literature review and consultation with several experts.

The DMAT tool can be described by means of the following sets:

- A set of K decision-makers called $K = \{D_1, D_2, \dots, D_k\}$;

- A set of m potential PPP projects called $A = \{A_1, A_2, \dots, A_m\}$; $i = 1,2, \dots, m$

- A set of n criteria, $C = \{C_1, C_2, \dots, C_n\}$, with which scores of projects are measured; $j = 1,2, \dots, n$

- A set of performance ratings of such projects $A = \{A_1, A_2, \dots, A_m\}$ with respect to such criteria $C = \{C_1, C_2, \dots, C_n\}$, called $X = \{x_{ij}, i = 1,2, \dots, m; j = 1,2, \dots, n\}$

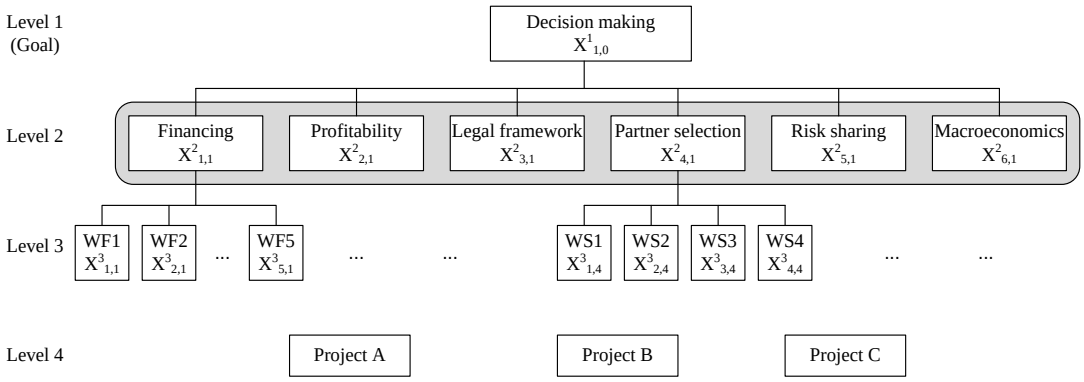



Figure 3-5 The hierarchy structure for investment decision alternatives assessment

**Step 2: Create fuzzy pairwise comparison matrix (J)**

Since the investment willingness attributes and criteria of PPP transportation projects have diverse significance and meanings, we cannot assume that each evaluation criteria is of equal importance. There are many methods that can be employed to determine weights such as eigenvector method, weighted least-square method, entropy method, analytic hierarchy process (AHP), and linear programming techniques for multidimensional analysis of preference (LINMAP). The selection of method depends on the nature of the problem. Evaluation of PPP transportation projects is a complex and wide-ranging problems, requiring the most inclusive and flexible method. The AHP method developed by Saaty (1977, 1980) is a very useful decision analysis tool in dealing with multiple criteria decision problems. However, in the operation process of applying the AHP method, it is easier and more humanistic for evaluators to assess "criterion A is much greater than criterion B" than to consider "the importance of principle A and principle B is seven to one". Hence, Buckley (1985) extended Saaty's AHP to the case where evaluators are allowed to employ fuzzy ratios in place of exact ratios to handle the difficulty of people assigning exact ratios when comparing two criteria and deriving the fuzzy weights of criteria by geometric mean method. Therefore, in this study, we employ Buckley's method to fuzzify hierarchical analysis by allowing fuzzy numbers for pairwise comparisons, and find the fuzzy weights.

The important level of attributes willingness will be measured by comparing the relative (comparative) weight between the attributes of the decision elements to form the reciprocal matrix. Table 3- represents the ratio scale that is employed to compare the

significant weight between criteria according to the linguistic meaning from 1 to 9 to denote equal importance to extremely important (Saaty 1977, 1980). Moreover, the degrees of the pairwise comparison of linguistic variables can be expressed using the fuzzy numbers as shown in Table 3-2. For n number of comparison items, the fuzzy judgment matrix J is:

$$J = \begin{bmatrix} j_{11} & j_{12} & \cdots & j_{1n} \\ j_{21} & \cdots & \cdots & j_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ j_{n1} & j_{n2} & \cdots & j_{nn} \end{bmatrix}$$

Table 3-1 Important scale in the AHP

| **Intensity** | 1 | 3 | 5 | 7 | 9 | 2,4,6,8 |
|---|---|---|---|---|---|---|
| **Linguistic** | Equal | Moderate | Strong | Demonstrated | Extreme | Intermediate value |

Table 3-2 The pairwise comparison of linguistic variables using fuzzy numbers (Saaty 1977 and 1980)

| **Fuzzy Scale** | **User-defined** | **Definition of linguistic variables** | **Explanation** |
|---|---|---|---|
| $\tilde{1}$ | (1, 1, 1) | Similar importance (SI) | Two criteria contribute equally to objective |
| $\tilde{3}$ | (3 - Δ, 3, 3 + Δ) | Moderate importance (MI) | Experience and judgment slightly favor one criterion over another |
| $\tilde{5}$ | (5 - Δ, 5, 5 + Δ) | Intense importance (II) | Experience and judgment strongly favor one criterion over another |
| $\tilde{7}$ | (5 - Δ, 5, 5 + Δ) | Demonstrated importance (DI) | One criterion is strongly favored and demonstrated in practice |
| $\tilde{9}$ | (8, 9, 9) | Extreme importance (EI) | The evidence favoring one criterion over another is of highest possible order of affirmation |
| $\tilde{2}, \tilde{4}, \tilde{6}, \tilde{8}$ | (x - Δ, x, x + Δ) | Intermediate values | When compromise is needed |
| $1/\tilde{x}$ | (1/(x + Δ), 1/x, 1/(x - Δ) | | |
| $1/\tilde{9}$ | (1/9, 1/9, 1/8) | | |

*Δ is a fuzzification factor*

For diagonal entries, i.e., i=j, $\tilde{j}_{ij} = 1$. Upper right-hand triangle entries $\tilde{j}_{ij}$ are comparison items needs to be defined by decision makers, whereas the lower left-hand triangle entries are derived by taking reciprocals, i.e, $\tilde{j}_{ij} = 1/\tilde{j}_{ij}$

**Step 3: Check for consistency (CI) for the most likely value**

Consistency is important in human thinking, which enables us to order the world according to dominance (Saaty, 2005). It is paramount to ensure that there is consistency in the pairwise comparisons. The AHP introduces a consistency measure to avoid this problem and estimate the relative weight in the presence of inconsistency in responses. Once the judgment matrix is populated (Step 2), the eigenvalue λ and eigenvector value $W$ are obtained by solving eigenvalue formulation $(J - \lambda I)W = 0$. Accordingly, the maximum eigenvalue is obtained by $\lambda_{max} = \max(\lambda)$. Satty (1977, 1980) has shown that in a consistent judgment matrix, $\lambda_{max} = n$, where n is the dimension of the judgment matrix. Consistency index (CI) indicates whether a decision maker provides consistent values (comparisons) in a set of evaluation. The CI is defined as

$$CI = (\lambda_{max} - n)/(n - 1)$$

The final inconsistency in the pairwise comparisons is solved using consistency ratio CR=CI/RI, where RI is the random index, which is obtained by averaging the CI of a randomly generated reciprocal matrix (Saaty, 1980). The values of RI are tabulated in Table 3-3. The threshold of the CR is 10%, and in case of exceedance a three-step procedure is followed (Saaty, 2005): (1) identify the most inconsistent judgment in the decision matrix, (2) determine a range of values the inconsistent judgment can be changed to so that would reduce the associated inconsistency, and (3) ask the decision maker to reconsider the judgment to a 'reasonable value'.

Buckley (1985) has proved that if a corresponding matrix by using crisp number is consistent, then the corresponding matrix by using fuzzy ratios is also consistent. The large eigenvalue method is used to judge the consistency of the matrixes that adopted the middle number of each fuzzy ratio as the ideal crisp ratio. (Stated by Li and Zou, 2011).

Table 3-3 The R.I. for different size matrices

| **Number of elements** | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **R.I.** | 0.52 | 0.89 | 1.11 | 1.25 | 1.35 | 1.40 | 1.45 | 1.49 | 1.51 | 1.54 | 1.56 |

**Step 4: Calculate the fuzzy weight**

**- The combination of experts' judgments:** This research combined all experts' judgment to be a general judgment. This general judgment could represent the opinion of the entire group of experts for the multiple criteria decisions. The geometric mean method could be used to calculate triangular fuzzy numbers from the judgments of experts as Eq. (3) (Buckley, 1985):

$$\tilde{J}_{ij} = (l_{ij}, m_{ij}, r_{ij}) : \; l_{ij} \le m_{ij} \le r_{ij}; l_{ij}, m_{ij}, r_{ij} \in \left[\frac{1}{9}, 9\right]$$

$$l_{ij} = \min(B_{ijk})$$

$$m_{ij} = \sqrt[n]{\prod_{1}^{n} B_{ijk}}$$

$$r_{ij} = \max(B_{ijk})$$

Where $B_{ijk}$ = pairwise comparison between criteria i and j evaluated by the k[th] expert.

- Noticeably, Meixner (2009) reminded that using minimum and maximum operations above is not appropriate if the evaluations are inhomogeneous. The whole span of fuzzy numbers gets big when one or a few experts provide extreme values of $l_{ijk}$ and/or $r_{ijk}$. The geometric mean method is therefore also used to calculate two remaining fuzzy numbers $l_{ijk}$ and $r_{ijk}$. As a result, the judgments of experts are combined as the following equation (Meixner, 2009):

$$l_{ij} = \left(\prod_{k=1}^{k} l_{ijk}\right)^{1/k} ; \; m_{ij} = \left(\prod_{k=1}^{k} m_{ijk}\right)^{1/k} ; \; r_{ij} = \left(\prod_{k=1}^{k} r_{ijk}\right)^{1/k}$$

Where $(l_{ijk}, m_{ijk}, r_{ijk})$ = triangular fuzzy numbers evaluated by the k[th] expert.

- Various techniques are used to compute the final fuzzy weights, such as computation of the eigenvector (as described in Step 3), arithmetic mean, geometric mean, etc. Preliminary investigation carried out using these techniques showed no significant difference. Consequently, for the ease of implementation, the geometric mean is adopted to estimate the weights. Fuzzy arithmetic operations (Table 3-4) are used over matrix J to calculate the fuzzy weights.

Table 3-4 Fuzzy arithmetic operation

| **Operators** | **Formulate (a,b)** | **Results** |
|---|---|---|
| Summation | A+B | $(a_1 + b_1, a_2 + b_2, a_3 + b_3)$ |
| Subtraction | A-B | $(a_1 - b_3, a_2 - b_2, a_3 - b_1)$ |
| Multiplication | A x B | $(a_1 \times b_1, a_2 \times b_2, a_3 \times b_3)$ |
| Division | A/B | $\left(\frac{a_1}{b_3}, \frac{a_2}{b_2}, \frac{a_3}{b_1}\right)$ |
| Scalar product | Q.A | $(Q \times b_1, Q \times b_2, Q \times b_3)$ |

[a] $A = (a_1, a_2, a_3)$; $B = (b_1, b_2, b_3)$

[b] *The values of A and B are positive, if negative numbers are used, the corresponding min and max values have to be selected* $a_1 < a_2 < a_3$; $b_1 < b_2 < b_3$; $a_i$ *and* $b_i$ *(i = 1 to 3)>0; n>0; Q>0*

Then, based on geometric mean technique to define the fuzzy geometric mean and fuzzy weights of such attributes and criteria as follows:

$$\tilde{J}_i = (\tilde{J}_{i1} \otimes \ldots \otimes \tilde{J}_{in})^{1/n}$$

$$\tilde{w}_i = \tilde{J}_i \otimes (\tilde{J}_1 \oplus \ldots \oplus \tilde{J}_n)^{-1}$$

Where $\tilde{w}_i$ is the fuzzy weight (where $i = 1$ to $n$).

**Step 5: Aggregate individual preferences**

This research proposed a measurement scale to evaluate the criteria of investment willingness in PPP projects. The linguistic scales was proposed to measure feasibility for each criterion. The scale is from "(0, 0, 20) - very poor" to "(80, 100, 100) – extremely high", where "(30, 50, 70) = fair" (Table 3-5). This scale enables participants to provide a feasibility score for each criterion in projects in a consistent manner.

Feasibility score matrix is shown as follows:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & & x_{2n} \\ \vdots & & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$$

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \cdots \\ \cdots \\ w_n \end{bmatrix}$$

Where i=1-n: alternatives; j=1-m: criteria

Finally, the feasibility level (FL) of potential projects was proposed as an overall feasibility measure. FL is determined as:

$$FL = W_j \times X_j = \begin{bmatrix} w_1.x_{11} & w_2.x_{12} & \cdots & w_n.x_{1n} \\ w_1.x_{21} & w_2.x_{22} & & w_n.x_{2n} \\ \vdots & & \ddots & \vdots \\ w_1.x_{m1} & w_2.x_{m2} & \cdots & w_n.x_{mn} \end{bmatrix}$$

Where $X_{ij}$ = feasibility score of criterion Cij; $W_{ij}$= overall weight of parameter Cij. $X_{ij}$ is rated by experienced professional directly involved in a project under assessment. $W_{ij}$ is the weight of each investment willingness criterion in PPP projects.

Table 3-5 Measurement scale for investment willingness criteria

| **Linguistic Scales** | **Code** | **Scale of Fuzzy number** | | |
|---|---|---|---|---|
| Very Poor (VP) | VP | 0 | 0 | 20 |
| Poor (P) | P | 10 | 25 | 40 |
| Fair (F) | F | 30 | 50 | 70 |
| Good (G) | G | 60 | 75 | 90 |
| Very Good (VG) | VG | 80 | 100 | 100 |

To employ the center of area (CoA) method to compute the non-fuzzy performance (BNP) value of the fuzzy feasibility measurement of potential project:

Taking the BNP value of the feasibility measurement score of potential projects as an example, the calculation process is as follows.

$$BNP_{FL_{PM}} = [(UFL_{PM} - LFL_{PM}) + (MFL_{PM} - LFL_{PM})]/3 + LFL_{PM}$$

**Step 6a: Linear scale transformation**

**Regular TOPSIS method**

The Technique for Order Preferences by Similarity to an Ideal Solution (TOPSIS) method was suggested by Hwang and Yoon (1981). The main idea came from the concept of the compromise solution to ***choose the best alternative nearest to the positive ideal solution (optimal solution) and farthest from the negative ideal solution (inferior solution).*** Then, choose the best one of sorting, which will be the best alternative.

TOPSIS was proposed by Hwang and Yoon (1981) to determine the best alternative based on the concepts of the compromise solution. The compromise solution can be regarded as choosing the solution with the shortest Euclidean distance from the ideal solution and the farthest Euclidean distance from the negative ideal solution. The procedures of TOPSIS can be described as follows.

Given a set of alternatives, $A = \{A_1, A_2, \dots, A_m\}$, and a set of criteria, $C = \{C_1, C_2, \dots, C_n\}$, where $X = \{x_{ij}, i = 1,2, \dots, m; j = 1,2, \dots, n\}$ denotes the set of performance ratings and $W = \{W_1, W_2, \dots, W_n\}$ is the set of weights, the information table I = (A, C, X, W) can be represented as shown in Table 3-6.

To avoid the complexity of mathematical operations in a decision process, the linear scale transformation is used to transform various criteria scales into comparable scales. Therefore, the first step of TOPSIS is to calculate normalized fuzzy decision matrix ($\tilde{R}$)

$$\tilde{R} = [\tilde{r}_{ij}]_{m \times n}$$

Table 3-6 The information table of TOPSIS method

| **Alternatives** | $C_1$ | $C_2$ | … | $C_m$ |
|---|---|---|---|---|
| $A_1$ | $x_{11}$ | $x_{12}$ | … | $x_{1m}$ |
| $A_2$ | $x_{21}$ | $x_{22}$ | … | $x_{2m}$ |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| $A_n$ | $x_{n1}$ | $x_{n2}$ | … | $x_{nm}$ |
| $W$ | $w_1$ | $w_2$ | … | $w_m$ |

Where B and C are the sets of benefit criteria and cost criteria, respectively, and

$$\tilde{r}_{ij} = \left( \frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right), j \in B;$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}}\right), j \in C;$$

$$c_j^* = \max_i c_{ij} \ \ if\ j \in B$$

$$a_j^- = \min_i a_{ij} \ \ if\ j \in C$$

Considering the different important of each criteria (weight), we can construct the weighted normalized fuzzy decision matrix as

$$\tilde{V} = [\tilde{v}_{ij}]_{m\times n} = [\tilde{r}_{ij}(.)\tilde{w}_j]_{m\times n}, i = 1,2,\dots,m; j = 1,2,\dots,n$$

The next step is to calculate the separation from the FPIS and the FNIS between alternatives. According to the weighted fuzzy decision matrix, normalized positive triangular fuzzy numbers can also appropriate the elements $\tilde{v}_{ij}, \forall i,j$. Then the fuzzy positive-ideal solution (FPIS, $A^*$) and fuzzy negative-ideal solution (FNIS, $A^-$) can be identified as:

$$A^* = (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*),$$

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-),$$

Where $\tilde{v}_j^* = max_i\{v_{ij3}\}$ and $\tilde{v}_j^- = min_i\{v_{ij1}\}, \quad i = 1,2,\dots,m; j = 1,2,\dots,n$

The distance of each alternative (PPP project) from $A^*$ and $A^-$ can be calculated as

$$d_i^* = \sum_1^n d_v\left(\tilde{v}_{ij}, \tilde{v}_j^*\right), \quad i = 1,2,\dots,m,$$

$$d_i^- = \sum_1^n d_v\left(\tilde{v}_{ij}, \tilde{v}_j^-\right), \quad i = 1,2,\dots,m,$$

Where $d_v(\cdot,\cdot)$ is the distance measurement between two fuzzy numbers. For example, let $\tilde{m} = (m_1, m_2, m_3)$ and $\tilde{n} = (n_1, n_2, n_3)$ to be two triangular fuzzy numbers. Based on vertex method of Chen (2000), the distance between two fuzzy numbers can be calculated by $d_v(\tilde{m}, \tilde{n}) = \sqrt{1/3\left[(m_1 - n_1) + (m_2 - n_2) + (m_3 - n_3)\right]}$

A closeness coefficient is defined to determine the ranking order of all alternatives once the distance of each alternative from $A^*$ and $A^-$ can be calculated. Thus, the closeness coefficient of each alternative is calculated as:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-} \quad , \qquad i = 1,2, \dots, m.$$

According to the closeness coefficient, the ranking order of each alternative can be determined and to help decision makers to choose the feasible alternative.

Step 6b: Fuzzy deduzzification

TOPSIS method (Incorporate risk attitude and confidence in decision-making)

Defuzzifying the weighted normalized fuzzy-feasibility matrix by $\alpha - cut$ method (confidence) and risk index $\lambda$

The $\alpha - cut$ technique decribed previous denotes the degree of confidence of decision maker in the fuzzy assessment. For instance, if $\alpha = 0$ means lack of confidence in the fuzzy assessment and then utilize the full range of uncertainty, whereas the upper value of $\alpha$ emphasizes a more confident of decision makers, and reaches maximum (i.e., 1) when the value approaches to the most likely value (Solomon and Rehan, 2006). For any given $\alpha - cut$ on a TFN, assuming $\tilde{A} = (a_1, a_2, a_3)$, the fuzzy interval$(a_1, a_3)$ will be reduced to $[a_1^\alpha, a_3^\alpha]$ after the $\alpha$-cutting:

$$a_1^\alpha = a_1 + \alpha(a_2 - a_1)$$

$$a_3^\alpha = a_3 - \alpha(a_3 - a_2)$$

Further, given the desired confidence over the data, the risk attitude has a significant effect on the defuzzified value. To get crisp weighting by considering risk index $\lambda$, we incorporate the experts' attitude toward the investment willingness factors by using risk index $\lambda = 0, \lambda = 0.5, and\ \lambda = 1$ to indicate that they have optimistic, moderate and pessimistic attitudes toward investment willingness factors.

$$a = \lambda a_3^\alpha + (1 - \lambda) a_1^\alpha$$

### 3.2 Data collection

In this research, data collection was primarily based on questionnaire surveys and in-depth interviews. Questionnaire surveys were designed to collect both qualitative and quantitative data. In-depth interviews were used to collect empirical evidence, and respondents' experience to support the findings of the questionnaire survey. The data collection process consists of three rounds, including pilot survey, large-scale survey, and validation survey. Figure 3-6 shows the content and purpose of each round of collecting data.

#### 3.2.1 Questionnaires

The objectives of this research were to explore perceptions of respondents about concern factors, risk factors and willingness attributes of the private sector in Vietnam PPP transportation projects. The data collecting from various experts within ten PPP project case studies have carried out using questionnaires for this research.

A questionnaire survey was designed to gather the viewpoints of the government agencies, private investors, financiers, lenders, contractors, sub-contractors, consultants and experts in managing PPP transportation projects. To fit in this research context (PPP transportation projects), these factors were reviewed and refined by a group of seven experienced professionals in PPP projects through in-depth interviews and case studies. The questionnaire survey was then amended so that it was easier to read and take exactly opinions of the respondents. After that, the questionnaire will administer to a further 320 respondents in a large-scale test. The data collected from the questionnaire surveys will be analyzed by using Statistical Package for Social Sciences (SPSS) version 22. The questionnaire consists of five sections as follow in Figure 3-6.

#### 3.2.2 Interviews

The in-depth interview is also designed to gather the awareness of the government agencies, private investors, financiers, lenders, contractors, sub-contractors, consultants and experts in managing PPP projects. The results will then incorporate with those from the questionnaire to conclude briefly overview of PPP legal issues; finance problems; incentive policies; typical structure; process; and difficulties and challenges of PPP projects. Three rounds of survey were carried out, including pilot survey, large-scale

survey, and validation survey. The details of questionnaire survey are shown in Appendix A, B, C, D, and E (see pages 259).

The respondents were invited to answer the questionnaire developed. Three phases of interviews, which included the pilot survey, large-scale survey and validation survey, were conducted:

**(1) The pilot survey**

The questionnaire was carried out of six respondents in the first pilot test and seven experienced professionals in the second pilot test. The duration for each interview is approximately from 30 minutes to 45 minutes depending on the interviewed supervisor's speed for the response.

**(2) The large-scale survey**

320 deliver respondents (116 feedback respondents) were invited to answer the questionnaire survey by the author. 30 consulted experts **(**17 feedback experts) were asked to participate in-depth interview in order to assess the relative weights and performance score of such attributes and three experienced professionals were invited to take part in assessing the feasibility score of potential PPP project case studies. The author came to meet the respondents directly to deliver questionnaires or send via email. The time needed for each interviewer to complete the survey varied from 30 minutes to 45 minutes, approximately the same amount of time as that of the pilot test, depending on how much the interviewer wanted to say connected with the content. The large-scale survey was conducted in Vietnam around three months from August to October 2014.

**(3) Validation survey**

Validation survey was used to verify the consistent of opinions of experts about concern factors, risk factors, a risk-based investment willingness assessment model (RIWAM), and a decision-making supporting tool (DMST), responsive strategies of the private sector when investing in Vietnam. The validation survey was carried out by three experts by selecting respondents in the large-scale survey. The respondents were chosen from more experience and were working on PPP projects in Vietnam (government agencies, sponsors, lenders, contractors, sub-contractors, and consultants). Then the willingness assessment model for the private sector in Vietnam was established.

Table 3-7 Contents of survey data collection

| PHASE | DATA COLLECTION | | CONTENT | PURPOSE |
|---|---|---|---|---|
| Pilot survey | 1) Pilot interview | Section 1 | - Information about the respondents' profile | Respondents' information |
| | | Section 2 | - Case studies<br>- Concern factors of private investors<br>- Risk factors affecting PPP transportation projects<br>- Investment willingness attributes of the private sector in PPP projects<br>- Strategies of the private sector applied when investing in PPP transportation projects | For overview of PPP in Vietnam<br>For research 1st, 2nd, 3rd, 4th, 5th objectives |
| | 2) Pilot questionnaire | Section 1 | - Information about the respondents' profile | Respondents' information |
| | | Section 2 | - Concern factors of private investors<br>- Risk factors affecting PPP transportation projects<br>- Investment willingness attributes of the private sector in PPP projects<br>- Strategies of the private sector applied when investing in PPP transportation projects | For research 1st, 2nd, 3rd, 4th, and 5th objectives |
| Large-scale survey | 1) Questionnaires<br>2) In-depth interview | Section 1 | - Information about the respondents' profile | Respondents' information |
| | | Section 2 | - The perception on the rating of concern factors contribute to the decision to invest into PPP transportation projects | For research 1st, 5th objectives |
| | | Section 3 | - The perception on the rating of risk factors affecting performance of PPP transportation projects in Vietnam (Probability and Impact of risk) | For research 2nd, 5th objectives |
| | | Section 4 | The perception of respondents:<br>- The influence level of risk factors into investment willingness of the private sector<br>- The agreement level about investment willingness attributes<br>- The agreement level of responsive strategies of the private sector | For research 3rd , 5th objectives |
| | | Section 5 | - Weight assignment for criteria and attributes of investment willingness factors<br>- Measurement of feasibility of potential PPP projects (Case studies) | For research 4th, 5th objectives |
| Validation survey | 1) Questionnaires<br>2) In-depth interview | | - Concern factors<br>- Risk factors<br>- RIWAM model<br>- DMAT tool<br>- Case studies | For research 1st , 2nd, 3rd, 4th, and 5th objectives |

### 3.4 Verification

The details of willingness assessment model will be developed by brainstorming from experts group that may be established by a format of a small focus group and using the Delphi technique (Nigel et al., 2006; Hallowell and Gambatese, 2010). Delphi method is an established technique for obtaining consensus estimates from many experts through using the strategic survey systems. This method can be applied to assess the concern factors, risks and established the response plans of private investors. Figure 3-6 shows the implementation process of Delphi technique in this research within the basic requirements for Delphi Research Method.

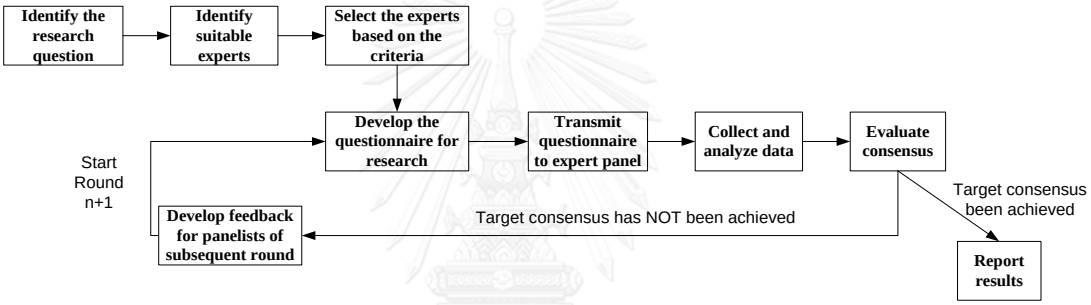



Figure 3-6 Delphi technique procedures (Hallowell and Gambatese, 2009)

Table 3-8 Proposed basic requirements for Delphi research method

| **Characteristic** | **Minimum requirement** |
|---|---|
| Identify suitable experts | The State agencies, Sponsors, Lenders, Contractors, Consultants have at least 5 experience years and has been working in PPP projects |
| Number of experts | 8-12 |
| Number of rounds | 2 |
| ***Feedback for each round*** | |
| Round 1 | Data from preliminary research or archived data |
| Round 2 | Median response from Round 1 |
| Measuring consensus | |

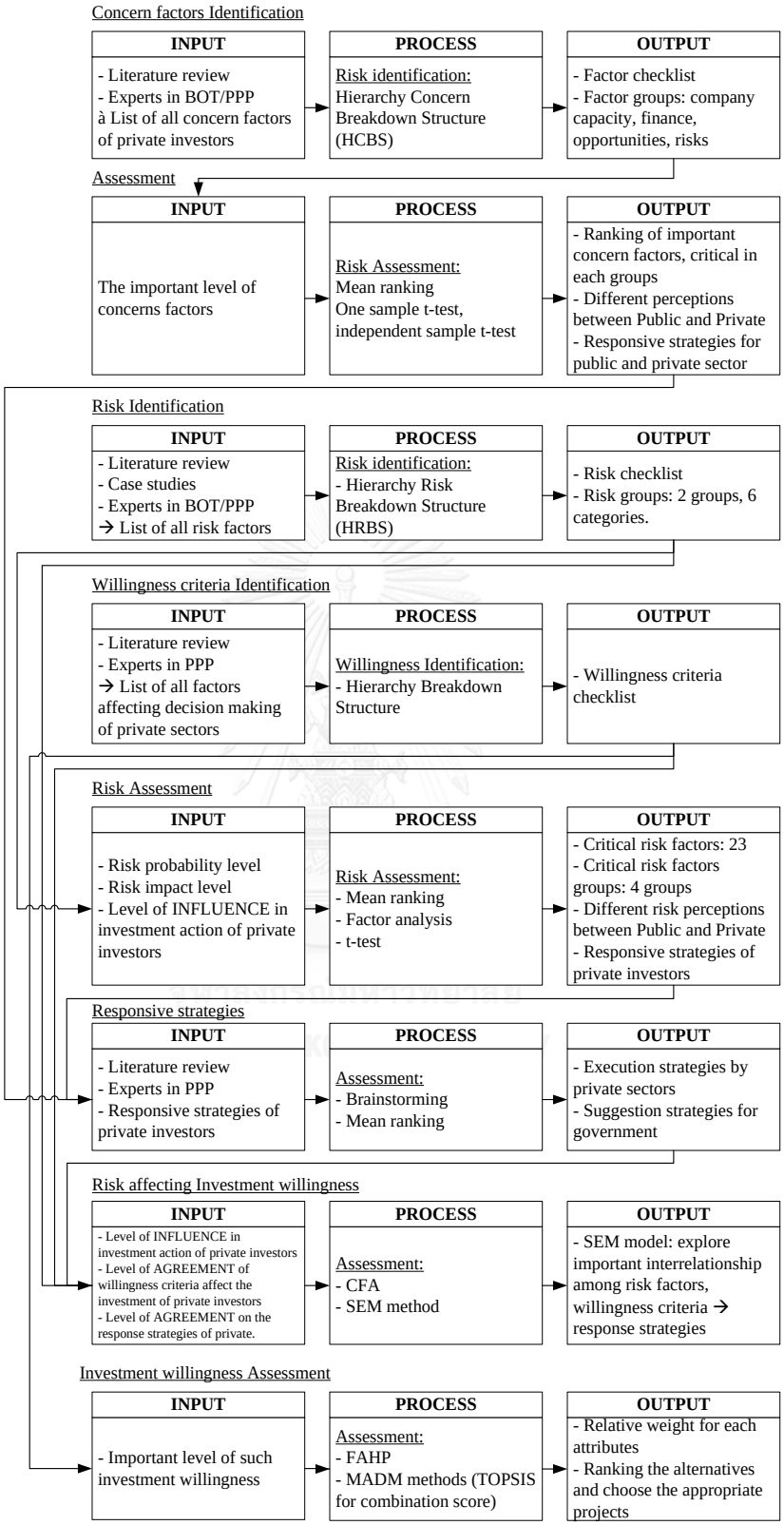



Figure 3-7 Research framework process

# CHAPTER 4
# OVERVIEW OF PPPs IN VIETNAM

This chapter explores the current situation of Public-Private Partnership (PPP) transportation projects in Vietnam. The first section presents the profile of all respondents that participated in the first pilot test of this research. The second section shows the results from the pilot interview about evolution, legal framework, structure, incentive policies, and stakeholders of PPP transportation projects in Vietnam. Then, the next section illustrates the remarkable features of PPP investment in Vietnam. Finally, this chapter also presents the difficulties and challenges of PPP transportation projects in Vietnam.

## 4.1 Respondents' profile for the first pilot interview

The respondents were chosen from project-based PPP projects. Table 4- illustrates the profile of the respondents, which include four respondents from Government agencies and two respondents from the private sector. Among six respondents, five respondents had experience in construction more than ten years (83.3%).

Moreover, most of the respondents in the first pilot survey from government agencies (66.7%), one respondent from the main contractor and another expert from a consultant company. Thus, the pilot survey can cover main objectives of this part, such as evolution, legal framework, structure, incentive policies, stakeholders, as well as the difficulties and challenges of PPP transportation projects in Vietnam.

Table 4-1 Profile of interviewees for the first pilot study

| No. | Organization | Designation | Experience in construction |
|---|---|---|---|
| 1 | The Department of Planning and Investment | Government Agencies | > 10 years |
| 2 | The Department of Planning and Investment | Government Agencies | > 10 years |
| 3 | GS E&C (Korea) | General Director | > 10 years |
| 4 | Ministry of Planning and Investment | Government Agencies | > 10 years |
| 5 | Ministry of Planning and Investment | Government Agencies | > 10 years |
| 6 | Deo Ca Investment., JSC | Consultant | 5-10 years |

### 4.2 PPP projects in Vietnam

In the pilot interview, the respondents were inquired about their perceptions about the legal framework for BOT and PPP projects in Vietnam and incentives policies of government for PPP transportation projects.

#### 4.2.1 Evolution of PPP

Since 1993, Vietnam has issued a number of BOT/BT/BTO and PPP regulations for infrastructure projects, according to which private investors can build projects under certain favorable conditions, collect tariff fee for a concession period and transfer back to public sector. The evolution of PPP in Vietnam can be divided into four generations in the followings. Comparisons among four generations are shown in Table 4-2.

**(1) The first generation (1993-2006)**

*The first regulation of investments in the form of Build–Operate–Transfer is Government No.87/CP dated on 22 November 1993* (Government 87, 1993) within a framework of the Law on Foreign Investment. At that time, only two projects using international commercial financing had been implemented, of which the largest one was the Phu My power plants and natural gas pipeline. Then the Vietnamese government issued Decree No. 77/CP dated June 18, 1997 (Decree77, 1997) promulgating the regulation on investment in the form of BOT contracts applicable to domestic investment. The government issued Decree No. 62/1998/ND-CP (Decree62, 1998) on May 15, 1998, promulgating the regulation on investment in forms of BOT contract, BTO contract and BT contract applicable to foreign investors in Vietnam. Later, Decree No. 62 was amended and supplemented by Decree No. 02/1999/ND-CP dated January 27, 1999 (Decree02, 1999) to improve implementation. These three decrees represented the initial legal framework for PPP in Vietnam, encouraging and supporting the participation of the private sector in investment and operation of infrastructure works for the development of Vietnam's economy.

**(2) Second Generation (2007 – 2009)**

Through *Decree No. 78/2007/ND-CP dated in 2007* (Decree78, 2007), the government stipulates the sectors, conditions, order, procedures and incentives applicable to investment projects for the development of infrastructure facilities by BOT, BTO, or

BT contracts. Lists of projects calling for investments in forms of BOT/BT/BTO contracts are prepared and issued annually by government based on socio-economic development planning in each period. Moreover, investors can propose their projects for investment. Then, it is the responsibility of investors to seek capitals for carrying out these projects. Decree No. 78 imposes the minimum thresholds of the investor's own capital: at least 30%, if the project's total investment capital is under 75 billion VND; 20%, if total capital is between 75 billion VND to under 1,500 billion VND; 10%, if total capital is 1,500 billion VND and more.

**(3) Third Generation (2010 – 4/2015)**

The *Decree No.108/2009/ND-CP dated 27/11/2009* (Decree 108, 2009) of the government on investment in the form of BOT/BTO/BT replacing the Decree No.78/2007/ND-CP dated 11/5/2007 (Decree 78, 2007) of the Government. Based on the planning and guidelines for socio-economic development, ministries, branches and provincial People's Committees will formulate and approve investment calling list of projects by BOT/BTO/BT contracts in their branches and localities. Based on project negotiation and implementation requirements, a competent state agency shall set up an "inter-branch working party" to assist in project negotiation and implementation. An "inter-branch working party" consists of representative members from competent state agencies; central and local agencies; and independent legal, technical or financial experts as decided by the competent state agency.

More recently, the development of PPP in Vietnam has been maintained by the government with an adoption of a new draft of a pilot PPP regulation provides a broad framework which procedures on PPP project implementation, such as project selection criteria, state participation portion and detailed processes. Decision No. 71/2010/QD-TTg dated November 9, 2010 (Decision 71, 2010) promulgates the regulation on pilot investment in the PPP form for performance of a number of PPPP projects as a basis for further improving mechanisms, policies and regulations on investment in the PPP form. This Decision took effect on January 15, 2011. The first wave of announced priority projects includes significant transport and healthcare opportunities (ports, airports, roads and hospitals). As results, a list of 24 potential projects was announced by the Government. Of the 24 projects on the lists, two or three are expected to be

selected from each sector for implementation of PPP pilot projects (Ashurst Insight, 2012).

**(4) Fourth Generation (4/2015 – now)**

The *Decree No.15/2015/ND-CP dated 14/02/2015* (Decree 15, 2015) of the government on Public-Private Partnership Investment form replacing the Decree No.108/2009/ND-CP dated 29/11/2009 (Decree 108, 2009), Decree No.24/2011/ND-CP, (Decree 21, 2011) and Decision No.71/2010/QD-TTg (Decision 71, 2010). This Decree sets forth the sectors, conditions, procedures for implementation of projects developed under public-private partnership investment form; the mechanism for management and utilization of public capitals for the contribution in implementing projects; policies for investment incentives and guarantees; and responsibilities of the State in management of projects developed under public-private partnership investment form. The Decree 15 (2015) took effect on 4$^{th}$ October 2015. Since issues so far, there still do not have any project which has been decided to implement under this form.

Table 4-2 Evolution of PPP infrastructure projects in Vietnam

| Type of projects | 1st Generation | 2nd Generation | 3rd Generation | | 4th Generation |
|---|---|---|---|---|---|
| | 1993 - 2006 | 2007 - 2009 | 2009-2014 | | 2015-Future |
| | BOT, BTO and BT | BOT, BTO and BT | BOT, BTO and BT | Pilot PPP | PPP |
| PPP legislation | - Government No. 87/CP - first BOT regulations on foreign investment<br>- Decree No. 77/CP - BOT regulation on domestic investment<br>- Decree No. 62/1998/ND-CP - regulation on BOT/BTO/BT investment form for foreign investors<br>- Decree No. 02/1999/ND-CP - amending and improving implementation | - Decree No.78/2007/ND-CP - sectors, conditions, orders, procedures and incentives for BOT/BTO/BT contracts | - Decree No. 108/2009/ND-CP -> replaced Decree No.78/2007/ND-CP<br>- Decree No. 24/2011/ND-CP: amending a number of Articles of Decree No. 108/2009/ND-CP | - Decision No. 71/2010/QD-TTg - promulgate the regulation on pilot investment in the PPP form | Decree 15/2015/ND-CP - regulation on PPP investment form<br>Decree 30/2015 - guidelines for some articles on investor selection of the bidding law |
| Conditions | | Investment projects are encouraged by the Government<br>+ Investors can propose their own projects | - Investors may propose on its own initiative a project other than the above listed projects and must prepare a proposal | - Private sector can propose projects to the Authorized state body but bidding is required and any special arrangement for the investor is not provided in Decision 71 | |
| Investor's own capital | | **Investor's own capital (IOC)**<br>- IOC ≥ 30% of TIC (for TIC < 75 Billion VND)<br>- IOC = 20% TIC (for TIC from 75 Billion VND to 1.5 trillion VND)<br>- IOC = 10% (for TIC > 1.5 trillion VND) | **Investor's own capital (IOC)**<br>- IOC ≥ 15% TIC (for TIC ≤ 1.5 trillion VND)<br>- IOC ≥ 15% x (1.5 trillion VND) + 10% x (TIC - 1.5 trillion VND) (for TIC >1.5 trillion VND)<br>**State participation capital (SPC)**<br>1) SPC ≤ 49% TIC<br>2) For project to be implemented to meet urgent needs, the use of state budget capital did not include in TIC | **Investor's own capital (IOC)**<br>- IOC ≥ 30% PPC<br>- Commercial loans and capital of other sources (without government guarantee) ≤ 70% PPC<br>--> IOC ≥ 21% TIC<br>**State participation portion (SPC)**<br>- SPC ≤ 30% of TIC (except other cases decided by Prime Minister) | **Investor's own capital**<br>- IOC ≥ 15% TIC (for TIC ≤ 1.5 trillion VND)<br>- IOC ≥ 15% x (1.5 trillion VND) + 10% x (TIC - 1.5 trillion VND) (for TIC >1.5 trillion VND)<br>**State participation portion**<br>- Depend on the financial plan of project |
| Bidding | | - National or international tendering<br>- Assigned by the State to enter into negotiations | - Open domestic or international tendering<br>- Dominated investors: (1) single investor; or (2) an urgent need | - Bidding law and international practices | |
| Perfomace bonds | | **Perfomance bonds (Pb)**<br>- Pb = 3% TIC (for TIC < 75 Billion VND)<br>- Pb = 2% TIC (for TIC from 75 Billion VND to 1.5 trillion VND)<br>- Pb ≥ 1% (for TIC > 1.5 trillion VND) | **Perfomance bonds (Pb)**<br>- Pb ≥ 2% TIC (for TIC ≤ 1.5 trillion VND)<br>- Pb ≥ 2% x (1.5 trillion VND) + 1% x (TIC - 1.5 trillion VND) (for project's TIC >1.5 trillion VND) | **Perfomance bonds (Pb)**<br>- Pb ≥ 2% TIC | **Perfomance bonds (Pb)**<br>- Not clarify about performance bonds<br>- Pb = 1%-1.5% TIC (PPP project of Group C) |
| Government incentives | | - Corporate income tax<br>- Duty exemption to goods import<br>- Tax exemption to technology transfer and royalty<br>- Exempted from land use levy or rental for the project's lifespan (BT contracts) | - Corporate income tax<br>- Preferences goods import<br>- Guarantees for obligation<br>- Right to mortgage assets<br>- Right to buy foreign currencies<br>- Assurance for provision of public services<br>- Settlement of disputes<br>- Capital and asset assurance | - Enterprise income tax incentives<br>- Goods import incentives<br>- Right to exemption from land use or rent<br>- Right to mortgage assets<br>- Right to buy foreign currencies<br>- Security for the provision of public services<br>- guarantee for obligations of Investors, the project Enterprise and other enterprises | - Enterprise income tax incentives<br>- Goods import incentives<br>- Right to exemption or reduction from land use or rent<br>- Guarantees for obligations of the Investors, project enterprise and other enterprises<br>- Right to mortgage assets<br>- Assurance of exercise of land use rights<br>- Assurance of foreign currency balance<br>- Assurance of provision of public services<br>- Assurance of property rights<br>- Dispute settlement |
| Others | | | | | - The investor has the right to assign part or all of its rights and obligations under the project contract to the lender or another investor.<br>- The signing parties may agree on the application of foreign law governing the follow contracts: (1) One party is foreign investor; (2) government gurantees the performance of obligations |

Note:
- *Investor's own capital (IOC)*
- *State participation capital (SPC)*
- *Total investment capital (TIC)*
- *Project's private sector capital (PPC)*
- *Amount of security (AS)*

### 4.2.2 Legal framework

The perceptions of respondents about the policies, legal institutions and investment environment are summarized below.

**(1) Policies:** the view-points of experts about the issues related to policies are as follows

"The policy was quite adequate but not synchronized".

"Policy adjustment has been pacing down/implemented slowly, which cannot practically meet the requirements in reality (relatively fast economic development measures → Exceeding policies reform)".

"Inconsistences among the current legal documents".

"The current policies potentially quite risky".

The Decision 71 (2010) issued nearly three years has not been possible. Therefore, the availability of PPP in Vietnam has to be considered.

**(2) Legal institutions**

- There are many opinions of respondents about the adjusted-legal framework. They recognized the amendments of the Decree 108 (2009) about the BOT/BTO/BT contracts. However, they said that the Decision 71 (2010) cannot be applied correctly or have to be adjusted.

"Decision 71 (2010) cannot be implemented correctly or have to be adjusted".

"Inconsistences among the current legal documents, such as Decree 108 (2009) for BOT/BTO/BT contract and Decision 71 (2010) for PPP pilot projects".

**(3) Investment environment**

Intransparency of procurement process (bidding process) was the enormous trouble for investment environment in Vietnam. For instance, the respondents emphasized the suspicion about the ability of the winning investors.

"PPP projects: not transparency of procurement process and nominated contractors situation. The winning-investors were often stated-own enterprise or private investors with the strong ability to lobby".

### 4.2.3 Structure of PPP

Figure 4- shows the typical structure of PPP transportation contract in Vietnam. As can be seen, it consists of various stakeholders, including government agencies, investors, contractors, project concessionaire company (specific purpose vehicle, SPV), financiers and customers. It also illustrates the relations of these participants in typical PPP transportation projects in Vietnam. In addition, the life cycle of PPP projects in Vietnam is depicted in Figure 4-. According to the results from pilot in-depth interviews and literature review, the interim framework process of PPP projects in Vietnam is also shown in Figure 4-3 (based on the Decision 71 (2010)). The framework process consists of nine main phases: (1) List all potential PPP projects, (2) Contribution of the government, (3) Investor selection, (4) Negotiation, (5) Investment certification, (6) Officially sign, (7) Establish SPV, (8) Implementation, and (9) Project facility transfer.

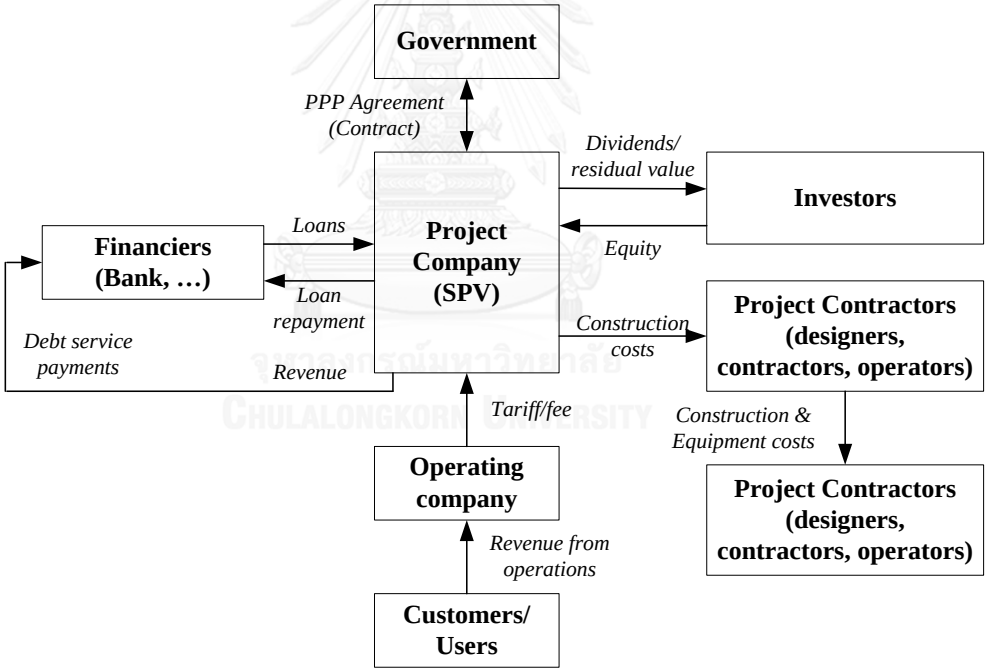



Figure 4-1 Typical structure of PPP transportation contract in Vietnam


Figure 4-2 Life cycle of PPP projects

### 4.2.4 The incentive policies of The Vietnamese government

The government has much incentive policies for private investors when investing in Vietnam, including land acquisition and compensation, operating the vicinity of projects, loan interest rate guarantee, and supporting from BT contract (conversion land for infrastructure). Indeed, the government often have to prepare land acquisition and exempt land use levy for land areas throughout the implementation duration of a project. However, a land clearance problem is the most concern issue of private investors when they plan to make invest in PPP transportation projects in Vietnam. Guarantees from the government to security for loan interest rate has an important role leading to the appeal in attracting private investors. In addition, the government also allows the investors to study and propose methods for operating the vicinity of projects when completed. Besides, based on the regulations in Decision 71 (2010), there are many supporting incentives for private investors such as:

- Enterprise Incentives tax incentives

- Goods import Incentives

- Exemption from land use levy for land areas throughout the implementation duration of a project

- Taxes imposed on contractors participating in project implementation (foreign and Vietnamese contractors)

- Right to mortgage assets

- Right to buy foreign currencies

- Security for the provision of public services

- Guarantee for obligations of investors, the project enterprise and other enterprises

- Right to commercialize the projects vicinity or right to lease projects asset (BT contract).

### 4.2.5 Stakeholders of PPP in Vietnam

This part specifies the correlation among stakeholders and their activities during the life cycle of PPP in Vietnam. Moreover, the issues and problems throughout the life cycle are also investigated. The results of pilot interview are shown in Table 4-3 and Table 4-4.

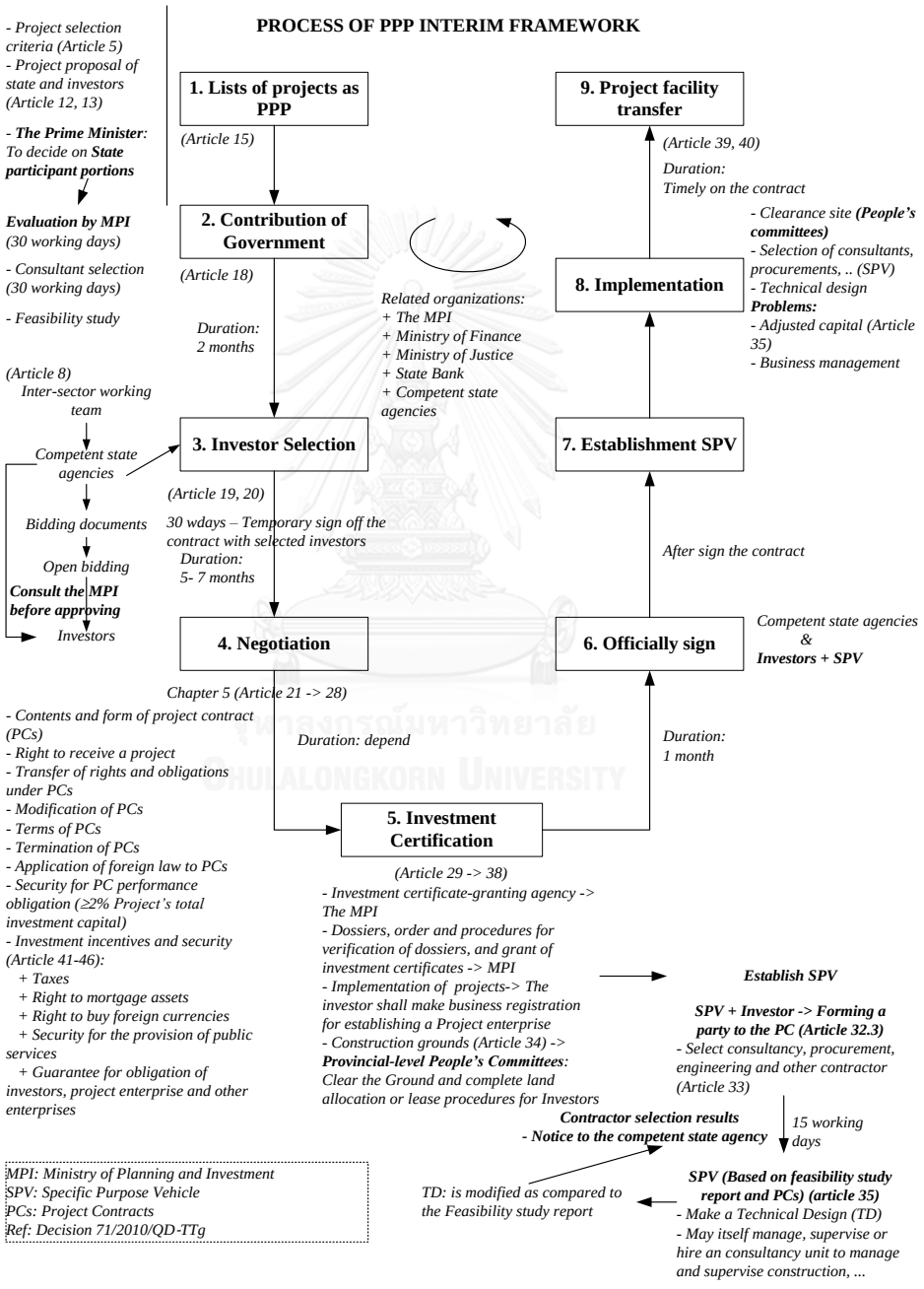



Figure 4-3 PPP interim framework

Table 4-3 Relations among stakeholders and their activities in the life cycle of PPP projects in Vietnam

| Phases | Pre-planning | | Feasibility | | Finance + Plan | | Implementation | | Operation |
|---|---|---|---|---|---|---|---|---|---|
| | **Lists of projects** | **Contribution of government (GOV)** | **Feasibility study (FS)** | **Investor selection** | **Negotiation** | **Investment Certification and sign** | **Design** | **Construction** | **Operation + Maintenance** |
| **Stakeholders/Activities** | * Projects proposals: Competent State Agencies and Investors<br>* Lists of projects and MPI | * State participation portion | * Consultants selection<br>* FS report | * Consultants of MPI | * Investors - Competent State Agencies (CSA | * Establish SPV + investors --> Make contract with CSA<br>* Select consultancy, procurement, engineering | * Technical design, supervision and management<br>* Land acquisition (Pre-construction)<br>* Scope adjustment | * Product products and services<br>* Goods prices, services charges and revenues (contract) |
| The Prime Minister | **Approve (A)*** ** | Approve (A) | - | - | - | - | - | - | - |
| Competent State Agencies (People's Committees of provinces or centrally run cities) | Initiate (I) | Initiate (I) | Organize procurement (P) | Procure, Appraise and Approve (P, AP and A) | Negotiate (N) | Sign (S) | Execute (E) (Land clearance) and Monitor (M) | Monitor (M) | Monitor and Check (M) |
| The Ministry of Planning and Investment (MPI) | Appraise (AP) | Appraise (AP) | Appraise and Approve (A and AP) | Appraise (AP) | - | Approve (A) | - | Monitor (M) | - |
| Concerned Ministries and Sectors | Appraise (AP) | Appraise (AP) | Appraise and Approve (A and AP) | - | Negotiate (N) | - | - | - | - |
| Inter-sectoral working team | - | - | - | Consult (C) | Negotiate (N) | Consult (C) | Consult (C) | Consult (C) | - |
| Investors and Project companies (SPV) | Initiate (I) | - | Initiate (I) or Execute (E) | Initiate (I) | Negotiate (N) | Sign (S) and Procure (P) | Execute (E) | Execute (E) | Transfer (T) and Operate (O) |
| Financiers | - | - | Initiate (I) | - | Negotiate (N) | Sign (S) | Execute (E) | Execute (E) | - |

*** *Example: The Prime Minister approves list of potential projects (A)*

Table 4-4 Issues/Problems throughout the life cycle of PPP projects in Vietnam

| | Pre-planning | | Feasibility | | Finance + Plan | | Implementation | | Operation |
|---|---|---|---|---|---|---|---|---|---|
| | **Lists of projects** | **Contribution of government** | **Feasibility study (FS)** | **Investor selection** | **Negotiation** | **Investment Certification and sign** | **Design** | **Construction** | **Operation + Maintenance** |
| **Concern Issues** | - Inefficient lists of PPP projects<br>- Inefficient PPP Laws and regulations | - Insufficient contribution of GOV (incentives, ...) | | | | | | | |
| | - Government's intervention (approvals and permits) | | - Uncompetitiveness and ambiguity of consultants selection process | - Uncompetitiveness and ambiguity of investors selection process | - | - Contract (SPV + Investors + State, SPV + Contractors + Consultants) problems | | | |
| | - Political risks | | - Benefit (ROI) problems | | | - Risk sharing issues | | | |
| | - Marco-economic risks | | - Financial risks (inflation, interest rate)<br>- Partners selection risks | | - | - | | | |
| | | | Negotiation problems | | - | | | | |
| | | | Laws and Regulations Issues | | | | | | |
| | | | | | | | - Contract problems<br>- Scope change<br>- Market change<br>- Land acquisition issues | | |
| | | | | | | | | - Material/ Labor issues<br>- Technology transfer issues<br>- Geotechnical Conditions problems<br>- Partner's difference practice problems<br>- Payments risks<br>- Completion risks | |
| | | | | | | | | | - Adjusting toll fee issues<br>- Inability of concessionaire<br>- Residual risks<br>- Benefit problems |
| | | | | | | Risk sharing issues | | | |
| | Legal framework issues | | | | | | | | |

### 4.3 Remarkable features of PPP investment in Vietnam

Such features as institutional procedures, financial supports, land use and acquisition, selection process and participants can be considered remarkable and summarized as in Table 2. Currently, there are two main PPP legislations in Vietnam, namely *Decision No.71/2010/QD-TTg (2010)* and *Decree No.24/2011/ND-CP (2011)*. The first concerned issue is that PPP projects have involved many interdisciplinary ministries, including the ministry of Planning and Investment (MPI), Finance, Industry and Trade, Transportation, Construction, State Bank of Vietnam, and other relevant agencies. Therefore, an inter-sector working team (pick up the members from many Ministries) was set up by the Minister of Planning and Investment to support competent state agencies in formulating and executing projects. In order to attract the private and overseas sector in PPP projects, the State has issued many incentive policies. For example, the provincial people's committee will be responsible for site clearance and the private investor shall be exempted from land use fee for the allocated area by the state or from land rent for the project duration. However, it fails to specify funding structure and management of the involved State budget. The government's guarantee for the private sector also depends on the case by case approach.

Land use or ownership for land is also the most concerned issue in Vietnam. The land is public property. Thus Vietnamese citizens are entitled to only have land use rights, not ownership. Foreign investors cannot get land use rights. Instead, they can use land by leasing from the government.

The participation portion of the public decreases from "*up to 49% Project's Total Investment Capital (TIC)*" (Decree No.24/2011/ND-CP, 2011) to "*up to 30% TIC*" (Decision No.71/2010/QD-TTg, 2010), then "*to be considered on the basis of the financial plan of project*" (Decree No.15/2015/ND-CP, 2015). The investor's equity capital must represent equal or greater than 15 percent of the private sector capital in this project. The investor may raise commercial loans and the capital of other sources (without a guarantee by the government), which account up to 85 percent of the private sector capital in a project. As we know, infrastructure projects often require a large initial capital investment, long duration, and massive risk. Thus, it might cause high

pressure on the domestic and the foreign investors to participate in PPP projects in Vietnam due to unclear public participation portions.

Table 4-5 Remarkable features of PPP investment environment in Vietnam

| Features | Description | Contents |
|---|---|---|
| **Institutional procedures** | Law and regulations for PPP | - Decision 71 (2010) promulgating the regulations on pilot investment in the Public-Private Partnership form.<br>- Decree 24 (2011) amending a number of articles of the Decree 108 (2009) on investment in the form of BOT/BT/BTO Contract.<br>- Decree 15 (2015) replacing Decree 108 (2009), Decree 24 (2011), and Decision 71 (2010) promulgating the regulations on investment in PPP |
| | Governmental organizations for promoting PPP | - The Ministries of Planning and Investment (MPI); Finance; Justice; Industry and Trade; Transport; and Construction, the State Bank of Vietnam and other relevant agencies. |
| **Financial supports** | Government Incentives | - There are many incentives from the government but fails to clearly specify the state budget participant in projects and fails to specify the structure of funding and managing fund of State budget participants. |
| | Government Guarantees | - Case by case approach (for long term funding). |
| **Land use and acquisition** | Ownership for land | - In Vietnam, land is public property. Thus Vietnamese citizens are entitled to only have land use rights, not ownership. Foreign investors cannot get land use rights. Instead, they can use land by leasing from the government. |
| | Land Acquisition support by government | - The provincial people's committee will be responsible for site clearance and for completing procedures for allocation or lease of land.<br>- The private investor shall be exempt from land use fee for the allocated area by the state or land rent for the project duration. |
| **Selection process** | Project Process and Guidelines | - To be invested in the PPP form, a project must satisfy any of the following criteria (Chapter 3-Decision 71, 2010):<br>1. Being important and large-sized and urgently required<br>2. Refunding capital to the investor from reasonable revenues collected from users<br>3. Tapping technological advantages, management, operation experience and effectively utilizing the financial capacity of the private<br>4. Other criteria as decided by the Prime Minister<br>The competent state agencies shall send project proposal to the MPI for summarization, appraisal and submission to the Prime Minister |
| | Project lists | - MPI released priority PPP project list |
| | Unsolicited proposal | - The private sector can propose projects to the state body (bidding is required) and any special arrangement is not provided in Decision 71 (2010). |
| **Investor's own capital** | State participant portion (SPC) | 1. SPC ≤ 49% TIC (Decree 24, 2011)<br>2. SPC ≤ 30% of TIC, except other cases decided by Prime Minister (Decision No. 71/2010/QD-TTg, 2010)<br>3. SPC: depend on the financial plan of project |
| | Investor's own capital (IOC) | - IOC ≥ 15% TIC (for TIC ≤ 1.5 trillion VND)<br>- IOC ≥ 15% x (1.5 trillion VND) + 10% x (TIC - 1.5 trillion VND) (For TIC >1.5 trillion VND) (Decree 24, 2011) (Decree 15, 2015)<br>2. IOC ≥ 21% TIC (Decision 71, 2010) |

### 4.4 Difficulties and challenges of PPP in Vietnam

#### 4.4.1 Difficulties/Challenges of PPP transportation projects

Currently, the Prime Minister issued Decision No. 71/2010/QD-TTg (2010) with numerous attractive and reasonably incentive policies to call for investing in PPP pilot projects. This decision is a basic legal to improve institutional investment under PPP model and to mobilize stronger private capital to invest in infrastructure projects, particularly transportation projects. Despite its many merits, PPP projects in Vietnam still have some issues. The problems of PPP in Vietnam were gathered by interviewing the respondents in the first pilot test. According to the results of in-depth interviews and questionnaire surveys, major issues and problems of PPP projects in Vietnam were identified, including legal, financial matters (e.g., financial market, sector participant portion), construction and operation issues (e.g., land acquisition and compensation, feasibility studies). The details of these matters are illustrated in the following

**1. Legal issues**

Since this PPP form is relatively new within the large capital investment, private investment fairly meet significant issues. The biggest difficulty in the implementation of PPP projects in Vietnam is no specific guidance of legal framework. The process is only at a primitive stage without specific guidelines. Therefore relevant state agencies, as well as their counterparts from the private sector, have not yet known how to deploy and implement necessary steps. Moreover, according to the in-depth interview with experts in Vietnam, lack of transparency throughout projects approvals and permits is the most challenging barriers for investors in Vietnam. This problem is because it is currently affected by capabilities of the government and inconsistencies between the current legal documents. Indeed, for most of the time, the Vietnamese government does not grant approval on project-related issues on time and sometimes they even cancel these that had been approved previously (Ogunlana and Abednego, 2009). As mentioned by Toan and Ozawa (2008), a high risk in a developing country as Vietnam in the private sector's perception and inappropriate policies of the Government made it difficult to attract the private sector. These are the major challenges for any the private sector in implementing their projects in Vietnam. Thus, the state agencies have to improve the legal framework by current situation. The regulatory policies of

Government support are needed to increase the availability of private investment (Zhang et al., 1998).

**2. Financial issues**

- *Financial market:* In Vietnam, the high inflation and the fluctuation of interest rates led to the crisis in the construction industry. Unfortunately, these risk factors are considered macroeconomic conditions and are impossible to avoid. Inflation approached 20 percent in 2011, twice the level of 2010 and the country's sovereign debt rating worsened (Schwab and Sala-i-Martín, 2012). In an effort to stem inflation later, the State Bank of Vietnam tightened its monetary policy, thus making access to credit more difficult. Besides, the current situation in Vietnam does not allow the projects to be both large-scale and financially feasible at the same time. Therefore, Government assistance in creating a minimum revenue of infrastructure projects is the key to deal with financial problems in Vietnam at the moment (Ashurst, 2012).

- *Sector participant portion***:** The total state participation portion must not exceed 30% of the total investment level of projects, except other cases decided by the Prime Minister (Decision No.71/2010/QD-TTg, 2010). State participation portion means a combination of all contributions of government participation, including state capital, investment incentives and relevant financial policies. In the developed country, the state participation portion often has higher rates, such as 49% in Germany, 47.2% in China (Xu et al., 2010). Thus, state participation portion is too small to appeal the private sector. Additionally, the investor's equity capital in a project must represent at least 30% of the private sector capital in this project. The investor may raise commercial loans and capital of other sources (without government guarantees) which account for up to 70% of the private sector capital in a project (Decision No. 71/2010/QD-TTg, 2010). This regulation made difficult for private investors in Vietnam since it is the challenge to spend simultaneously hundreds of millions of dollars for PPP project without the government guarantee policies. Thus, it causes many fears for the private sector to participate in PPP infrastructure projects. Therefore, the state participant portion must be increased through clearly investment support incentives and government guarantee policies.

**3. Construction and Operation issues**

- *Land acquisition and compensation:* Land acquisition risk has been considered as one of risk that could have a huge impact on the overall implementation of infrastructure projects. In the case of Vietnam, many infrastructure projects had to cope with a number of issues, such as 'the proposed compensation land price by the government is always lower than its actual market price', 'differences compensation price between provinces', and 'corruption during compensation process' (Ogunlana and Abednego, 2009). Besides, under the PPP regulations, the provincial people's committees are responsible for site clearance while the Authorized State body is the entity party to the project contract. This separation of roles and responsibilities may lead to delays in land acquisition and compensation in practice if there is no timely and efficient co-ordination (Ashurst, 2012). Thus, site clearance and compensation processes encountered a number of difficulties. These problems could affect the entire schedule and viability of the project. Therefore, the government must have appropriate policies to address this issue.

- *Feasibility studies:* The preparation of feasibility studies (FS) is usually quite significant costs, but the Vietnam government has funds to support the project FS. Feasibility studies are made by consultants, selected through bidding. According to the in-depth interviews, FS of infrastructure projects in Vietnam is less reliable (WB, 2006). It probably comes from the weak capacity of consultants. The most frequent shortcoming are from country and sector issues, development objectives, funding options, project alternatives considered, sustainability, monitoring and evaluation process issues, and so on (WB, 2006). Moreover, the different viewpoints between the public and private sectors are also the most concern issue in Vietnam. As the results, the private sector often hires the foreign consultants to make the new FS report; it causes unnecessary costs and prolonged time for project evaluation. Consequently, agreement among the participants in feasibility studies is essential, and FS must be studied carefully by experienced consultants.

**4.4.2 SWOT analysis for the local and international investor companies**

Besides understanding the issues/problems of the implementation of PPP projects in Vietnam, the SWOT analysis for the domestic and international companies when

investing in PPP projects are also noted. The strengths, weaknesses, opportunities and threats of domestic and international companies when investing in Vietnam are shown in Table 4-6 and Table 4-7.

Table 4-6 Strengths and weaknesses of domestic and international companies

| | **Internal factors** *(Affect company's success and also the success of project)* | |
|---|---|---|
| | **Strengths** | **Weaknesses** |
| **Domestic** | + Strong legal background<br>+ Service network adapted to domestic market | - Poor coordination ability<br>- Poor financing ability<br>- Restrained investment space<br>- Lack of PPP experience<br>- Low risk resistance capacity<br>- Small scale<br>- Loose organization structure<br>- Nonstandard operation behavior<br>- Lack of long sight development strategy<br>- High debt-equity ratio |
| **International** | + High operation levels<br>+ Capital/resource abundance<br>+ Clear property rights<br>+ High quality of staffs/managers<br>+ Innovative<br>+ High management efficiency<br>+ Flexible organization<br>+ Rich market experience<br>+ Independent decision-making | - Legal background<br>- Lack of bargaining power with government<br>- Long negotiation time<br>- High negotiation cost |

Table 4-7 Opportunities and Threats of domestic and international companies

| **External factors** *(Affect the company and implementation of the project)* | |
|---|---|
| **Opportunities** | **Threats** |
| + Rapid expansion and development of country<br>+ Favorable changes of financing policy<br>+ Increasing demand of government supervision<br>+ Increasing demand of innovative technologies<br>+ Enormous demand of public infrastructures<br>+ Government's incentives for PPP<br>+ Low efficiency of government investment<br>+ Promulgation of relative PPP laws/regulations<br>+ Increasing understanding of PPP in the industry<br>+ Low efficiency of government operation<br>+ Stable industry development<br>+ Positive policy changes for non-public capital<br>+ Respectability of private enterprises | - Corruption<br>- Laws and regulations overlap<br>- Availability of finance<br>- Immature PPP legal system<br>- Immature management system for PPP projects<br>- Inappropriate risk management of PPP projects<br>- Lack of PPP professionals<br>- Intricate project approval and permit<br>- Regional and sectional monopolization<br>- Excessive restrictions on participation<br>- Long time in contract transaction<br>- Abnormal inflation<br>- Abnormal interest rate<br>- Legislative changes<br>- Public opposition<br>- Unclear definition of responsibilities<br>- Absence of competitive and transparent bidding process<br>- Abnormal exchange rate |

# CHAPTER 5
# ANALYZING THE PROBLEMS AND ISSUES OF PPP PROJECTS IN VIETNAM

This chapter explores the situation of Public-Private Partnership (PPP) transportation projects in Vietnam such as project case studies, concern factors of private investors; risk factors affecting the performance of the private sector: investment willingness attributes; and responsive strategies of private investors. The first section presents the profile of all respondents that participated in the second pilot survey of this research. The second part presents the problems and issues of some representative PPP projects case studies in Vietnam. The last section shows the opinions of experts from in-depth interview about the lists of concern factors, risk factors, investment willingness attributes and criteria, and responsive strategies of the private sector of PPP transportation projects in Vietnam.

## 5.1 Respondents' profile for the second pilot interview

The respondents were involved in project-based PPP projects. Seven experienced professionals participated in the pilot test entailed two officers from the Ministry of Planning and Investment, a PPP investor, a consultant, a contractor, and two university lecturers. All professionals had at least ten years of experience in transportation projects in Vietnam, as shown in Table 5-1. Moreover, most of respondents in the second pilot survey from private investors and experts about PPP (71.4%), and other two respondents from government agencies (the Ministry of Planning and Investment). The objective of the second pilot survey is to verify the list of concern factors, risk factors, investment willingness attributes and criteria, as well as potential strategies of private investors as they plan to invest in PPP transportation projects in Vietnam. Moreover, we also would like to understand the opinions from the public sector's aspect. Thus, the data from these seven experienced professionals in the second pilot test should be able to address all of the objectives of this phase.

Table 5-1 Profiles of interviewees for the second pilot study

| No. | Designation | Organization | Experience | Sector |
|---|---|---|---|---|
| 1 | Public procurement policy | Ministry of Planning and Investment | ≥ 10 years | Public |
| 2 | Assistant director | Ministry of Planning and Investment | ≥ 10 years | Public |
| 3 | Representative investors | PPP investor | ≥ 10 years | Private |
| 4 | Assistant director | Consultant | ≥ 10 years | Private |
| 5 | Project management | Contractor | ≥ 10 years | Private |
| 6 | Expert | University | ≥ 10 years | Private |
| 7 | Project management | University | ≥ 10 years | Private |

## 5.2 Case studies – PPP projects in Vietnam

In order to understand clearly investment environment for PPP projects in Vietnam, the general information, risk affecting life cycle of previous PPP projects was also investigated. As we know, the PPP projects are very complex and they have a lot of stakeholders (e.g., private investors, financial institutions, bankers, contractors, subcontractors, suppliers, and operators). Therefore, some PPP projects in Vietnam were analyzed by in-depth interviews with respondents and related documents to deeply understand the problems/issues which must be solved to enhance the participation of private investors. Consequently, the information of five case studies are shown as following



### 5.2.1 BOT Binh Trieu II Road Bridge

The general information and risk factors affecting the performance of Binh Trieu II Road Bridge are shown in Table 5-2, and Table 5-3.

Table 5-2 General information of Binh Trieu II Road Bridge

| **Information** | **Phase 1** | **Phase 2** |
|---|---|---|
| **Project name:** | Binh Trieu II Road Bridge | |
| **Investors:** | Traffic Works Construction Corporation - Ministry of Transport (CIENCO 5) | Ho Chi Minh City Infrastructure Investment Joint Stock Company (CII) |
| **Total investment:** | 341 billion VND (21.3 million USD) | |
| | Reality: 2000 billion VND (125 million USD) | |
| **PPP form** | BOT (Building - Operation - Transfer) | BOT |
| **Project executer:** | Investment and Construction of Binh Trieu Bridge JSC | |
| **Construction start date – completion time** | Expected: 1996 – 2001 | 2005 - Still not complete |
| | Reality: 02/2001 – 2004 (still not completed) | |
| **Scope** | Due to the certain objective reasons, only the sub-project 2 has been carried out – build Binh Trieu 2 Bridge, upgrade and extend some roads around Eastern Terminal | |
| **Documents** | On 04/11/2004, The government has issued Document No. 1647/CP-CN allowing terminating the BOT Contract of Binh Trieu Bridge 2 between the People's Committee of HCM City and Cienco 5 and assigned the City to adjust the project. | |

Table 5-3 Risk factors affecting performance of Binh Trieu II Road Bridge project

| Risk factors | Phases | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Feasibility | Plan | Finance | Design | Construction | Operation | Maintenance | Own |
| | | | | | | | | |
| - Subjective project evaluation method<br>- Inefficient feasibility study | - Incorrect estimating the project cost | | | | | | | |
| - Real estable and land market problems<br>- Land acquisition and compensation | - Volatility of land and real estate market | | | | | | | |
| - Change of policies<br>- Scope change of projects | | | | - Adjusting the expansion of highway 13 project lane from 32m to 53m (increasing total investment of project from 341 to 1600 billion VND) | | | | |
| - Problems duse to partner's difference practice<br>- Quality of design and construction<br>- Completion risks | | | | - Incomplete design<br>- The failure of construction process when compare with initial design<br>- Slow schedule, cost ovemun | | | | |
| - Lack of supporting infrastructure<br>- Breach of contract by govemment | | | | | | - Binh Trieu II Bridge was completed, however, the link connection to this bridge was not yet completed | | |
| - Early termination of concession by concession company | | | | | | - Binh Trieu II Bridge was completed --> Cienco has been terminated of concession due to scope change of projects | | |
| | | | | | | | | |
| - Change of feasibility study | - Adjusting scope and design of Binh Trieu II Road Bridge (e.g, divide the project into seven sub-projects) led to total investment rose to 3,493 Billion VND | - Submitting appraisal process for adjusting projects late 2 | | | | | | |
| - Land acquisition and cor | | | - Price for land acquisition and compensation soaring (Adjust project scope from 32m to 53m) | | | | | |

### 5.2.2 BOT Yen Lenh Bridge

The general information, structure of stakeholders, and risk factors affecting the performance of BOT Yen Lenh Bridge are shown in Table 5-4, Figure 5-1, and Table 5-5.

Table 5-4 General information of Yen Lenh BOT Bridge project

| **Project name** | **Yen Lenh Bridge** |
|---|---|
| **Investors:** | Thang Long Construction Corporation and the Civil Engineering Construction Corporation No.4 (CIENCO No.4)<br>Investors (53%) + Ha Nam & Hung Yen Province (19%) + Vietnam government (28%) |
| **Total investment:** | 360 Billion VND (22.5 mUSD) |
| **PPP form** | BOT |
| **Project executer:** | Yen Lenh Bridge BOT Company Limited |
| **Construction start date – completion time** | Construction start date: 01/6/2002 |
| | Completion: 15/5/2004 (10 months early than expected) |
| **Concession period** | 17 years |

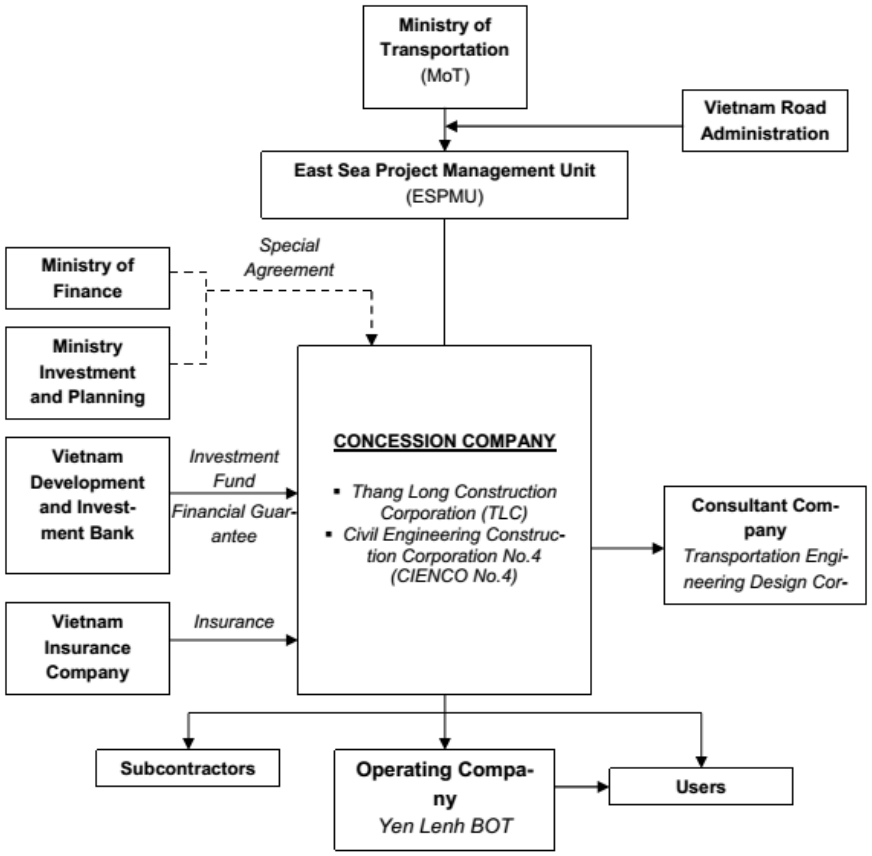



Figure 5-1 Structure of stakeholders in Yen Lenh BOT Bridge project (Ogunlana and Abednego, 2009)

Table 5-5 Risk factors affecting performance of Yen Lenh BOT Bridge project

**Yen Lenh Bridge**

| Risk factors | Phases | | | | | | |
|---|---|---|---|---|---|---|---|
| | Feasibility | Plan | Finance | Design | Construction | Operation | Maintenance | Own |
| - Land acquisition and compensation | | | | - The proposed compensation land price by the government is lower than its actual market price. Land owner did not have bargaining/negotiation power<br>- Land compensation price differ between provinces<br>- Corruption<br>- Weekness coordination between government agencies | | | | |
| - Approvals and permits | -Unexperienced of the government officials<br>- Inadequate law and regulations (e.g., inappropriate, untransparent, and series of amendments)<br>- Complex and bureaucratic approval procedures<br>- Unnecessary requirements from many divisions and levels of public sector | | | | | | | |
| - Risk of transportation network in region influencing the BOT project<br>- Wrong predicted revenue from feasibility study | | | | | | - Availability of competing projects<br>- Poor condition quality of connecting roads<br>- Wrong estimation on the number of vehicles passing through this bridge | | |
| - Cost overun<br>- Inflation | | | | | - Erros on technical design, tenology implementation<br>- Poor management of concessionaire | | | |
| - Unrealistic forecast on future economic development and demand of the society | - There has not been any adequate research that studies the amount of demand | | | | | - Change policies of government --> develop alternative toll-free road<br>- Over estimation on the socio-economic development of the surronding region | | |
| - Increasing inflation rate | | | - Inflation rate are increasing | | - Prices of main construction materials are increased --> increased 30% cost from the | | | |
| - Incorrect length of concession period | | | | | - A discount rate (6%) less than inflation rate | | | |
| - Interest rate fluctuation | - Interest rate are increasing --> reduce the private sector's potential profit, pay additional interest | | | | | | | |
| - Corruption and untrustworthiness of public official | - Corruption | | | | | | | |
| - Actual traffic revenues | | | | | | | - Competing projects<br>- Unrealistic and inaccurate forecast on future socio-economic development<br>- Unwillingness to pay by users<br>- Insufficient road condition<br>- Lack of fund for operation and maintenance | |

### 5.2.3 BOT Phu My Bridge Corporation

The general information, structure of stakeholders, and risk factors affecting the performance of Phu My BOT Bridge project are shown in Table 5-6, Figure 5-2, and Table 5-7.

Table 5-6 General information of Phu My BOT Bridge project

| **Project name:** | **Phu My Bridge** |
|---|---|
| **Investor:** | Phu My Bridge Corporation (PMC) consists of Hanoi Construction Company, Investco, Cienco 620, Thanh Danh Co, and CII |
| **Total investment:** | Investment capital: 1,806 BiVND (Schedule) --> 3,250 BiVND (Real)<br>Investors: 30% Equity + 70% Debt<br>Public sector: HCM city People's Committee<br>Ministry of Finance: the guarantor for foreign loans of private investors |
| **PPP form** | BOT |
| **Financiers institutions** | Société + Calyon (Crédit Agricole CIB) Bank, BIDV bank, and Sacombank<br>Hochiminh City Finance and Investment state-owned Company (HIFU --> HFIC) |
| **Main contractors** | Bilfinger Berger (Germany), Baulderstone Hornibrook (Australia), Freyssinet International et Companie và Arcadis (France) |
| **Construction start date – completion time** | Construction start: 2/2007 |
| | Operation: 9/2009 |
| **Concession period** | 26 years |

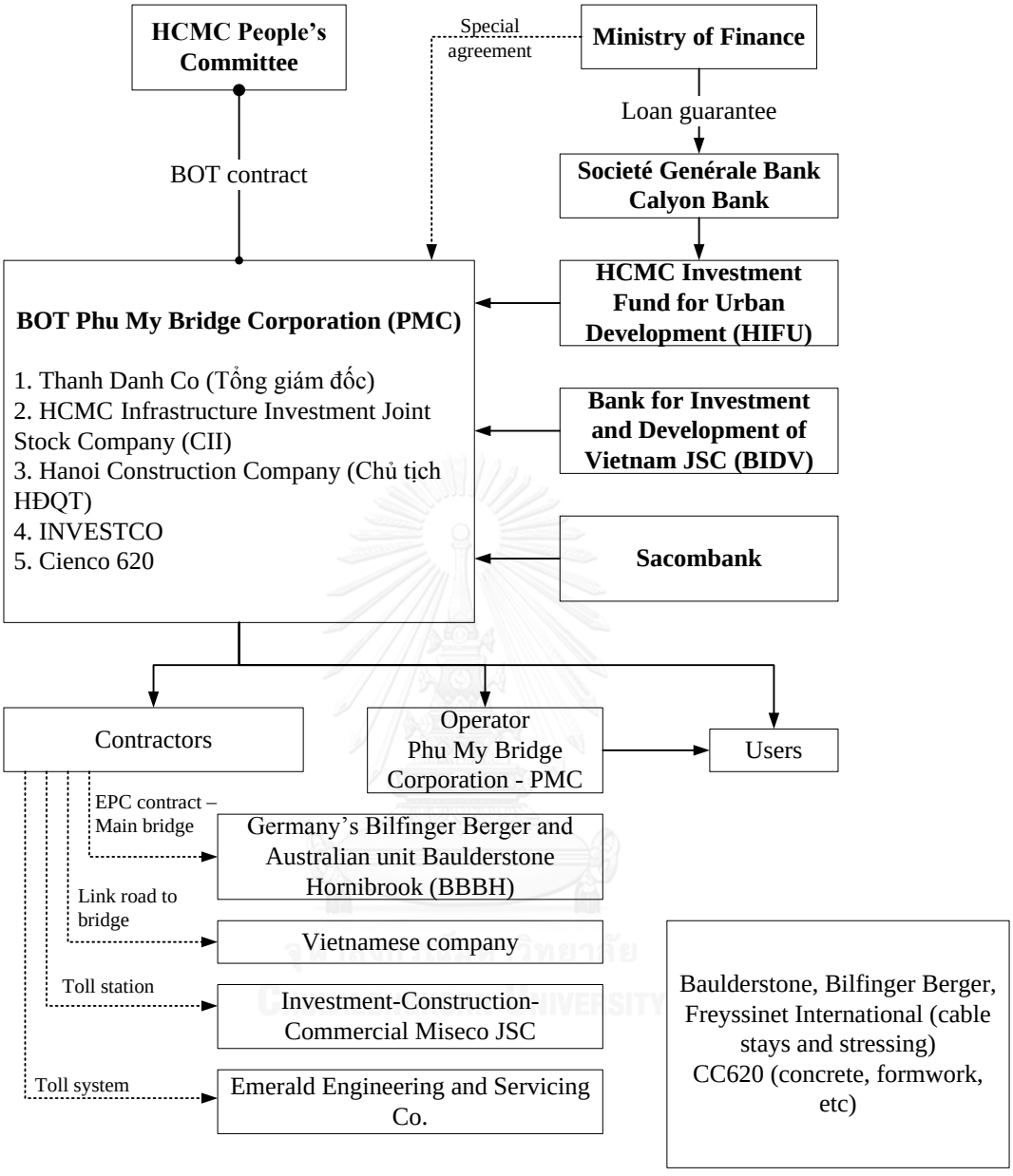



Figure 5-2 Structure of stakeholders in Phu My BOT Bridge project

Table 5-7 Risk factors affecting performance of Phu My BOT Bridge project

**Phu My Bridge**

| Risk factors | Phases | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Feasibility** | **Plan** | **Finance** | **Design** | **Construction** | **Operation** | **Maintenance** | **Own** |
| - Lack of institutional frameworks and suitable policies<br>- Lack of mornitoring mechanisms and sanctions for the parties to comply with contractual commitments | | | | | | - Dispute between private and public on the issue of compensation | | |
| - The issues related to private equity<br>- Initial investment capital of investors problems<br>- Lack of mornitoring mechanisms and sanctions for the parties to comply with contractual commitments | - PMC has not fully contributed 30% of the total investment, PMC has got loán from BIDV and Sacombank --> Initial investment capital of investors is failure to comply contractual commitments<br>- PMC has mortgaged rights to collect toll fees to borrow money (toll fee rights is important to ensure the repayment of the project) | | | | | | | |
| - Land acquisition and compensation | | | | | - Inceasing expenses for compensation and site clearance | - Delay to deliver construction sites for Phu My - Rach Chiec Bridge II BT project | | |
| - Subjective project evaluation method<br>- Inefficient feasibility study | | | | | | - Problems with evaluating the financial and economic feasibility of the project<br>- Government do not allow to charge motorcycles toll fee that not complied with financial plan of BOT contract<br>- Revenues from toll fees were so low althrough traffic flow is assumed to be equivalent to the forcast in feasibility study | | |
| - Poor public decision-making process | - Provide foreign commcercial loan guarantees for private investors | | | | | | | |
| - Conflicting or imperfect contract<br>- Lack of mornitoring mechanisms and sanctions for the parties to comply with contractual commitments | - Lack of regulations on reimbursement project from the concession company (e.g. value refunds and reimbursement methods) | | | | | | | |

**Phu My Bridge**

| Risk factors | Phases | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Feasibility | Plan | Finance | Design | Construction | Operation | Maintenance | Own |
| - Breach of contract by government | | | | | | - People's committee of HCMC did not perform contractual commitments (e.g. (1) public sector did not finish Eastern ring road to connect Nguyen Van Linh Street, Phu My Bridge, and Ha Noi Highway, (2) public did not organize and manage traffic to ramification of heavy trucks to Phu My Bridge) | | |
| - Lack of supporting infrastructure<br>- The capacity of government agencies to implement commitment in BOT contract | | | | | | - Public sector did not finish Eastern ring road to connect Nguyen Van Linh Street, Phu My Bridge, and Ha Noi Highway | | |
| - Changes of government policies risks | | | | | | - Government do not allow to charge motorcycles toll fee | | |
| - Unrealistic forecast on future economic development and demand of the society | | | | | | - Change policies of government --> develop alternative toll-free road<br>- Over estimation on the socio-economic development of the surronding region | | |
| - Low traffic flow<br>- Actual traffic revenues lower than estimated<br>- Demand risk | | | | | | - Large differences in expected and actual traffic flow to Phu My Bridge. Revenues are equal of 53.29% of the forecast revenues (not enough to pay debt) | | |
| - High inflation rate | | | | | | - High inflation index (i.e. loan foreign currency: 1USD = 15,500 VND, 1Euro = 20,502 VND --> repayment: 1USD = 21,000 VND, 1Euro = 28,685 VND) --> revenues are not sufficient to pay interest and debt | | |
| - Toll fee issues | | | | | | - Increasing total investment may lead increasing toll fees or extending concession period (40 years) | | |
| - Early termination of concession by concession company | | | | | | - Private sector terminate of concession and return this project for public sector | | |

Table 5-8 Risk factors affecting performance of Co May Bridge project

| Risk factors | Phases | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Feasibility** | **Plan** | **Finance** | **Design** | **Construction** | **Operation** | **Maintenance** | **Own** |
| - Change investment capital of projects | | | | - Increasing the investment cost of project from 78 billion VND to 113 billion VND | | | | |
| - Change concession period: from 8 to 12 years | | | | | | - Adjusting the concession period from 8 years to 12 years 1 month | | |
| Success factors | | | | | | | | |
| Supporting incentives policies of the public sector | - The government committed to build path in and out of Co May Bridge from Ba Ria Province to Vung Tau Province in BOT contract | | | | - The public sector has built the path road from the junction of Ba Ria to Co May Bridge and road from Co May to Vung Tau Province (20Km) | | | |
| Construction finish on time | | | | | - Construction finish on time | | | |

### 5.2.4 Others PPP projects

The general information, and risk factors affecting the performance of Co May Bridge project are shown in Table 5-9, and Table 5-8

Table 5-9 General information of Co May Bridge project

| | |
|---|---|
| **Project name:** | **Co May Bridge** |
| **Investor:** | Hai Chau Company Limited |
| **Total investment:** | 78 Billion VND (Real: 113 Billion VND) |
| **PPP form** | BOT |
| **Financiers institutions** | Co May Bridge Construction and Operation |
| **Construction start date – completion time** | Construction finish: 8/1997 |
| | **Operation: 6/1999** |
| **Concession period** | 8 years (real: 12 years 1 month) |

The general information, and risk factors affecting the performance of Dau Giay – Phan Thiet Expressway project are shown in Table 5-10, and Table 5-11.

Table 5-10 General information of Day Giay – Phan Thiet Expressway project

| | |
|---|---|
| **Project name:** | **Dau Giay - Phan Thiet Expressway** |
| **Investor:** | |
| **Total investment:** | 757 Million USD |
| **PPP form** | Public-Private Partnership (PPP) |

Table 5-11 Risk factors affecting performance of Dau Giay – Phan Thiet Expressway project

| Risk factors | Phases | | |
|---|---|---|---|
| | Feasibility | Plan | Finance |
| **Phase 1: 2008 - 2014** | | | |
| - Lack of the suitable law and policy for PPP<br>- Direct contracting | - Bitexco Group: 1st nominated investors (60% total investment capitals)<br>From 2008 - 2013: the government still have not selected any investors (40%) cooperated with Bitexco Group<br>Lack of transparency, risk related to new policies for PPP pilot project are relatively high | | |
| - Government's intervention | - Dau Giay - Phan Thiet expressway is one of 20 PPP pilot projects. Thus, it met a lot of problems/issues related to intervention of the government (e.g. policies, approval and permits, corruption, …) | | |
| - Intervention of sponsors (e.g., World Bank) | - World Bank request to suspend the project to implement quality improvement review, and propose many changes in plan to implement the project<br>- World Bank propose new mechanisms (e.g., back-up credit instruments, accounts designated to protect the lenders in order to avoid demand risks and traffic volume) | | |
| **Phase 2: 2015: Divide project into two projects: 36Km (State budget) + 62 Km (PPP)** | | | |
| - Unsuitable policies of the government<br>- Government's intervention | Divide project into two projects: 36Km (State budget) + 62 KM (PPP)<br>Bitexco group no longer acts as the first investors | | |

## 5.3 Concern factors of private investors

By reviewing many previous research such as studies by Sader (2000), Qiao et al. (2001), Thomas et al. (2003), Thomas et al. (2005), Toan and Ozawa (2008), Kwak et al. (2009), Mustajab (2009), Demirag et al. (2011), and in-depth interviews with the experienced professionals related to PPP projects in Vietnam, a total of 22 concern factors of private investors were defined. Moreover, to fit with PPP transportation projects in Vietnam, these concern factors were reviewed and determined throughout the semi-structured interviews and group discussion. Most of the respondents were agreed with the list of the concern factors that private investors consider when they promote the investment capitals into PPP transportation projects. Finally, 22 concern factors (Figure 5-3) which were collectively chosen by seven professionals consists of two categories (company-specific and project-specific factors), and four sub-categories (company profile, finance, opportunities, and risks of PPP projects). The descriptions of such concern factors are shown in Table 5-12.

**(1) Company profile (CP)**: displays the concern factors related to capabilities, such as management capacity, financial viability, resources and experiences of their partners in concession company (SPV Company). (*Note: some partners join together to establish specific purpose vehicle to carry out PPP transportation projects*)

**(2) Finance of PPP projects (FP)**: displays the concern factors affecting the finance issues of PPP projects. Finance issues of PPP projects consist of many issues, namely return on equity (ROE), long-term income, cash flow, financing sources, tariff, and demand issues.

**(3) Opportunities of PPP projects (OP)**: displays the concern factors related to opportunities of private investors when they decide to invest in PPP projects, such as seek new markets; enhancing good relationship with financiers, lenders, and stakeholders of PPP projects; enhancing the strength of company in its industry; enhancing the reputation to other investors; and need for work.

**(4) Risk of PPP projects (RP)**: displays the concern factors related to risk of previous PPP projects in a host country, such as political, risk, commercial, design and procurement, construction, and operating risks.

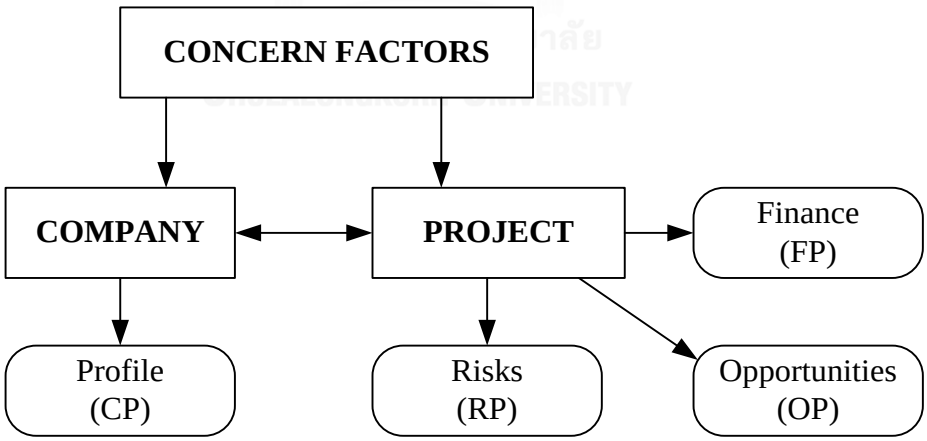



Figure 5-3 Concern factors groups of private investors

Table 5-12 Main concern factors contributing to the decision to invest by private investors

| No. | Code | Concern factors | Descriptions |
|---|---|---|---|
| **I** | **CP** | **COMPANY PROFILE** | |
| 1 | CP1 | Management capacity of the company | Management capacity issues of its company contributing to the decision to pursue the investment into PPP transportation projects |
| 2 | CP2 | Financial viability of the company | Financial viability issues of its company contributing to the decision to pursue the investment into PPP transportation projects |
| 3 | CP3 | The company's resources about labor, machinery, engineering | The issues of company's resources (e.g., labor, machinery, engineering) contributing to the decision to pursue the investment into PPP transportation projects |
| 4 | CP4 | The company's experience with same project before | Company's experience with same project (e.g., experience with type, scope, technology of previous PPP projects) before will lead to the decision to pursue the investment of concession company |
| **II** | **FP** | **FINANCE OF PPP PROJECTS** | |
| 1 | FP1 | Return on equity investment | The company concerns about return on equity investment in the future before making decision to invest into PPP transportation projects |
| 2 | FP2 | Possibility of long-term income | The company concerns about possibility of long-term income before making decision to invest into PPP transportation projects |
| 3 | FP3 | Project cash flows | The company concerns about project cash flows (e.g.,(1) Feasibility studies: plan to prepare initial capitals (e.g., equity, loan); (2) Design and Construction: plan to loan repayments, construction costs; (3) Operation: tariff fee, revenue from operations) before making decision to invest into PPP transportation projects |
| 4 | FP4 | Availability of financing sources | The company concerns about availability of financing sources (e.g., situation of local or international financial market) before making decision to invest into PPP transportation projects |
| 5 | FP5 | Tax/tariff issues | The company concerns about tariff issues (e.g., tariff structure, policies related to tariff structure, tariff indexation arrangement) before making decision to invest into PPP transportation projects |
| 6 | FP6 | Demand issues | The company concerns demand of PPP projects (e.g., traffic flow, ready to pay by users, social conditions) before making decision to invest into PPP transportation projects |
| **III** | **OP** | **OPPORTUNITIES OF PPP PROJECTS** | |
| 1 | OP1 | Assess/seek to new markets | The company would like to invest in PPP projects to assess or seek to new investment markets |
| 2 | OP2 | Enhancing relationship with lenders | The company would like to enhance relationship with lenders (e.g., financiers, bankers, and lenders) |

| No. | Code | Concern factors | Descriptions |
|---|---|---|---|
| 3 | OP3 | Enhancing relationship with contractors, project management, or operator companies | The company would like to enhance relationship with stakeholders of PPP projects (e.g., contractors, consultants, operators, and subcontractors) |
| 4 | OP4 | Enhancement of company's strength in its industry | The company would like to have opportunities to increase company's strength in its industry |
| 5 | OP5 | Value of image to other investors | The company would like to have opportunities to improve its image value (reputation) to other investors |
| 6 | OP6 | Need for work | The company would like to invest in PPP projects to create work (jobs) for its own company |
| **IV** | **RP** | **RISK OF PPP PROJECTS** | |
| 1 | RP1 | Politics risks | The company concerns about the political situation of a host country (e.g., government's intervention, approvals and permits, and corruption) which will affecting the performance of PPP projects |
| 2 | RP2 | Law risks | The company concerns about basic legal and regulatory system, or legal related to PPP of host country which will affecting the performance of PPP projects |
| 3 | RP3 | Commerce risks | The company concerns about the commercial situation (e.g., financial market, interest rate, inflation, and exchange rate) of host country which will affecting the performance of PPP projects |
| 4 | RP4 | Design and procurement risks | The company concerns about the risk related to design and procurement phase of previous PPP projects (e.g., poor public decision-making process, lack of transparency in the bidding, supporting incentives risk, imperfect contract, inefficient feasibility study, …) |
| 5 | RP5 | Construction risks | The company concerns about the risk related to construction phase of previous PPP projects (e.g., land acquisition and compensation, problems with different practice, scope change, and force majeure) |
| 6 | RP6 | Operation risks | The company concerns about the risk related to operating phase of previous PPP projects (e.g., early termination of concession, toll fee issues, payment risk, demand risk, and operator inability) |

### 5.4 Risk factors affecting performance of previous PPP transportation projects

By reviewing many previous research in this area such as Dias and Ioannou (1995); Toan and Ozawa (2008); Ke et al. (2009); Xu et al. (2010); Karim (2011); Ke et al. (2011), Hwang et al. (2013), Ezelding and Badran (2013), ten case studies in Vietnam, and in-depth interviews with the professionals in Vietnam PPP market, a total of 38 risk factors relevant to the performance of PPP schemes were drawn up. To fit in this research context (transportation projects), these factors were reviewed and refined by a

group of seven experienced professionals through semi-structured interviews and group discussion. Each professional was provided list of risk factors and was asked to specify which factors affecting the performance of PPP projects, based on his/her experience. From this process, while easily agreed by seven professionals to keep the list of project risk factors, eight factors were removed, and three new factors were additionally suggested by them. Three new factors were added to the list, including "unclear about state participant potion", "breach of contract by government", and "inefficient feasibility study". Finally, 33 risk factors were collectively chosen by seven professionals. In-depth interviews with experience professional were then carried out to collect actual data from ten previous PPP projects in Vietnam, the principal risks encountered in previous PPP projects in Vietnam are as shown in Table 5-13.

In this research, the hierarchy risk breakdown structure (HRBS) technique was used as shown in Figure 5-4 to identify the risk factors of the PPP transportation projects in Vietnam and risk code system to manage all of the risk factors. Descriptions of 33 risk factors affecting the performance of the private sector in PPP transportation projects in Vietnam are as shown in Table 5-14. All of risk factors can identify into six main risk groups as follow:

**(1) Politics risks (P)**: displays the external risk factors that related to political environment of Vietnam.

**(2) Law risks (L)**: shows the risks related to Vietnam legal environment

**(3) Commerce risks (C)**: displays risk related to Vietnam commercial environment

**(4) Design and Procurement risks (D)**: displays risk related to design and procurement phases of PPP transportation projects

**(5) Construction risks (Co)**: displays risk related to construction phase of PPP transportation projects.

**(6) Operation risks (O)**: displays risk related to operation phases of PPP transportation projects.

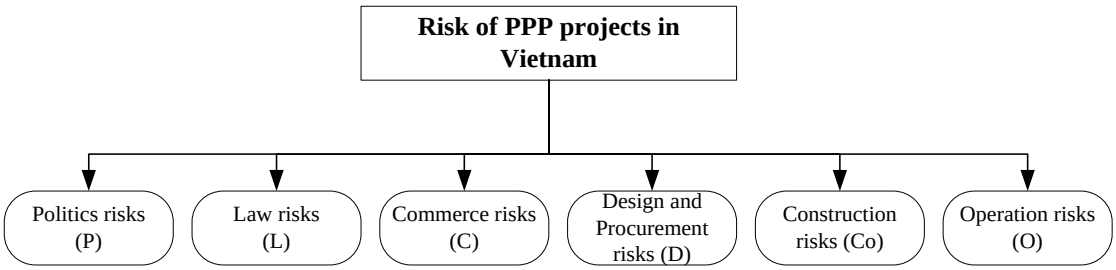



Figure 5-4 Proposed hierarchical risk breakdown structure (HRBS) for PPP projects in Vietnam

Table 5-13 Principal risks encountered in previous PPP projects of Vietnam

| Categories | | ID | Risk factors | Case No. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| General risks | Politics risks | P1 | Government's intervention | | | ✓ | ✓ | | | | | | |
| | | P2 | Delay in project approvals and permits | | ✓ | ✓ | ✓ | | | ✓ | | | |
| | | P3 | Corruption | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Law risks | L1 | Inadequate law and supervision system | | | ✓ | ✓ | | | | | | |
| | | L2 | Change in laws and regulations | | ✓ | | ✓ | | | | | | ✓ |
| | | L3 | Change in tax regulation | | | | | ✓ | | | | | |
| | Commerce risks | C1 | Financial market risk | | | | ✓ | | | | | | |
| | | C2 | Interest rate fluctuations | | ✓ | | | | | | | | |
| | | C3 | Foreign exchange fluctuations | | | | ✓ | | | | | | |
| | | C4 | Inflation | | ✓ | | ✓ | | | | | | |
| Project-specific risks | Design and procurement risks | D1 | Poor public decision-making process | | | ✓ | ✓ | | | | | ✓ | |
| | | D2 | Lack of transparency in the bidding | | | ✓ | ✓ | | | | | ✓ | |
| | | D3 | Subjective project evaluation method | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| | | D4 | Supporting incentive of government risk | | | | ✓ | | | | | | |
| | | D5 | Unclear about state participant portion | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | D6 | Conflicting or imperfect contract | | | | ✓ | ✓ | | | | ✓ | |
| | | D7 | Breach of contract by government | ✓ | | | ✓ | | | | ✓ | | |
| | | D8 | Inefficient feasibility study | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| | | D9 | Unfair process of selection of the private sector | | | | | | | | | ✓ | |
| | | D10 | Inadequate allocation of responsibility and risk | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| | | D11 | Low capacity of concession company | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| | Co | Co1 | Scope change of projects | ✓ | | | | ✓ | | | ✓ | ✓ | ✓ |

| Categories | ID | Risk factors | Case No. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | Co2 | Land acquisition and compensation | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| | Co3 | Problems due to partner's different practice | | | | | | | | | ✓ | |
| | Co4 | Lack of supporting infrastructure | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | |
| | Co5 | Environmental protection risk | | | | | | | | | | |
| | Co6 | Force majeure risk | ✓ | ✓ | | ✓ | | | | | | |
| Operation risks | O1 | Completion risk | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | O2 | Early termination of concession by concession company | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | |
| | O3 | Toll fee issues | | ✓ | | ✓ | | ✓ | | | | |
| | O4 | Payment risk | | | | | ✓ | ✓ | ✓ | ✓ | | |
| | O5 | Demand risk | | ✓ | ✓ | ✓ | | | | | | |
| | O6 | Operator inability | | | | | | | | | | ✓ |

*Case 1: Binh Trieu II Road Bridge; Case 2: Yen Lenh Bridge; Case 3: Ong Thin Bridge; Case 4: Phu My Bridge; Case 5: BOT 1A National Highway, An Suong - An Lac; Case 6: 13 National Highway, HCM-Binh Duong; Case 7: 1K National Highway, HCM-Bien Hoa; Case 8: BOT My Phuoc-Tan Van Highway; Case 9: Deo Ca Tunnel; and Case 10: Co May Bridge*

Table 5-14 Definitions of risk factors affecting the private sector

| Cate | No. | Code | Risk factors | Descriptions |
|---|---|---|---|---|
| Politics risks | 1 | P1 | Government's intervention | The public sector interferes unreasonable in the activities of the private sector (Expropriation by the government) in the performance of PPP transportation projects |
| | 2 | P2 | Delay in project approvals and permits | Delay or refuse approval for the project approvals and permits by government agencies |
| | 3 | P3 | Corruption | Corruption of government authorities, bribes or unjust rewards |
| Law risks | 4 | L1 | Inadequate law and supervision system | Law system and legal framework is incomplete and overlapping |
| | 5 | L2 | Change in laws and regulations | Regular promulgated and amended the laws, regulations, rules by the government |
| | 6 | L3 | Change in tax regulation | Change in tax regulations inconsistent between central or local government during the performance of PPP transportation projects |
| Commerce risks | 7 | C1 | Financial market risk | Poor financial markets or ineffective of financial mobilization tools (e.g., the government induced changes in interest, foreign exchange, and liquidity crisis in market) |

| Cate | No. | Code | Risk factors | Descriptions |
|---|---|---|---|---|
| | 8 | C2 | Interest rate fluctuations | Changes of interest rate due to immature of banking systems and local economic |
| | 9 | C3 | Foreign exchange fluctuations | Fluctuations of currency exchange rates and convertibility |
| | 10 | C4 | Inflation | Changes of inflation rate due to immature of banking systems and local economic |
| **Design and procurement risks** | 11 | D1 | Poor public decision-making process | The government officials consider of their own career, short-term goals or personal interests. In addition, their management experience in PPP projects is too little, leading to poor political decision-making process |
| | 12 | D2 | Lack of transparency in the bidding | Lack of transparency in the bidding process (e.g., bidding process and documents vary from projects to projects and from province to province). In Vietnam, it still not have standardized for bidding documents and contracts |
| | 13 | D3 | Subjective project evaluation method | The criteria evaluation methods for PPP projects (e.g., concession period, technology, demand, tariff structure, …) are not effective, subjective or inappropriate |
| | 14 | D4 | Supporting incentive of government risk | Incentive policies and guarantees (e.g., incentives or guarantees according to specific industries or sectors) are not clear, inefficient and incomplete |
| | 15 | D5 | Unclear about state participant portion | State participation portion in PPP projects are not specified explicit (e.g., state participation portion from other sources such as ADB or WB have to go through a lot of regulations of these institutions to use) |
| | 16 | D6 | Conflicting or imperfect contract | The contractual agreement is inappropriate, including risk allocation inconsistent among stakeholders, incorrectly commitment from public and private partners, and lack of provisions related to land acquisition and compensation |
| | 17 | D7 | Breach of contract by government | During the project implementation, the government does not guarantee the initial commitment problem in the contract. In addition, this also led to the breakdown of contractual commitments by the government |
| | 18 | D8 | Inefficient feasibility study | The feasibility study of project is not effective, need to adjust or change many times to fit with the new policies, or situation, or based on the suggestion of investors |
| | 19 | D9 | Unfair process of selection of the private sector | The process of selection of investors is unclear, not transparent (e.g., select incapability of the private sector) resulting in a inappropriate the private sector |
| | 20 | D10 | Inadequate allocation of responsibility and risk | Inadequate risk allocation among project stakeholders, and mismatch commitment between the public and private sectors |
| | 21 | D11 | Low capacity of concession company | Concession company has insufficient capacity to perform the project works |

| Cate | No. | Code | Risk factors | Descriptions |
|---|---|---|---|---|
| Construction risks | 22 | Co1 | Scope change of projects | The scope of project need to adjust or change many times to fit with the situation, or based on the suggestion of investors (e.g., design changes, force majeure, and policies changes) |
| | 23 | Co2 | Land acquisition and compensation | The project site land is unavailable or unable to be used at required time (e.g., dispute amongst land acquisition and compensation process, and corruption) |
| | 24 | Co3 | Problems due to partner's different practice | Different experience between the public and private sectors, and among investors, contractors/subcontractors, suppliers, and operators |
| | 25 | Co4 | Lack of supporting infrastructure | Lack of infrastructure to support the implementation and operation of projects (e.g., lack of temporary roads, transit road, path roads, etc.) |
| | 26 | Co5 | Environmental protection risk | Poorly environment impact assessment |
| | 27 | Co6 | Force majeure risk | These risks are outside of the control of the public and private sectors (e.g., war, fires, floods, epidemics…) |
| Operation risks | 28 | O1 | Completion risk | Construction period longer than expected plan, the construction cost overruns or poor quality of construction |
| | 29 | O2 | Early termination of concession by concession company | The concession company cannot continue to carry out the project due to some big problems (e.g., Government does not comply with contractual commitments, concession company does not have enough ability to complete projects, or unexpected demand, revenue) |
| | 30 | O3 | Toll fee issues | Change of toll fee due to many reasons (e.g., low traffic , incomplete supporting infrastructure, uncertainty of contractual commitments) |
| | 31 | O4 | Payment risk | Government/Users unwilling to pay or delay payment because of social issues or other problems (e.g., bad quality of service, unreasonable toll collection system, impact of alternative projects) |
| | 32 | O5 | Demand risk | The change in project demand due to many factors (e.g., social, economic, new policies …) |
| | 33 | O6 | Operator inability | Operator companies do not have enough capabilities to perform projects under operation phase |

### 5.5 Investment willingness attributes and criteria

Based on a lot of previous research works such as Dias and Ioannou (1995), Sader (2000), Ward and Sussman (2005), Ng et al. (2009), Kwak et al. (2009), Vickram (2009), and Liu et al. (2014), a total of 28 investment willingness criteria relevant to private investors' perceptions were drawn up. To fit in this research context (PPP transportation projects), these factors were reviewed and refined by seven experienced

professionals through in-depth interviews and group discussion. Finally, 28 investment willingness criteria were collectively chosen, and divided into six main attributes to measure investment willingness level of the private sector in PPP transportation projects in Vietnam (Figure 5-5). List of all investment willingness attributes is as following (see Table 5-15)

1) **Finance attribute (WF)**: displays the investment willingness criteria of private investors related to the finance of PPP projects.
2) **Profitability attribute (WP)**: displays the investment willingness criteria of private investors related to the profit or revenues of PPP projects.
3) **Legal framework attribute (WL)**: displays the investment willingness criteria of private investors related to the legal framework of PPP projects.
4) **Partner selection attribute (WS)**: shows the investment willingness criteria of private investors related to the partner selection of PPP projects.
5) **Risk sharing attribute (WR)**: displays the investment willingness criteria of private investors related to the risk sharing or risk allocation of PPP projects.
6) **Macroeconomics attribute (WM)**: shows the investment willingness criteria of private investors related to the macroeconomics of country that PPP projects constructed.



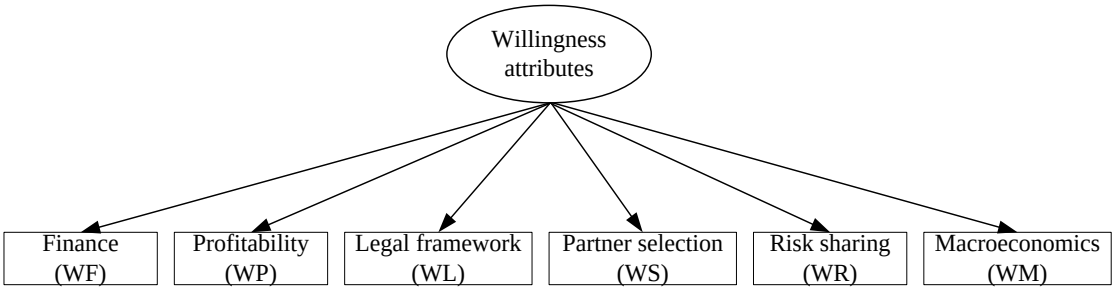



Figure 5-5 Proposed measurement criteria for the private sector's willingness of PPP projects in Vietnam

Table 5-15 Investment willingness criteria of private investors

| 1. Investment willingness | | Descriptions |
|---|---|---|
| **Wil1. Financing criteria (WF)** | | |
| WF1 | Ability to supply capital for the project | The company's ability to carry out and provide financial resources for project to (1) fund the project (e.g., equity infusions); and (2) back its projects operations (e.g., "fund" incurred costs that have not been paid). |
| WF2 | Credibility to call loan for the project | The capacity of its company to call loan for the project (e.g., reputation, relationship with its industry, and guarantees for loan of the government) |
| WF3 | Ability to fund initial project costs | The company's ability to share capital with other partners the expenditures that incur during the initial stages of the project (e.g., pre-feasibility studies, feasibility studies, preliminary design, proposal preparation and bid submission) |
| WF4 | Efficiency of domestic capital market | Assessment of the availability of adequate domestic capital market to fund the project. It considers (1) the actuality of a well-developed local capital market (e.g., opportunity to raise long-term funds from local commercial sources); (2) the availability of loans and export credits from international financial institutions (e.g., World Bank, ADB, and international credit agencies) to increase equity and local debt; and (3) the readiness of the financial instruments used to arrange the financial package. |
| WF5 | Suitability of equity/debt ratio | Assessment of suitable ratio of equity of its company with debt which company can borrow from financiers/lenders |
| **Wil2. Profitability criteria (WP)** | | |
| WP1 | Revenues from operating the vicinity of project | Assessment of the quality of project throughout the revenues from operating the vicinity of project. It considers (1) government policies; and (2) possibility of proposal from private investors |
| WP2 | Revenues from the services of project | Assessment of the quality of project in terms of return on the company's investment during operation phase |
| WP3 | Stability of project's cash flow | Assessment the stability of project's cash flow. It considers income, potential, and uncertainty of project based on (1) Demand issues; (2) Concession period; (3) Identification of revenue streams; (4) Availability of revenues before construction completion; (5) Adjusting toll fees; (6) competing projects; (7) provision of contract; (8) the quality of receivables (i.e., the creditworthiness of the future users/tenants of the facility); (9) changes of macroeconomic factors (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI...) |
| WP4 | Ability of new markets' seeking and penetration | Assessment of the ability of its company can enter and penetrate the new markets (e.g., searching for new investment opportunities and enhancing relationship with local partners) |
| **Wil3. Legal framework criteria (WL)** | | |
| WL1 | Transparency and adequacy of legal framework | Assessment of the transparency and adequacy of the basic legal and regulatory system (e.g., labor and tax laws) and regulations regarding to PPP projects (e.g. land acquisition, private ownership |

| 1. Investment willingness | | Descriptions |
|---|---|---|
| | | of assets, investment law, tariff indexation arrangements, and environment protection law) |
| WL2 | Advantage of legal framework for investment | Assessment of the advantage of legal and regulatory systems regarding PPP projects to investment process of the private sector |
| WL3 | Efficiency of State's incentive policies for investment | Assessment of the efficiency of the supporting or incentive policies of government for investment process of the private sector |
| WL4 | Clarity of State participant portion | Assessment of the clarity of all forms of state participation portion (e.g., state capital, investment incentives, and relevant financial policies) |
| WL5 | Facilitation for procedures of land acquisition and compensation | Assessment of the facilitation procedures of land acquisition and compensation |
| **Wil4. Partner selection criteria (WS)** | | |
| WS1 | Accessibility to reliable partners | Assessment of the likelihood to find reliable partners (e.g., strong financial institutions; partners with good management capacity, financial viability, strong resources, and/or good experiences) |
| WS2 | Capacity of partners | The capacity of other partners to perform project based on their engineering expertise, experiences, knowledge, technology, negotiating and political skills to cope with financial, technology, and management |
| WS3 | Favorable investment environment for seeking partners | Assessment of the favorable of the investment environment of host country (e.g., fields, type of projects, technologies) to find reliable partners |
| WS4 | Competitiveness and transparency of bidding process | Assessment of the transparency and competitiveness of bidding process |
| **Wil5. Risk sharing criteria (WR)** | | |
| WR1 | Less risky in project | Assessment of the degree of risk may encounter to that kind of PPP project |
| WR2 | Efficient legal framework about project risk sharing | Assessment of the efficient of legal and regulatory systems regarding risk allocation in PPP transportation project |
| WR3 | Clear risk allocation among parties | Assessment of the clarity of risk sharing (e.g., allocate risks to the participants best able to manage them) |
| WR4 | Clear supporting condition about risk sharing by the State | Assessment of the supporting incentives of State in sharing risks with private investors |
| **Wil6. Macroeconomics criteria (WM)** | | |
| WM1 | Changes of macroeconomics policies | Assessment of the macroeconomic policies stability of the host country. It considers (1) the possibility of governments to take actions that directly affect the profitability level of the project (e.g., changes in environmental laws, taxation and controls on equity, repatriation of funds, fiscal and monetary controls, and exchange mechanisms; interference in operations and tariff policy; nationalization; and expropriation); and (2) the likelihood of having significant changes in the political regime or significant levels of political inspired violence (e.g., possibility of riots, terrorism, general strikers, and wars) |

| 1. Investment willingness | | Descriptions |
|---|---|---|
| WM2 | Favorable conditions by the State for investment operation of the private sector | Assessment of the state support throughout favorable conditions for investment operation |
| WM3 | Attractiveness of investment environment | Assessment the attractiveness of macroeconomic policies affecting the investment environment |
| WM4 | Efficiency of the monetary policy of the state | Assessment the efficiency of the monetary policies of the state may affect the investment willingness of private investors |
| WM5 | Stability of macroeconomic indicators (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI...) | Assessment of the alterations on macroeconomic indicators (e.g., inflation, interest rate, currency exchange rates, GDP, CPI…) |
| WM6 | Effectiveness of environmental impact assessment | Assessment the effectiveness of environmental impact assessment (EIA) |

### 5.6 Responsive strategies of the private sector

All respondents were asked to express their degree of agreement on the identified responsive strategies though a five-point Likert scale with 0-Not applicable, 1-Strong disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, and 5-Strongly agree. There are four suggested-strategies groups (see Figure 5-6) based on the second pilot survey are shown in the following:

1) **Cooperation strategies (SC)**: displays the strategies which private investors will prepare to cope with the issues/problems during the cooperation/partner selection stage in PPP transportation projects.

2) **Finance strategies (SF)**: displays the strategies which private investors will prepare to cope with the issues/problems during the financial preparation stage in PPP transportation projects.

3) **Evaluation strategies (SE)**: displays which private investors will prepare to cope with the issues/problems during the feasibility study stage in PPP transportation projects.

4) **Suggestion strategies (SS)**: displays the strategies which private investors will suggest for the public sector to improve the investment environment and attractiveness of PPP transportation projects.

Descriptions of all 18 responsive strategies of private investors are as shown in Table 5-16

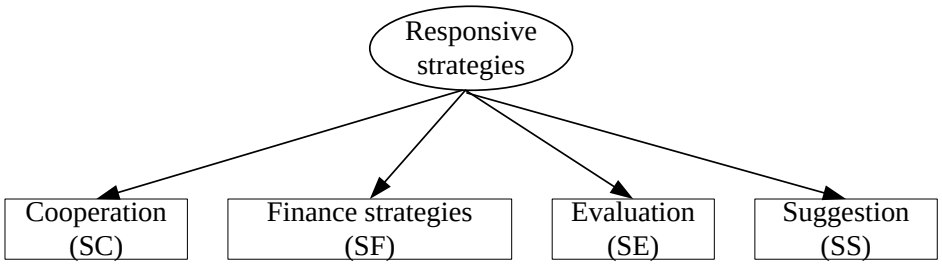



Figure 5-6 Proposed responsive strategies for the private sector when investing in PPP projects in Vietnam

Table 5-16 Responsive strategies of private investors

| **1. Response strategies** | | **Descriptions** |
|---|---|---|
| **Stra1. Cooperation strategies** | | |
| SC1 | Select a capable partners (technical capacity and financial resources) | Select a suitable partners that can perform project based on their good engineering expertise, experiences, knowledge, technology, negotiating and political skills to cope with financial, technology, and management |
| SC2 | Maintain long-term relationships with industrial partners | Perform fundamental policies to enhance the long-term relationships with industrial partners (e.g., define clearly range of assets, employees, organizations, resources, and strategic among partners; organize regular meetings and reports) |
| SC3 | Maintain good relationship with local government and higher officials | Maintain good relationship with local government and higher officials (e.g., cooperate with partners that have good relationship with government officials) |
| SC4 | Improve capacity of professionals involved | Improve capacity of professionals involved (e.g., select the suitable experts corresponding to each phase of PPP projects; implement training course for professionals) |
| **Stra2. Finance strategies** | | |
| SF1 | Establish detailed plan for loan capitals and long-term financing | Establish detailed plan for loan capitals and long-term financing. It considers the detailed plan according to each phase of PPP projects (1) Feasibility studies: plan to prepare initial capitals (e.g., equity, loan); (2) Design and Construction: plan to loan repayments, construction costs; (3) Operation: tariff fee, revenue from operations |
| SF2 | Evaluate carefully the incentive policies and the state participation portion | Evaluate carefully the incentive policies and the state participation portion (e.g., land acquisition and compensation; land ownership, land lease, supporting infrastructure, guarantees for loan interest rate, conversion land for infrastructure (BT contract), and funds from state agencies) |
| SF3 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | Evaluate the effecting of inflation, interest rate and, foreign exchange issues to projects' cash flows. Moreover, suggest some strategies to restrict the influence of these index (e.g., pre-defined prices contract with the government, escalation clauses, reimbursement clauses in contract to mitigate loss from interest rate, foreign exchange issues) |

| 1. Response strategies | | Descriptions |
|---|---|---|
| SF4 | Seek government support and guarantees | Seek more government supports and guarantees (e.g., minimum guaranteed revenue, flexibility in tariff structure, financial supports, force majeure protection (extend concession periods or make compensation for force majeure risks) |
| **Stra3. Evaluation strategies** | | |
| SE1 | Develop a project evaluation tool | Develop a project feasibility evaluation tool (e.g., criteria for feasibility evaluation based on each phase of projects, then private investors can manage |
| SE2 | Hire experienced consultants to assess the feasibility of the project | Hire experienced consultants to assess the feasibility of the project. Consultants could be selected from third party |
| SE3 | Analyze appropriate allocation of responsibility and risk | Identify and analyze appropriate responsibility and risk (e.g., allocate such risks to the partner can be best able to manage them) |
| SE4 | Evaluate concession period for projects | Evaluate concession period for projects based on information in pre-feasibility studies such as investment capitals, equity/debt ratio, demand issues, revenues from operation, adjusting toll fee, competing projects, and changes of macroeconomic index |
| **Stra4. Suggestions for government** | | |
| SS1 | Acquire proposals from the private sector | Acquire proposals from the private sector (e.g., acquire proposed projects for the public sector, or feasibility studies of some potential PPP projects) |
| SS2 | Build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | Build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes |
| SS3 | Establish adequate legal and regulatory framework | Establish adequate legal framework for PPP form (e.g., Improve the political, investment environment; establish fair bidding process; implementation process for PPP projects) |
| SS4 | Establish an inter-sector working team | Establish an inter-sector working team (e.g., provide training course at all levels for government staff) |
| SS5 | Develop a database for historical PPP projects | Develop a database for historical PPP projects (e.g., incentive policies, minimum guaranteed revenue, tariff structure, financial support, force majeure protection of previous PPP projects) |
| SS6 | Adjust the appropriate risk allocation between the private and public sectors | Adjust the appropriate risk allocation between the private and public sectors (e.g., the government should responsibility for suitable risk such as force majeure, demand issues, administrative procedures) |

## 5.7 Large-scale test

The questionnaire was then finalized and distributed to Vietnamese experienced professionals related to PPP transportation projects in the large-scale survey. Direct delivery or face-to-face interview was preferred to motivate respondents and to guarantee the accuracy of answers and improve feedback rate. The respondents were divided into two major groups: 1) public sector and 2) private sector. The private sector includes private investors, consultants, contractors, financiers and designers who are

experienced in PPP schemes, whereas officers in relevant government department were targeted in the public sector. The questionnaire survey was conducted in Vietnam around three months from August to October 2014. Altogether 320 questionnaires were administered in Vietnam, out of which, 123 valid responses were received representing a response rate of more than 38 percent. The response rates for the different groups are 20.3% for the public sector, and 79.7% for the private sector, as shown in Table 5-17. The response rates from various stakeholders (Figure 5-7) are government agencies (20.3%), private investors (44.7%), consultants (22.0%), contractors (8.1%), financiers (4.1%), and designers (0.8%).

More than half (57.7%) of the respondents were line directors and project managers, followed by directors/deputy directors (23.6%) and project managers (34.1%). The proportions of the respondents regarding a number of experience years involved in construction were: 43.1% (between five and ten years) and 56.9% (ten years or more). More than 90% of respondents were mostly experienced in equal or more than one PPP projects. This result implies that the research can reflect the current situation of PPP transportation projects in Vietnam.

Table 5-17 Questionnaire return rate

| **Stakeholder** | **Questionnaire distributed** | **Response received** | **Response rate** | **Proportion (%)** | **Partner** | **Number** |
|---|---|---|---|---|---|---|
| Private Investors | 132 | 55 | 41.7% | 44.7% | Private sector* | 98 |
| Government Agencies | 43 | 25 | 58.1% | 20.3% | Public sector | 25 |
| Consultants | 61 | 27 | 44.3% | 22.0% | Total | **123** |
| Contractors | 53 | 10 | 18.9% | 8.1% | | |
| Financiers | 20 | 5 | 25.0% | 4.1% | | |
| Designers | 11 | 1 | 9.1% | 0.8% | | |
| **Total** | **320** | **123** | **38.4%** | **100.0%** | | |

**The private sector includes private investors, consultants, contractors, financiers and designers*

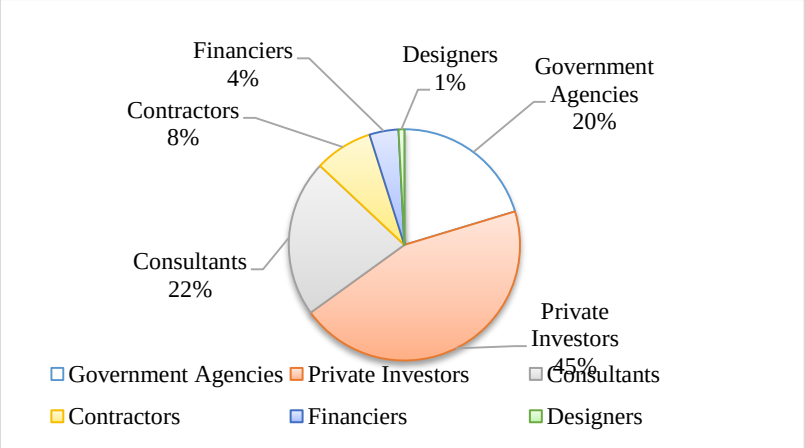



Figure 5-7 Different stakeholders participated in this research

# CHAPTER 6
# CONCERN FACTORS OF PRIVATE INVESTORS

This chapter presents the analysis of concern factors (CF) for private investors which will affect the decision to promote finance or capitals into PPP transportation projects. The first part describes the general assessment of data collection for concern factors. The second part presents the ranking analysis of concern factors groups. The following section defines the different concern perceptions between private and public sectors. Finally, the latest part of this chapter shows the recommendations for the private sector to the public sector and summary some lessons for private investors.

## 6.1 Analysis for concern factors

### 6.1.1 Reliability analysis

To check the reliability of each item asked in each group of concern factors, the Cronbach Alpha scores for such groups. The obtained Alpha scores of company capability, finance, opportunities, and risk of PPP projects groups were calculated by SPSS 22 of 0.617, 0.670, 0.730, and 0.610, respectively. We found that the Cronbach Alpha coefficient of each cluster higher than 0.6 which indicates that the scale has fine internal consistency (the minimum acceptable can be more than 0.60 (Slater, 1995)). For instance, considering the reliability table of the "finance of PPP projects" concern group as shown in Table 6-1, under the "Cronbach's Alpha if Item Deleted" the reliability of 0.670 is the highest, so it is not necessary to delete any of the items to improve the reliability score of this scale.

Table 6-1 Reliability statistics for "finance of PPP projects" concern group

| **Reliability Statistics** | |
|---|---|
| Cronbach's Alpha | N of Items |
| .670 | 6 |

| **Item-Total Statistics** | | | | |
|---|---|---|---|---|
| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| Return on equity investment | 20.4878 | 5.416 | .362 | .641 |
| Possibility of long-term income | 20.4390 | 4.789 | .499 | .590 |
| Project cash flows | 20.5041 | 5.498 | .342 | .647 |
| Availability of financing sources | 20.4634 | 5.070 | .447 | .611 |
| Tax/tariff issues | 20.9837 | 5.524 | .280 | .670 |
| Demand issues | 20.4146 | 5.146 | .475 | .603 |

### 6.1.2 Data assessment

The rankings of 22 concern factors are shown in Table 6-2. The ranking in different categories are presented in Table 6-4, Table 6-5, Table 6-6, and Table 6-7 for company profile, finance, opportunities, and risks, respectively. The criticality of the 22 concern factors ranges from the lowest value of 3.31 (need for work – OP6) to the highest value of 4.47 (financial viability of the company – CP2). Interestingly, all of the respondents evaluated all concern factors that have a mean above the important average level of 3. The results of one-sample t-test (test value = 3; confidence level = 95%) indicated that all 22 concern factors had significantly high criticalities. Capacity of company (i.e., financial viability and management capacity), finance issues (i.e., return on equity, profitability, and finance sources) and risk issues (i.e., law, politics, commerce, and design and procurement risks) are the most critical concern factors; they receive a mean score of equal or higher than 3.90. Operation risks and the need for work are two least critical concern factors, with means of 3.33 and 3.31, respectively.

## 6.2 Analysis on Group Basis

### 6.2.1 Analysis on critical concern factors of the private sector

To deeply investigate the effect of critical concern factors of the private sector on the investment willingness into PPP transportation projects in Vietnam, mean score techniques were used to rank all the concern factors (Table 6-2). According to the experienced professionals and important level from 1 (very unimportant) to 5 (very important), the critical concern factors are the factors that have the mean score equal to or more than 3.5 (>3 = neutral important). Then there are 19 critical concern factors (CCFs) based on the overall rating of private investors in PPP transportation projects in Vietnam (Table 6-2). Among 19 critical concern factors, five most critical concern factors (CCFs) were identified including *financial viability of the company (CP2), management capacity of the company (CP1), demand issues (FP6), law risks (RP2), and possibility of long-term income (FP2).* In order to carefully investigate which sectors and concern categories were involved for these concern factors, concern categories were then ranked in terms of perceptions of public, private and overall as

shown in Table 6-3. Regarding critical level of concern factors, both public and the private sectors agreed on the ranking of all concern factors categories. Finance, company capability, risks of PPP projects issues were the most concern issues of private investors when they would like to promote investment in Vietnam, whereas opportunities of PPP projects were the least critical concern group (still critical due to its mean $\geq$ 3.5). Therefore, the critical concern factors in each category should be investigated carefully in the following.

Table 6-2 Concern factors of PPP transportation projects in Vietnam

| CODE | CONCERN FACTOR | OVERALL | | | PUBLIC | | | PRIVATE | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Rank | Mean | SD | Rank | Mean | SD | Rank |
| **I. COMPANY CAPABILITY** | | | | | | | | | | |
| CP1 | Management capacity of the company | 4.31 | 0.62 | 2 | 4.16 | 0.62 | 6 | 4.33 | 0.62 | 2 |
| CP2 | Financial viability of the company | 4.47 | 0.56 | 1 | 4.8 | 0.41 | 1 | 4.37 | 0.57 | 1 |
| CP3 | The company's resources about labor, machinery, engineering | 3.6 | 0.67 | 15 | 3.56 | 0.82 | 16 | 3.64 | 0.64 | 16 |
| CP4 | The company's experience with same project before | 3.76 | 0.69 | 12 | 3.68 | 0.63 | 12 | 3.76 | 0.71 | 12 |
| **II. FINANCE OF PPP PROJECTS** | | | | | | | | | | |
| BP1 | Return on equity investment | 4.17 | 0.7 | 7 | 4.08 | 0.64 | 8 | 4.18 | 0.72 | 3 |
| BP2 | Possibility of long-term income | 4.22 | 0.77 | 5 | 4.4 | 0.65 | 3 | 4.15 | 0.82 | 6 |
| BP3 | Project cash flows | 4.15 | 0.69 | 8 | 4.16 | 0.69 | 7 | 4.16 | 0.71 | 5 |
| BP4 | Availability of financing sources | 4.2 | 0.73 | 6 | 4.36 | 0.57 | 4 | 4.1 | 0.77 | 9 |
| BP5 | Tax/tariff issues | 3.67 | 0.75 | 13 | 3.56 | 0.77 | 15 | 3.69 | 0.78 | 14 |
| BP6 | Demand issues | 4.24 | 0.68 | 3 | 4.52 | 0.59 | 2 | 4.12 | 0.69 | 7 |
| **III. OPPORTUNITIES OF PPP PROJECTS** | | | | | | | | | | |
| OP1 | Assess/seek to new markets | 3.56 | 0.8 | 17 | 3.76 | 0.83 | 11 | 3.54 | 0.8 | 18 |
| OP2 | Enhancing relationship with lenders | 3.51 | 0.72 | 19 | 3.6 | 0.65 | 13 | 3.51 | 0.76 | 19 |
| OP3 | Enhancing relationship with contractors, project management, or operator companies | 3.43 | 0.79 | 20 | 3.48 | 0.77 | 17 | 3.42 | 0.82 | 20 |
| OP4 | Enhancement of company's strength in its industry | 3.63 | 0.78 | 14 | 3.24 | 0.88 | 21 | 3.71 | 0.74 | 13 |
| OP5 | Value of image to other investors | 3.53 | 0.74 | 18 | 3.36 | 0.91 | 18 | 3.54 | 0.71 | 17 |
| OP6 | Need for work | 3.31 | 0.84 | 22 | 3.12 | 0.83 | 22 | 3.42 | 0.85 | 21 |
| **IV. RISK OF PPP PROJECTS** | | | | | | | | | | |
| RP1 | Politics risks | 3.97 | 0.8 | 9 | 3.32 | 1.11 | 20 | 4.11 | 0.59 | 8 |
| RP2 | Law risks | 4.23 | 0.76 | 4 | 4.36 | 0.76 | 5 | 4.18 | 0.76 | 4 |
| RP3 | Commerce risks | 3.9 | 0.59 | 10 | 3.96 | 0.45 | 9 | 3.88 | 0.62 | 10 |
| RP4 | Design and procurement risks | 3.9 | 0.75 | 11 | 3.96 | 0.68 | 10 | 3.87 | 0.79 | 11 |
| RP5 | Construction risks | 3.59 | 0.76 | 16 | 3.32 | 0.63 | 19 | 3.65 | 0.8 | 15 |
| RP6 | Operation risks | 3.33 | 0.7 | 21 | 3.56 | 0.58 | 14 | 3.24 | 0.71 | 22 |

Table 6-3. Ranking of important level of concern factor categories

| CATEGORIES | Overall | | Public sector | | Private sector | |
|---|---|---|---|---|---|---|
| | Mean | Rank | Mean | Rank | Mean | Rank |
| Company capability | 4.04 | 2 | 4.05 | 2 | 4.03 | 2 |
| Finance of PPP projects | 4.11 | 1 | 4.18 | 1 | 4.07 | 1 |
| Opportunities of PPP projects | 3.50 | 4 | 3.43 | 4 | 3.52 | 4 |
| Risks of PPP projects | 3.82 | 3 | 3.75 | 3 | 3.82 | 3 |

### 6.1.3 Concern group 1: Company capacity

**Investors' finance capacity.** Among the four concern factors in Table 6-4 and Figure 6-1, the most critical factor is financial viability of the company (CP2). It received a mean of 4.47 (1st ranking), which means that financial viability of their company was considered the most significant concern factors of PPP transportation projects in Vietnam. Thus, private investors have to prepare adequate financial as well as specific plans to address financial problems before deciding to participate in PPP transportation projects.

**Investors' management capacity.** Another critical concern factor of private is management capacity of the company (CP1). It received the 2nd ranking. Management capabilities of private investors are related to issues such as organizational management and work collaboration. The PPP projects are very gigantic and complex, and public sector, investors, lenders, contractors, subcontractors, and especially users/customers are associated with the projects. Finance, resources, operation issues are also related to the projects. Thus, private investors must prepare themselves a real management skill to cope with this matter.

**Experience with the similar project before** (CP4) and **resources of the company** (CP3) were considered the least concern factors in this group.

Table 6-4 Group 1: Company capacity

| Rank | Code | Concern factor | Mean | SD |
|---|---|---|---|---|
| 1 | CP2 | Financial viability of the company | 4.47 | 0.56 |
| 2 | CP1 | Management capacity of the company | 4.31 | 0.62 |
| 3 | CP4 | The company's experience with same project before | 3.76 | 0.69 |
| 4 | CP3 | The company's resources about labor, machinery, engineering | 3.60 | 0.67 |

*Cronbach's Alpha = 0.617*

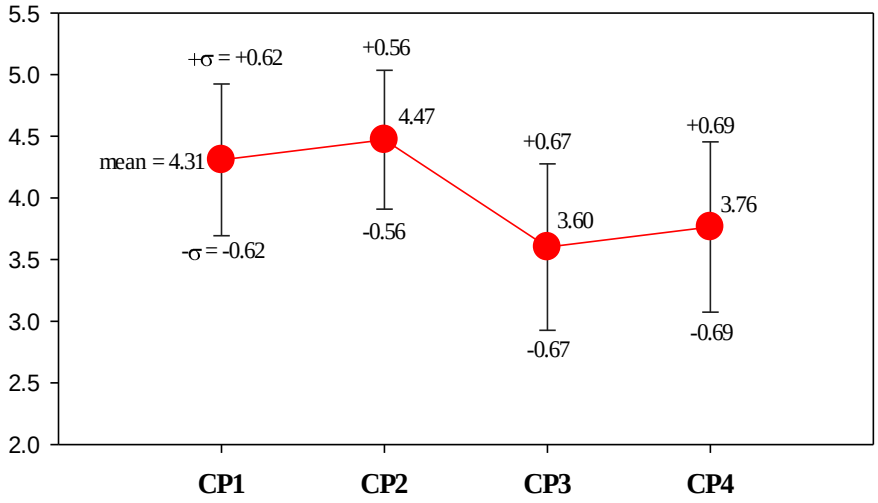



Figure 6-1 Group 1 - Company capacity



### 6.2.3 Concern group 2: Finance of PPP projects

Concern factors related to finance situation of PPP projects have to be scrutinized in PPP transportation projects. Private investors tend to be linked together to implement these projects in order to reduce the financial risk. Therefore, the characteristics of projects finance will influence significantly on the investment willingness of the private sector. Indeed, research results showed that more than 80% (5 out of 6 concern factors) were evaluated key concerns of private investors when considering investment in PPP projects (see Table 6-5 and Figure 6-2).

**Demand issues.** Among the six concern factors in 'finance of PPP projects" group, the most critical concern factors is the demand issues (FP6), it received the 1st ranking.

Indeed, it is entirely consistent with the actual situation in Vietnam. For example, the failures of Yen Lenh Bridge (Ogunlana and Abednego, 2009), Ong Thin Bridge and Phu My Bridge resulted from the underestimated demand analysis of the project.

**Project's profitability.** The possibility of long-term income (BP2) is also a critical concern factor of the private investor. It received the 2nd ranking. Another concerning factor related to a profitability of projects is the return on equity investment (BP1), which is ranked 4th. These factors were clearly related to the profitability during the life cycle of PPP projects. Indeed, profitability was mentioned by most of respondents according the research of Demirag et al. (2011) could influence private investors' decision to participate in PPP projects.

**Availability of financing sources.** Another critical concern factor is an availability of financing sources (BP4). It received a critical value of 4.20 and so was ranked 3rd in the finance of PPP projects group. A lack of availability of financing sources (i.e., the investors cannot find the lenders, financing institutions or other cooperation investors) thus can lead to quit or run out of PPP transportation projects of private investors.

**Project's cash flow**. A project cash flow (BP3) issue is regarded as the most critical concern factor for PPP projects. Although it ranked 5th, it received a very high value of important level (value = 4.15). The cash flow of PPP projects are the most concern issues of private investors in decision-making process to participate in these projects. Moreover, some problems of public's cash flow might cause barriers to entry by private investors.

Table 6-5 Group 2: Finance of PPP projects

| Rank | Code | Concern factor | Mean | SD |
|---|---|---|---|---|
| 1 | BP6 | Demand issues | 4.24 | 0.68 |
| 2 | BP2 | Possibility of long-term income | 4.22 | 0.77 |
| 3 | BP4 | Availability of financing sources | 4.20 | 0.73 |
| 4 | BP1 | Return on equity investment | 4.17 | 0.70 |
| 5 | BP3 | Project cash flows | 4.15 | 0.69 |
| 6 | BP5 | Tax/tariff issues | 3.67 | 0.75 |

*Cronbach's Alpha = 0.670*

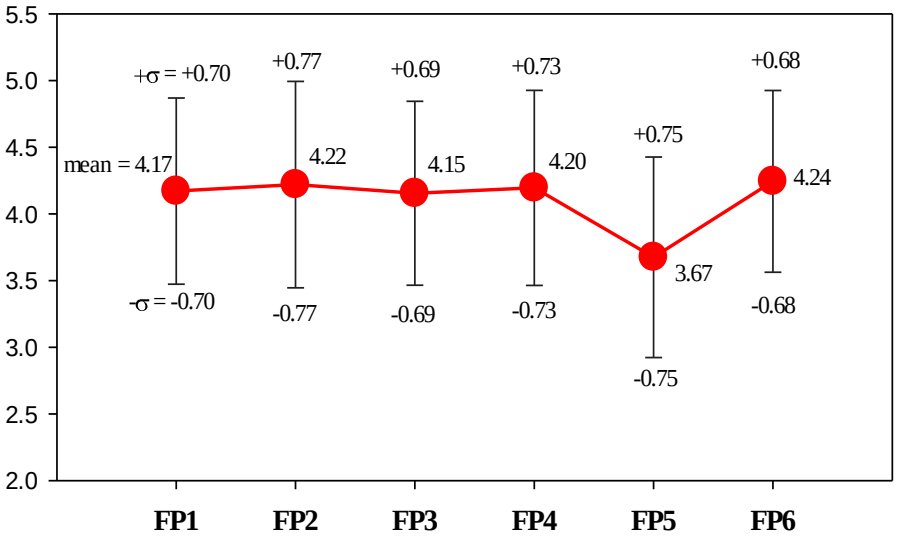



Figure 6-2 Group 2 - Finance of PPP projects

### 6.2.3 Concern group 3: Opportunities of PPP projects

The rankings of six concern factors of this group are shown in Table 6-6 and Figure 6-3. The criticality of the six concern factors ranges from the lowest value of 3.31 (need for work – OP6) to the highest value of 3.63 (Enhancement of company's strength in its industry – CP2). Obviously, all of the respondents evaluated that all concern factors that have a higher mean of the important average level (value =3). The important level of these opportunity factors is not highly appreciated in Vietnam. It proved that the investment environment of Vietnam is still not attractive enough to private investors (i.e., domestic and international companies) to enhance their new opportunities.

**Enhancement their capacities.** Among the six concern factors in 'opportunities of PPP projects" group, the most critical concern factor is the enhancement of company's strength in its industry (OP4). The mean of this factor is 3.63. Other concern factors related to enhancement the relationships are enhancing relationship with lenders (OP2-4$^{th}$) and enhancing relationship with contractors, project management, or operator companies (OP1-5$^{th}$). Thus, investing in PPP transportation projects would help private companies to improve or create a good relationship with the other private investors, contractors, consultants and operating companies in the country. This result accords with the research by Kwak et al. (2009).

**Seeking new markets.** Assess or seek to new markets (OP1) is critical and this concern factor was ranked 2nd in this group. It can be said that opportunities to entry new markets can affect private investors' decisions while they may have a lower profit contribution (Ozdoganm and Birgonul, 2000; Winch and Bonke, 2002).

**Reputation.** Value of image to other investors (OP5) also plays a significant role, and this concern factor was ranked 3rd. There are plenty of opportunities for private investors to enhance their reputation or capacity profile when promoting in PPP transportation projects. It means that private companies may get the strong reputation for the similar projects in the future.

**Need for work.** Need for work (OP6) is the least critical factor in this group. This strategy might be helpful for small or medium companies (e.g., subcontractors, suppliers, and operators participate in the project) to get works during the period of the employment crisis.

Table 6-6 Group 3: Opportunities of PPP projects

| Rank | Code | Factor | Mean | SD |
|---|---|---|---|---|
| 1 | OP4 | Enhancement of company's strength in its industry | 3.63 | 0.78 |
| 2 | OP1 | Assess/seek to new markets | 3.56 | 0.80 |
| 3 | OP5 | Value of image to other investors | 3.53 | 0.74 |
| 4 | OP2 | Enhancing relationship with lenders | 3.51 | 0.72 |
| 5 | OP3 | Enhancing relationship with contractors, project management, or operator companies | 3.43 | 0.79 |
| 6 | OP6 | Need for work | 3.31 | 0.84 |

*Cronbach's Alpha = 0.730*

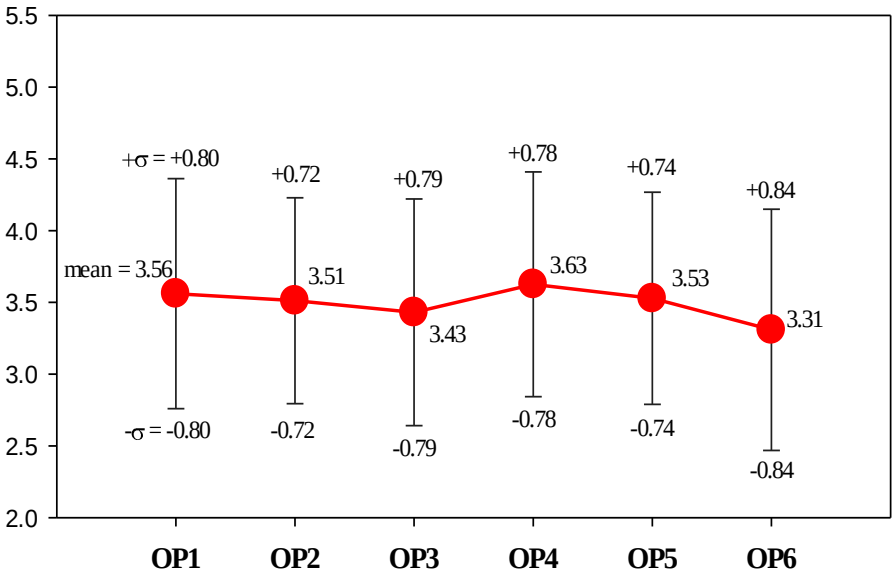



Figure 6-3 Group 3 - Opportunities of PPP projects

### 6.2.4 Concern group 4: Risks of PPP projects

Concern factors related to "risks of PPP projects" consist of two main groups, general risks, and project-specific risks. The general risks contain the legal, political, and commercial risks factors whereas the project-specific risks include design and procurement, construction, and operating risk factors (see Table 6-7 and Figure 6-4).

Table 6-7 Group 4: Risk of PPP projects

| Rank | Code | Concern factor | Mean | SD |
|---|---|---|---|---|
| 1 | RP2 | Law risks | 4.23 | 0.76 |
| 2 | RP1 | Politics risks | 3.97 | 0.80 |
| 3 | RP3 | Commerce risks | 3.90 | 0.59 |
| 3 | RP4 | Design and procurement risks | 3.90 | 0.75 |
| 5 | RP5 | Construction risks | 3.59 | 0.76 |
| 6 | RP6 | Operation risks | 3.33 | 0.70 |

*Cronbach's Alpha = 0.610*

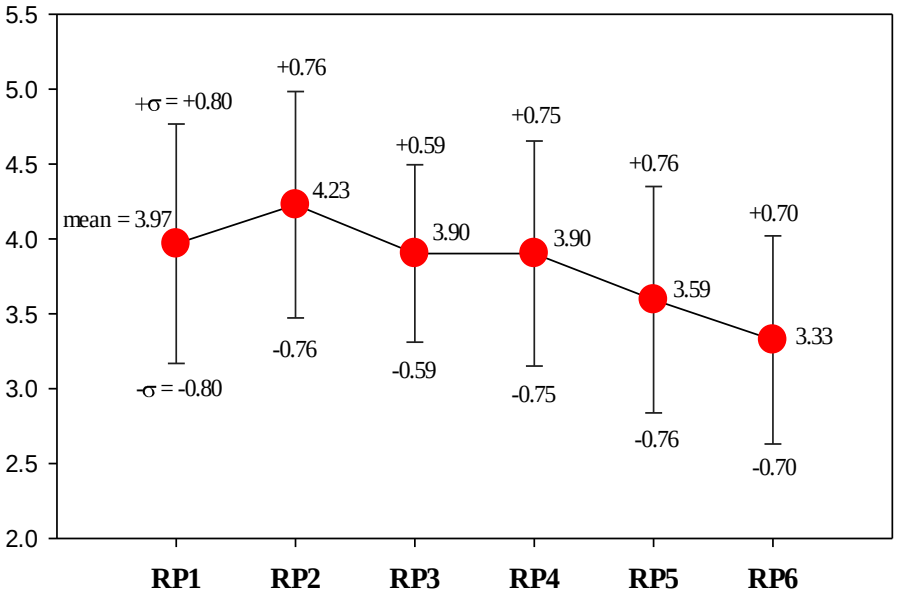



Figure 6-4 Group 4 - Risk of PPP projects

**Law risks (RP2).** Law risks include inadequate law and supervision system; change in legislation and regulations; and tariff change. Among the six risk groups in Table 6-7, the most critical concern factor is the law risks. It received a mean of 4.23, far higher than the remaining factors. In some developing countries like Vietnam, the legal systems are very complicated, the laws and regulations overlap, and some of them contradict each other (Long et al., 2004; Do and Veerasak, 2013). Therefore, it can be said that the stability of legal framework might have considerable influence on attracting private investors to engage in PPP transportation projects since PPP is still a very new form in Vietnam.

**Politics risks (RP1).** Politics risks factor comprises of many sub-factors such as government's intervention; approvals and permits issues; and corruption. Political risks factor is also the most critical factor, and this concern factor was ranked 2$^{nd}$. In Vietnam, the government directly influences the public construction sector by setting the rules for development and contractual relationships. Moreover, their influence is also identified in the private sector through policies and legislation regarding approvals and permits, taxes, availability of financing for construction, and corruption. Therefore, the Vietnamese government should concentrate on improving the political environment in

order to attract private investors so that they are going to ready to invest in infrastructure projects, particularly in PPP transportation projects.

**Commerce risks (RP3).** Commerce risks factor includes some main sub-factors such as financial market issues, fluctuation of interest rate, foreign exchange rate, and instability of inflation. The results of the study showed that the commerce risks factor is also the critical concern for private investors. This factor was ranked 3rd, and its mean was 3.90. It can be said that the evaluation of financial viability is the most commonly used for assessing the potential of the project to achieve the financial targets of private investors (Pantelias and Zhang, 2010). Moreover, interest rate, foreign exchange rate or inflation are impossible to manage or predict. Instability of interest rate and inflation would cause the undesirable financial condition of all sectors in the projects regarding potential profit.

**Design and procurement risks (RP4).** Design and procurement risks factor consists of some sub-factors related to procurement and design phases of PPP projects, including lack of transparency in the bidding, supporting incentive of government risk, unclear about state participant portion, inefficient feasibility study, an unfair process of selection of the private sector, and low capacity of concession company. The design and procurement risks factor is very imperative, and this factor was ranked 4th. The procurement and design phases are so complicated and must spend plenty of time on PPP transportation projects. It is critical in determining the success or failure of projects throughout selection process of investors, investment forms, total investment, and concession period. It can be said that the design and procurement risks factor is the most concern issue of private investors.

**Construction and operation risks (RP5 and RP6)).** Compared with the other concern factors, construction, and operation risks are considered to be less critical, and they were ranked last in this group, but they are still quite critical concerns for private investors because their mean scores are 3.59 and 3.33, respectively.

### 6.3 Different concern perceptions between the public and private sectors

The empirical analysis was then conducted to test the consensus amongst two groups of respondents on their ranking using the Spearman's rank correlation test. Hypothesis testing verifies these relations between rankings of two groups at the 1% significant level. The Spearman's correlation coefficients for ranking of important levels of the concern factors between the public and private sectors is 0.740. Table 6-8 summarizes the Spearman's rank correlation coefficients and corresponding significant levels. It suggests that the null hypotheses that no significant correlation between the public sector and private sectors can be rejected. It implies a high degree of agreement (i.e., $r_s$ from 0.5 to 1.0) between two groups on the level of important of concern factors (Cohen, 1988).

Although the results of the Spearman's correlation test exposed that the public and private respondents shared a relatively consistent view of the classification of concern factors of the private sector in PPP transportation projects in Vietnam, the analysis of ranking of concern factors designates some interesting results. As illustrated in Table 6-2, there are nineteen critical concern factors (CCFs) based on the perception of the private sector's respondents whereas only sixteen CCFs were recognized by the public sector's respondents (assumption: critical mean $\geq$ 3.5). The public sector ranked "demand issues" (BP6) and "operation risks" (RP6) as the second and fourteen CCFs, whereas the private sector ranked them 7$^{th}$ and 22$^{nd}$, respectively. Similar results were also found in "assess/seek to new markets" (OP1), and "enhancing relationship with lenders" (OP2). The ranking exercise further unveiled the different interest of the public sector from the private sector, particularly on the classification of "enhancement of company's strength in its industry" (OP4), "management capacity of the company" (CP1) and "construction risks" (RP5). Therefore, in order to clarify the difference perceptions of two groups of concern factors of the private sector in Vietnam, the public and private sectors' perceptions were compared through independent sample *t-test* to confirm any significant differences (at $\alpha$=5%). The null hypothesis was that there was no significant difference in the public and private sectors' perceptions. Finally, cross-comparison by spider diagram among public and private sectors are shown in Figure

6-5 and concern factors with significant differences between public and private under *t*-test are displayed in Table 6-9.

Table 6-8 Spearman's rank correlation coefficient test between groups for concern factors of private investors in PPP projects

| **Comparison** | | **$r_s$** | **Sig.** | **Conclusion** |
|---|---|---|---|---|
| **Public sector ranking vs. Private sector ranking** | Important level | .740 | .000 | Reject $H_o$ at 1% sig. level, and thus accept the $H_1$ |

*$H_o$ = No significant correlation on the ranking of PPP's concern factors between two groups.*
*$H_1$ = Significant correlation on the ranking of PPP's concern factors between two groups.*
*Reject $H_o$ if the significant level (p-value) is less than the allowance value of 5% (2 tailed).*

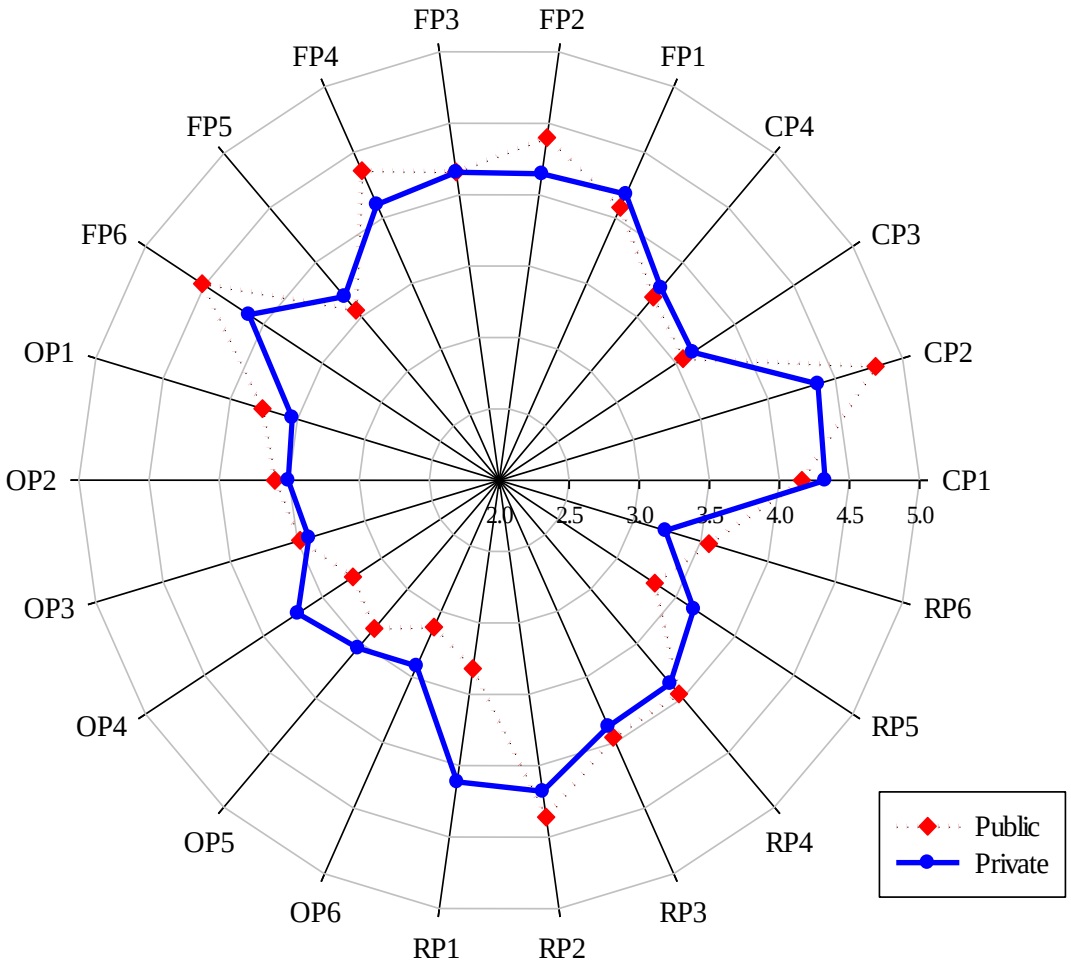



Figure 6-5 Cross-comparison by spider diagram among the public and private sectors

Table 6-9 Factors with significant difference between public vs private under *t*-test

| Concern factors | Levene's test for equality of variances | | | t-test for equality of means | | | | |
|---|---|---|---|---|---|---|---|---|
| | Assumption | F | Sig. | t | df | Sig (2-tailed) | Mean Diff. | Std. Error Diff. |
| **Private sector vs. Public sector** | | | | | | | | |
| Politics risks (RP1) | Equal variances not assumed | 26.580 | .000 | 3.537 | 27.728 | .001 | 0.813 | 0.230 |
| Enhancement of company's strength in its industry (OP4) | Equal variances assumed | 1.568 | .213 | 2.840 | 121 | .005 | 0.484 | 0.171 |
| Construction risks (RP5) | Equal variances not assumed | 4.151 | .044 | 2.324 | 44.524 | .025 | 0.343 | 0.148 |
| Demand issues (FP6) | Equal variances assumed | .026 | .873 | -2.309 | 121 | .023 | -0.347 | 0.150 |
| Financial viability of the company (CP2) | Equal variances not assumed | 17.680 | .000 | -4.132 | 50.482 | .000 | -0.412 | 0.100 |

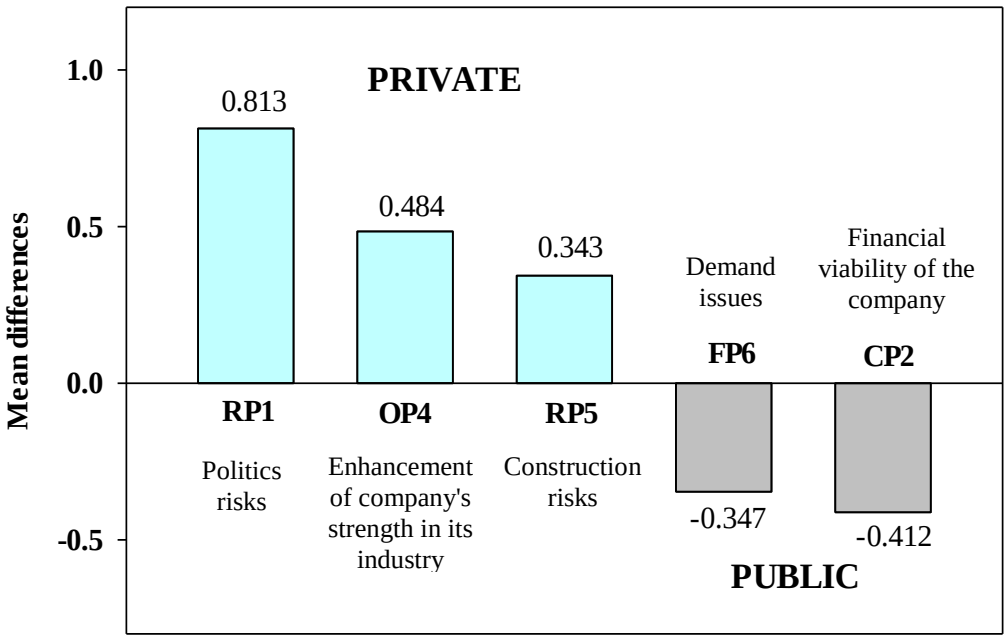



Figure 6-6. Mean differences between private and public sectors' perceptions

The study findings reveal that around one-fourth of concern factors (5 out of 22) shows a significant difference in the perception of public and private organizations about concern factors of the private sector when they intend to invest in PPP transportation projects. Five significant difference concern factors (Table 6-9) are financial viability

of the company (CP2), demand issues (BP6), enhancement of company's strength in its industry (OP4), politics risks (RP1), and construction risks (RP6). Factors with the great mean differences between the private and public sectors are “politics risks” (mean difference - MD = 0.813), “enhancement of company's strength in its industry” (MD = 0.484), and “construction risks” (MD = 0.343). Otherwise, factors with the great differences between the public and private sectors are “financial viability of the company” (MD = 0.412) and “demand issues” (MD = 0.347) (see Figure 6-6). These differences can be recognized in the fact that the public and private sectors have different points of views and perspectives. For instance, the private sector is more concerned about the political situation, capacity improvement of their companies, and risks in the construction phase, whereas the public sector notion that the private sector is more concerned about the financial viability of the company as well as the market demand for PPP transportation projects.

However, there is no significant difference in the perception of public and private organizations as to concern factors of private investors in PPP on company capacity (i.e., management skill, resources, and experiences), projects’ benefits (i.e., ROE, long-term income, cash flows, financing sources, and tariff issues); new markets entrance, enhancing relationship with stakeholders, reputation; and projects’ risks (i.e., law, commerce, design and procurement, operation risks). Thus, the public sector can realize some expectations for investment strategic of the private sector.

There still exist some concern factors that public, as well as private, must be aware to enhance the investment environment in PPP transportation projects in Vietnam as follows

**Politics issues:** PPP transportation projects have a complex financial and organization structures. In addition, these projects are also influenced by the socio-economic-environmental, especially, the political situation in a host country. Indeed, regarding previous research works, the major risk which is considered a potential to PPP projects is a lack of political support (Ng et al., 2010; Schaufelberger and Wipadapisut, 2003). The unstable politics may lead to many changes in policies, resulting in the cancelation of several new PPP projects. For instance, within the frequent change in government premiers in Bangkok, Thailand, it led to the termination of many new PPP public

infrastructure projects (Chan et al., 2010). In Vietnam, the government induced directly influences on PPP transportation projects through setting the rules for development and contractual relationships. Moreover, their influences were also indicated in the private sector through policies and legislation regarding approvals and permits, taxes, availability of financing for construction, and corruption. The stability of political climate is a good condition to attract private investors during the pre-feasibility phase of PPP projects (Qiao et al., 2001). Therefore, the Vietnamese government needs to stabilize the political environment (e.g., improve the investment climate, restrict corruption, and improve approvals/permits process) to be able to call investment capital from the private sector, especially international investors.

**Enhancement of company's strength in its industry:** private investors moreover would like to improve their reputation and familiarity relationships in its industry when they decide to invest in PPP transportation projects in Vietnam. This result accords with the previous research by Demirag et al. (2011) about non-financial criteria for decisions to participate in a PFI projects. Private investors must enhance their capacities to increase the ability to win competitive tendering process when considering to participate in PPP projects. A fair and transparent investment environment is considered the biggest concern of private investors, especially international investors. Consequently, the government or the public sector from central to local level have to establish an adequate legal framework for PPP form and transparent and professional procurement system to attract more participation of private investors.

**Construction risks:** It also has a significant difference in perception between private and public sectors about construction risks in PPP projects. Private investors concerned about the risks incurred during the life-cycle of PPP transportation projects. Particularly, they are interested in the quality of domestic contractors, subcontractors, and suppliers related to these processes. The quality of projects' stakeholders affects greatly to the time, cost, quality, and scope of the project. Moreover, in investors' perception, the role of state management during the construction process is crucial, which determine the success or failure of PPP transportation projects.

**Financial viability:** the financial capacity of private investors is one of the critical concern issues of the private sector. Indeed, searching and cooperating with potential

investors is one binding factor which will bring success in PPP projects. Moreover, private investors need to pay attention to disputes among equity partners as well as adverse changes in the parent organizations of equity partners which will have the significant effect on the financial viability of SPV Company. Especially, private investors do often expect much supporting or incentive policies from the public sector, whereas the government highly appreciate the role of the private sector in the success or failure of projects. For instance, the financial viability was affected by a lot of sudden changes in the cost of debt (Thomas et al., 2006), such as interest changes by government, fluctuation of foreign exchange, liquidity, and fluctuation of capital markets. Thus, guarantees, assurances, and incentive policies by the government (i.e., loan guarantees) would improve the viability of PPP transportation projects in "call for investment" stage (Ashuri et al., 2012). Consequently, the ability of private investors and the supporting incentives from the government should achieve the balance to ensure the investment from the private sector.

**Demand issues:** Demand issues is one of the most critical concern factor has a significant difference in perception between private and public sectors. It received the 2nd and 7th ranking in perceptions of the public and private sectors, respectively. Certainly, demand forecasts of the project was a determinant factor affecting investors' decision to get involved (Valentine, 2008). However, assessing the exact demand of the project in Vietnam faced many difficulties. For instance, a lot of Vietnamese PPP projects, such as Yen Lenh Bridge (Ogunlana and Abednego, 2009), Ong Thin Bridge and Phu My Bridge, failed to meet expected traffic revenues because the demand analysis was underestimated. Typically, fluctuations in project-related policies, changes in contractual commitments of the government have affected the actual traffic revenues in Phu My Bridge. It can be said that private investors are concern about the supporting policies from the government to share the financial risk related to the demand issues more than demand issues itself (Ashuri et al., 2012).

### 6.4 Recommendations and lessons

To confirm the accuracy of the analyzes for the concern factors of private investors developed in this study, three PPP experts from the government (1), private sector (2)

were invited to participate in the validation interviews. Although the ranking of concern factors and different perceptions of the public and private sectors was subjected to some controversy, interviewees agreed with the results and confirmed some opinions to increase the investment environment for PPP transportation projects in Vietnam. All interviewees agreed and focused that if the government would like to attract the participation of private investors must be concerned three main factors, (1) decrease risks (e.g., law, politics, and commerce risks); (2) increase attractiveness of PPP projects (e.g., demand issues, long-term income, return on equity, and cash flows); and (3) select good capacity investors (e.g., proper financial and management capacities). Then the recommendations for public sector and lessons for private investors were also confirmed by three experienced professionals.

### 6.4.1 Recommendations for the public sector or the government

From these results, several recommendations for public sector to attract the participation of the private sector into PPP transportation projects in Vietnam are as follows:

1. Recommendations related to legal and regulatory framework

- Establish adequate and transparent legal framework for basic legal and regulatory framework
- Establish adequate laws and regulations for PPP form
- Improve the political environment in Vietnam
- Improve approvals and permits process related to PPP projects
- Establish transparent and professional procurement system

2. Recommendations related to types/forms, feasibility studies of PPP projects

- Identify and prioritize PPP pilot projects
- Select a suitable PPP form (e.g., BOT, BT, BTO, BOO, BTL, BLT, and O&M contract) for projects
- Conduct comprehensive feasibility studies for PPP projects

3. Recommendations related to PPP contract

- Stabilize the policies and contractual commitments
- Standardize PPP procurement process and contract documentation
- Suggest to sign pre-defined prices contract (the contract could be adjusted to fit economic, political, and social changes)
- All risk should be identified, and a fair risk allocation should be secured
- Flexibility in tariff structure

4. Recommendations related to coordinating and supportive agencies

- Establish coordinating and supportive agencies to manage PPP projects
- Provide training at all levels for government staff

5. Recommendations related to detail database for historical PPP projects

- Establish detail database for historical PPP projects
- Improve the feasibility of PPP transportation projects by the guarantees, assurances, and incentive policies for private investors during early stages.
- Appropriate incentive policies based on previous PPP projects (e.g., minimum guaranteed revenue, the flexibility in tariff structure, the financial support, and force majeure protection). Moreover, too much government support may raise a concern that the private sector will make too much profit at the cost of the public. Therefore, the government should adjust the level of its support and choose appropriate types of supports according to the viability of a PPP project.

6. Recommendations related to appropriate risk allocation between private and public sectors

- Construct two-way communication channels with the private sector
- Early feedback from the private sector can be expected to improve the quality of the policies and increase the possibility of success for a PPP project

### 6.4.2 Lessons for private investors

From these results, some lessons for the private sector to improve the performance of PPP transportation projects in Vietnam are as follows:

- Share knowledge with the public sector to create favorable investment policies and environment
- Get early involvement with the financial institutions (e.g., get involvement with sufficient financial institutions early in the bid preparation process)
- Maintain long-term relationships with industrial partners
- Prepare a consortium including multidisciplinary companies.

### 6.3 Conclusion

The PPP form has been proclaimed as bringing a new age to infrastructure development in Vietnam. New consistent PPP regulations in 2015 and some PPP pilot projects is expected to open up many opportunities for foreign and domestic investors to penetrate into new markets in Vietnam. However, attracting the participation of private investors in Vietnam are currently facing many difficulties due to the instability of the legal framework, investment environment, financial market, as well as the investment unwillingness these private investors. The main objectives of this research are to unveil the critical concern factors as well as uncover the significant different perceptions between the public and private about the private sector' concerns in PPP transportation projects in Vietnam. The results indicated that (1) the critical concern factors in such group basis; (2) the concern factors with significant different between public and private; and (3) some recommendations for government and lessons for private investors.

In order to invest in PPP transportation projects, the main concern or expectation factors of private investors are benefits or profits, their capacity, and risks of projects. Opportunities when investing in PPP does not get critical expectations from respondents in this research. Among all of concern factors, those associated with capacity (i.e., finance, management) of private companies; profitability, the demand for PPP projects; and legal, political, commercial risks are considered the most critically important for strategic investment of private investors.

Moreover, the concern factors that have significant difference among public and private in PPP transportation projects have also been identified and discussed. There are five

significant difference concern factors, namely political risks, enhancement of company's strength in its industry, construction risks, demand issues, and financial viability of the company. The findings from these results would be helpful for The Vietnamese government to understand the concerns as well as expectations of private investors in investment decision-making process.

From these findings, there are some recommendations for the public sector to attract the participation of the private sector into PPP transportation projects. Moreover, the private sector itself can get useful lessons before preparing to invest into PPP transportation projects in Vietnam.

# CHAPTER 7
# RISK FACTORS AFFECTING PERFORMANCE OF THE PRIVATE SECTOR

This chapter describes the risk factors affecting the performance of the private sector in Public-Private Partnership (PPP) transportation projects. The first part describes the difference ranking of risk probability and risk impact. The second part assesses the level of such risk factors throughout PI method and then shows the comparison results with risk previous research works. The following section explores multivariate interrelationships existing among the critical risk factors concerning level of risk by using factor analysis. Group comparison of partners then is assessed by independent t-test method. Finally, the risk management actions or strategies of private and public sectors also explore in the final part.

## 7.1 Ranking probability and impact of risk

By reviewing previous research works of Toan and Ozawa (2008), Xu et al. (2010), Karim (2011), Ke et al. (2011), Hwang et al. (2013), and after analyzing ten case studies and in-depth interviews with the professionals in Vietnam PPP market. The hierarchical risk breakdown structure (HRBS) was used to identify the risks of PPP projects such as risk groups, risk categories, and risk factors. Risks of PPP projects in Vietnam were divided into two groups, such as general risks and project-specific risks (see Figure 7-1). General risks were subdivided into political, legal and commercial categories. Project-specific risks were divided further into design and procurement, construction and operating categories. Total thirty-third risk factors were identified as indicated in Table 7-1. In order to check the internal consistency reliability of data, Cronbach's alpha coefficient has been conducted in this study. The reliability test returned a Cronbach's alpha coefficient of internal consistency value of 0.906 (>0.600), which is considered reliable.

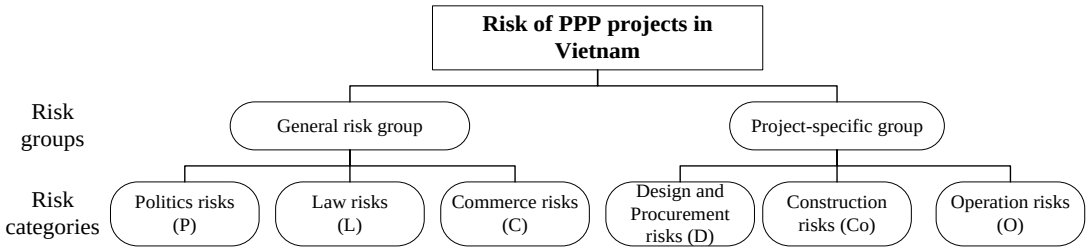



Figure 7-1 Hierarchical risk breakdown structure of PPP projects

Table 7-1 Risk factors and risk categories

| Groups | Categories | No. | Code | Risk factors |
|---|---|---|---|---|
| General | Politics risks | 1 | P1 | Government's intervention |
| | | 2 | P2 | Delay in project approvals and permits |
| | | 3 | P3 | Corruption |
| | Law risks | 4 | L1 | Inadequate law and supervision system |
| | | 5 | L2 | Change in laws and regulations |
| | | 6 | L3 | Change in tax regulation |
| | Commerce risks | 7 | C1 | Financial market risk |
| | | 8 | C2 | Interest rate fluctuations |
| | | 9 | C3 | Foreign exchange fluctuations |
| | | 10 | C4 | Inflation |
| Project - specific | Design and procurement risks | 11 | D1 | Poor public decision-making process |
| | | 12 | D2 | Lack of transparency in the bidding |
| | | 13 | D3 | Subjective project evaluation method |
| | | 14 | D4 | Supporting incentive of government risk |
| | | 15 | D5 | Unclear about state participant portion |
| | | 16 | D6 | Conflicting or imperfect contract |
| | | 17 | D7 | Breach of contract by government |
| | | 18 | D8 | Inefficient feasibility study |
| | | 19 | D9 | Unfair process of selection of the private sector |
| | | 20 | D10 | Inadequate allocation of responsibility and risk |
| | | 21 | D11 | Low capacity of concession company |
| | Construction risks | 22 | Co1 | Scope change of projects |
| | | 23 | Co2 | Land acquisition and compensation |
| | | 24 | Co3 | Problems due to partner's different practice |
| | | 25 | Co4 | Lack of supporting infrastructure |
| | | 26 | Co5 | Environmental protection risk |
| | | 27 | Co6 | Force majeure risk |
| | Operation risks | 28 | O1 | Completion risk |
| | | 29 | O2 | Early termination of concession by concession company |
| | | 30 | O3 | Toll fee issues |
| | | 31 | O4 | Payment risk |
| | | 32 | O5 | Demand risk |
| | | 33 | O6 | Operator inability |

The full ranking of the degree of Probability (P) and Impact (I) of 33 risk factors rated by different respondents are available from **Appendix F**. Table 7-2 shows the top 20 risks perceived as having a high level of probability (P) and significant impact (I). From these rankings, many risks had high rankings for both their degree of probability and impact. Examples are *land acquisition and compensation* (Co2), *delay in project approvals and permits* (P2), *inefficient feasibility study* (D8), *subjective project evaluation method* (D3), and *financial market risk* (C1). It can be said that these problems occurred under a broad range of causes: financial market conditions, project evaluation problems, land issues, and approvals/permits problems.

Table 7-2 Risk factors with high probability or high impact

| Rank | Risks as high probability | Mean | SD | Rank | Risks as high impact | Mean | SD |
|---|---|---|---|---|---|---|---|
| 1 | Land acquisition and compensation | 0.718 | 0.149 | 1 | Land acquisition and compensation | 0.767 | 0.151 |
| 2 | Delay in project approvals and permits | 0.671 | 0.153 | 2 | Delay in project approvals and permits | 0.750 | 0.144 |
| 3 | Corruption | 0.586 | 0.214 | 3 | Inefficient feasibility study | 0.744 | 0.144 |
| 4 | Inefficient feasibility study | 0.581 | 0.175 | 4 | Financial market risk | 0.693 | 0.151 |
| 5 | Lack of supporting infrastructure | 0.568 | 0.175 | 5 | Change in laws and regulations | 0.689 | 0.136 |
| 6 | Payment risk | 0.567 | 0.155 | 6 | Subjective project evaluation method | 0.687 | 0.142 |
| 7 | Inadequate allocation of responsibility and risk | 0.565 | 0.134 | 7 | Scope change of projects | 0.661 | 0.153 |
| 8 | Subjective project evaluation method | 0.555 | 0.161 | 8 | Interest rate fluctuations | 0.654 | 0.140 |
| 9 | Completion risk | 0.552 | 0.166 | 9 | Poor public decision-making process | 0.654 | 0.175 |
| 10 | Interest rate fluctuations | 0.550 | 0.132 | 10 | Demand risk | 0.651 | 0.167 |
| 11 | Financial market risk | 0.549 | 0.161 | 11 | Supporting incentive of government risk | 0.646 | 0.147 |
| 12 | Poor public decision-making process | 0.547 | 0.179 | 12 | Inadequate law and supervision system | 0.645 | 0.136 |
| 13 | Scope change of projects | 0.546 | 0.184 | 13 | Early termination of concession by concession company | 0.641 | 0.200 |
| 14 | Unfair process of selection of the private sector | 0.546 | 0.209 | 14 | Toll fee issues | 0.635 | 0.159 |
| 15 | Change in laws and regulations | 0.536 | 0.193 | 15 | Lack of transparency in the bidding | 0.633 | 0.18 |
| 16 | Lack of transparency in the bidding | 0.536 | 0.197 | 16 | Corruption | 0.633 | 0.177 |
| 17 | Supporting incentive of government risk | 0.536 | 0.172 | 17 | Unfair process of selection of the private sector | 0.622 | 0.182 |
| 18 | Problems due to partner's different practice | 0.534 | 0.142 | 18 | Inadequate allocation of responsibility and risk | 0.619 | 0.120 |
| 19 | Demand risk | 0.533 | 0.141 | 19 | Low capacity of concession company | 0.617 | 0.145 |
| 20 | Inadequate law and supervision system | 0.533 | 0.187 | 20 | Inflation | 0.615 | 0.156 |

Several risk factors, however, entailed high levels of probability but low levels of impact and vice versa. Although a *change in laws and regulations* (L2) and *inadequate law and supervision system* (L1) were rated with medium levels of probability, their impacts were very high. In contrast, *corruption* (P3), *lack of supporting infrastructure* (Co4), and *inadequate allocation of responsibility and risk* (D10) were rated with high levels of probability and low levels of impact. Besides, the *corruption* risk was recognized by respondents with a significant degree of probability, but a low level of impact. These results correspond with those by Xu et al. (2010), and Toan and Ozawa (2008), which also investigated PPP in developing countries.

To carefully investigate which sectors and groups were responsible for these risk factors, risk categories were ranked concerning their degree of probability and impact as shown in Table 7-3 and Table 7-4, respectively.

Regarding the degree of probability, both the public and private sectors agreed about the likelihood of risks related to "design and procurement", "construction", "law", and "operation". On the other hand, differences between the two sectors are found in the categories of "politics" and "commerce". The public sector was of the view that "commerce" risks are most likely to happen, and the probability of "politics" risks is least likely. Meanwhile, the pattern of risk possibility was the reverse according to the private sector as they ranked "politics" first and "commerce" fourth.



Table 7-3 Ranking of degree of probability of risk categories

| **Risk categories** | **Overall** | | **Public sector** | | **Private sector** | |
|---|---|---|---|---|---|---|
| | **Mean** | **Rank** | **Mean** | **Rank** | **Mean** | **Rank** |
| Politics risks | 0.558 | 1 | 0.442 | 6 | 0.587 | 1 |
| Law risks | 0.494 | 5 | 0.456 | 4 | 0.504 | 5 |
| Commerce risks | 0.532 | 3 | 0.508 | 1 | 0.538 | 4 |
| Design and Procurement risks | 0.524 | 4 | 0.467 | 3 | 0.538 | 3 |
| Construction risks | 0.537 | 2 | 0.486 | 2 | 0.550 | 2 |
| Operation risks | 0.493 | 6 | 0.449 | 5 | 0.504 | 6 |

Table 7-4 Ranking of degree of impact of risk categories

| Risk categories | Overall | | Public sector | | Private sector | |
|---|---|---|---|---|---|---|
| | Mean | Rank | Mean | Rank | Mean | Rank |
| Politics risks | 0.664 | 1 | 0.586 | 4 | 0.684 | 1 |
| Law risks | 0.635 | 4 | 0.600 | 1 | 0.645 | 4 |
| Commerce risks | 0.642 | 2 | 0.577 | 5 | 0.658 | 2 |
| Design and Procurement risks | 0.636 | 3 | 0.595 | 3 | 0.647 | 3 |
| Construction risks | 0.598 | 6 | 0.538 | 6 | 0.614 | 6 |
| Operation risks | 0.616 | 5 | 0.597 | 2 | 0.620 | 5 |

As for the degree of impact of risks, the private sector considered "politics" and "commerce", which ranked first and second respectively, to have a profound effect on their execution of PPP projects. Public sector did not share these opinions with their private counterparts as these two risk categories were in turn assigned to fourth and fifth positions by the public sector. This ranking reflects the concern of the private sector is political stability. Indeed, political stability, as well as a transparent legal mechanism, would more likely result in investors' willingness to proceed with their works. At the present, the public sector has realized the importance of stable legal regulation and framework that support PPP. Therefore, they considered "law" related risks to have a massive impact on the execution of PPP projects in Vietnam. Evidently, the current Vietnam legal regulation and framework that serve PPP projects need revising soon.



### 7.2 Risk levels

To deeply investigate the effect of critical risk factors on the performance of PPP transportation projects in Vietnam, combined risk levels (RL) were used to rank all the risk factors, as shown in Table 7-5. Figure 7-2 displays a risk contour diagram of all 33 risk factors. The diagram is divided into three zones, namely, low-risk level (no risk), medium-risk level (10 risks), and high-risk level (23 risks). The mean scores and the rank of 23 critical risk factors (CRFs) are as shown in Table 7-5 based on the overall respondents' opinions ($RL \geq 0.8$), as well as based on sectors (i.e., the public and private sectors).

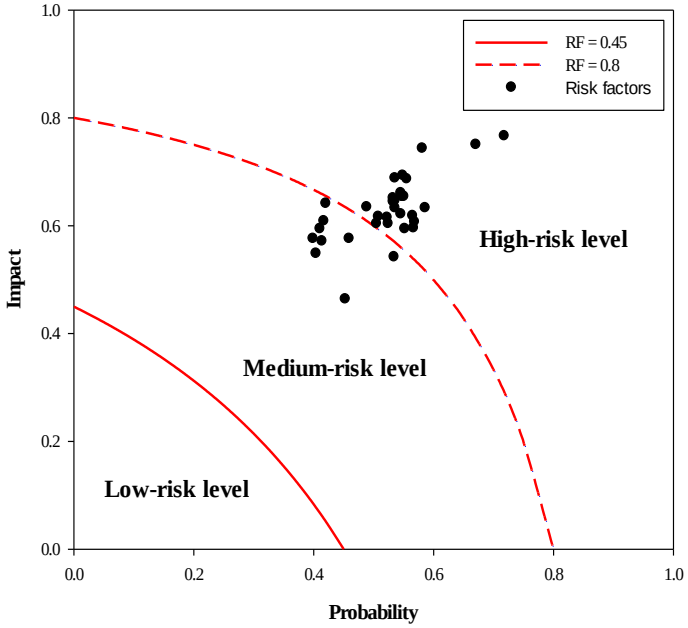



Figure 7-2 Risk contours diagram of the results

The two factors that were ranked as least affecting PPP projects are force majeure and environmental protection risk. Top ten critical risk factors (CRFs), in descending order of importance are:

1) Land acquisition and compensation (*Co2*),
2) Delay in project approvals and permits (*P2*),
3) Inefficient feasibility study (*D8*),
4) Financial market risk (*C1*),
5) Subjective project evaluation method (*D3*),
6) Change in laws and regulations (L2),
7) Interest rate fluctuations (C2),
8) Corruption (P3),
9) Scope change of projects (Co1),
10) Supporting incentive of government risk (D4).

Most of the CRFs are risks related to pre-feasibility studies or feasibility studies phase of the PPP projects. It implies that Vietnam government might face the huge difficulties

in attracting the participation of private investors during initial phases of PPP transportation projects. Therefore, a large number of current issues in PPP transportation projects in Vietnam must be solved to attract the investment from the private sector. Top ten critical risks are analyzed as followings.

Land acquisition and compensation (Co2):

Land acquisition and compensation risk was the most critical risk with a probability of 0.718, an impact of 0.767 (highest), and an RF of 0.924 ($1^{st}$). In the case of Vietnam, land acquisition and compensation had to cope with a number of issues, such as the proposed compensation land price by the government is always lower than its actual market price; differences compensation price between provinces; corruption during compensation process (Ogunlana and Abednego 2009; Long et al., 2004), litigation, administrative delay, and non-availability of land on time for construction (Thomas et al., 2006). Moreover, under the PPP pilot regulations (Decision 71, 2010), the provincial people's committees are responsible for site clearance while the Authorized State is the entity party to the project contract. This separation of roles and responsibilities may lead to delays in land clearance in practice if there is no timely and efficient coordination (Ashurst, 2012). *Corruption* (P3) issues was ranked $8^{th}$ as a high critical risk factors in PPP projects. It may cause the delay of compensation process and led a failure of PPP projects.

In addition, although the difficulties of land acquisition and compensation have been recognized and evaluated huge impact for PPP projects, analysis and mitigation strategies for this issue were not sufficient. Site clearance and compensation processes still encountered several difficulties. These problems could affect the entire schedule and viability of the project. Therefore, the government must launch new appropriate policies to address these problems.

Table 7-5 Ranking of risk factors

| CODE | Risk factors | Probability | | Impact | | Risk level | | |
|---|---|---|---|---|---|---|---|---|
| | | P | Rank | I | Rank | RF | Rank | Remark |
| Co2 | Land acquisition and compensation | 0.718 | 1 | 0.767 | 1 | 0.924 | 1 | High |
| P2 | Delay in project approvals and permits | 0.671 | 2 | 0.750 | 2 | 0.912 | 2 | High |
| D8 | Inefficient feasibility study | 0.581 | 4 | 0.744 | 3 | 0.878 | 3 | High |
| C1 | Financial market risk | 0.549 | 11 | 0.693 | 4 | 0.852 | 4 | High |
| D3 | Subjective project evaluation method | 0.555 | 8 | 0.687 | 6 | 0.851 | 5 | High |
| L2 | Change in laws and regulations | 0.536 | 15 | 0.689 | 5 | 0.847 | 6 | High |
| C2 | Interest rate fluctuations | 0.550 | 10 | 0.654 | 8 | 0.837 | 7 | High |
| P3 | Corruption | 0.586 | 3 | 0.633 | 16 | 0.835 | 8 | High |
| Co1 | Scope change of projects | 0.546 | 13 | 0.661 | 7 | 0.834 | 9 | High |
| D4 | Supporting incentive of government risk | 0.536 | 16 | 0.646 | 11 | 0.829 | 10 | High |
| D1 | Poor decision-making process | 0.547 | 12 | 0.654 | 8 | 0.829 | 11 | High |
| D10 | Inadequate allocation of responsibility and risk | 0.565 | 7 | 0.619 | 18 | 0.829 | 12 | High |
| O5 | Demand risk | 0.533 | 19 | 0.651 | 10 | 0.828 | 13 | High |
| L1 | Inadequate law and supervision system | 0.533 | 20 | 0.645 | 12 | 0.823 | 14 | High |
| Co4 | Lack of supporting infrastructure | 0.568 | 5 | 0.607 | 22 | 0.813 | 15 | High |
| O1 | Completion risk | 0.552 | 9 | 0.594 | 26 | 0.812 | 16 | High |
| O4 | Payment risk | 0.567 | 6 | 0.596 | 25 | 0.811 | 17 | High |
| D2 | Lack of transparency in the bidding | 0.536 | 16 | 0.633 | 15 | 0.811 | 18 | High |
| C4 | Inflation | 0.523 | 22 | 0.615 | 20 | 0.809 | 19 | High |
| O3 | Toll fee issues | 0.489 | 25 | 0.635 | 14 | 0.808 | 20 | High |
| D9 | Unfair process of selection of the private sector | 0.546 | 14 | 0.622 | 17 | 0.804 | 21 | High |
| D6 | Conflicting or imperfect contract | 0.524 | 21 | 0.604 | 23 | 0.802 | 22 | High |
| D11 | Low capacity of concession company | 0.508 | 23 | 0.617 | 19 | 0.801 | 23 | High |
| C3 | Foreign exchange fluctuations | 0.505 | 24 | 0.604 | 24 | 0.790 | 24 | Medium |
| O2 | Early termination of concession by concession company | 0.420 | 28 | 0.641 | 13 | 0.780 | 25 | Medium |
| Co3 | Problems due to partner's different practice | 0.534 | 18 | 0.542 | 32 | 0.779 | 26 | Medium |
| P1 | Government's intervention | 0.417 | 29 | 0.609 | 21 | 0.761 | 27 | Medium |
| D5 | Unclear about state participant portion | 0.459 | 26 | 0.576 | 28 | 0.757 | 28 | Medium |
| D7 | Breach of contract by government | 0.411 | 31 | 0.594 | 27 | 0.752 | 29 | Medium |
| L3 | Change in tax regulation | 0.414 | 30 | 0.572 | 30 | 0.740 | 30 | Medium |
| O6 | Operator inability | 0.399 | 33 | 0.576 | 28 | 0.739 | 31 | Medium |
| Co6 | Force majeure risk | 0.404 | 32 | 0.549 | 31 | 0.719 | 32 | Medium |
| Co5 | Environmental protection risk | 0.453 | 27 | 0.464 | 33 | 0.691 | 33 | Medium |

**Delay in project approvals and permits (P2):**

In most cases, the Vietnamese government does not grant an approval on project-related issues on time, and sometimes they even cancel these that had been approved previously (Ogunlana and Abednego, 2009). The prolonged approval process is mostly due to a number causes such as incompetence and unprofessional of government officials, complex approval procedures, and change in laws and regulations. Some of the current laws and regulations have been amended many times in short periods, thus making them difficult to be applied practically. According to a study by Li et al. (2005), the project approval and permit risk is difficult to be classified clearly into the public sector, the private sector, or shared allocation. It is logical that *delay in project approvals and*

*permits* was ranked 2nd as very high critical risk factors. This implies that the legal and regulations for the PPP projects is currently problematic in Vietnam.

**Inefficient feasibility study (D8):**

Proposals of projects will be assessed and be developed into a potential project list. Based on the project list, an Authorized State Body in Vietnam will conduct bidding documents in order to select a consultant to formulate the feasibility study (FS) report. In addition to the contents of the project proposal, the FS report must include an analysis of risks, rights and obligations of the parties (Ashurst, 2012). Thus, it plays a leading role in the success of PPP infrastructure projects, especially PPP transportation projects. According to the in-depth interviews, FS of PPP transportation project is less efficient, ranking the 3rd in the list. It probably comes from the weak capacity of FS consultants and different viewpoints or disputes between the public and private sectors (Kert and Izaguirre, 2007). Feasibility study inefficiency, in many cases, is also caused by deliberately falsified FS data intending to speed up the tendering process (Flyvbjerg et al., 2002). Consequently, FS report regularly requires adjustments several times, even changes. It may lead to the *scope change of projects* (Co1) which are also critical risk factors, ranking 9th. Therefore, utilizing a third-party consultants ensures the highest level of objectively possible feasibility studies (Valentine, 2008).

**Financial market risk (C1):**

The evaluation of financial viability is the most commonly used for assessing the potential of the project to achieve the financial targets of its various stakeholders (Pantelias and Zhang, 2010). The risk level of the financial market in Vietnam is so critical (4th), thus making it difficult for private investors to draw investment into PPP transportation projects. Indeed, *high inflation* (C4-19th) and *fluctuation of interest rate* (C2-7th) led to the crisis in the construction industry. Unfortunately, these risk factors are considered to be macroeconomic conditions and are impossible to avoid. Instability of interest rate and inflation would cause the undesirable financial condition of all sectors in the projects regarding potential profit. Furthermore, accessing to capital through loans from financial institutions by the private sector is also tough.

**Subjective project evaluation method (D3):**

Project evaluation consists of many activities, such as the design of the concession period, tariff structure, and market demand. The risk level of *subjective project evaluation method* in PPP projects is so critical ($5^{th}$). This result accords with previous research works (Kert and Izaguirre, 2007; Ke et al., 2010). Most BOT/BT/BTO projects in Vietnam have faced many problems with the concession period and market demand. For instance, Phu My Bridge BOT project has terminated by Phu My Corporation (PMC) during operating stage and return this project to Hochiminh City People's Committee. The main reasons led to the failure of Phu My Bridge are low traffic flow, revenues, incomplete of link road connection to Phu My Bridge, and especially big problems with project evaluation method. Therefore, it is necessary for the public and private sectors to produce comprehensive project evaluation method.

**Change in laws and regulations (L2):**

Laws and regulations in Vietnam are very complicated, and some of them duplicate with each other. Projects are required to be approved by several administration levels and various laws, decrees, decisions, circulars, and dispatches. The level of changes of legislation and regulations risk is so critical. It received a critical value of 0.847, and which was ranked $6^{th}$. It led to unattractive of the investment environment in Vietnam to potential investors. Although the public sector has improved many incentive policies for private investors, they still did not attractive enough to increase capitals from the private sector. It is clearly reflected by the results of this research; respondents evaluated the *supporting incentive of government risk* (D4) factor received a critical value of 0.829, which was ranked 10th on overall 23 critical risk factors.

### 7.3 Comparison results with previous research works

The aim of this part is to get an overview of risk factors affecting the PPP projects among some countries through an examination of top five critical risk factors (CRFs) from this study and six different selected previous studies. The selected research works are up-to-date and have been done in recent years after 2008 (see Table 7-6), the years of recovery and redevelopment after the economic crisis in 2008. Although these studies were not identical regarding objectives and methodology, comparisons among selected countries are useful for understanding significant risks often occur in these Asia country.

Table 7-6 Comparison top five CRFs among countries

| Research | Top five CRFs | | | | |
|---|---|---|---|---|---|
| | **Factor 1** | **Factor 2** | **Factor 3** | **Factor 4** | **Factor 5** |
| Vietnam – This study (2015) | Land acquisition and compensation | Delay in project approvals and permits | Inefficient feasibility study | Financial market risk | Subjective project evaluation method |
| Egypt – Ezeldin and Badran (2013) | Foreign exchange fluctuation | Political risk | Inflation | Poor public decision-making process | Government policy |
| Singapore – Hwang et al (2013) | Lack of support from government | Availability of finance | Construction time delay | Inadequate experience in PPP | Unstable government |
| China – Ke et al (2011) | Government's intervention | Poor political decision-making | Financial risk | Government's reliability | Market demand change |
| China Mainland – Xu et al. (2010) | Government intervention | Poor public decision-making process | Government corruption | Financing risk | Inadequate law and supervision system |
| India – Iyer and Sagheer (2010) | Preinvestment risk | Delay in financial closure | Resettlement and rehabilitation | Delay in land acquisition | Permit/approval risk |
| Vietnam – BOT – Toan and Ozawa (2008) | Financial attraction of project investors | Availability of finance | Time and quality risk | Land acquisition and compensation | Unfair process of selection of the private sector |

Land acquisition and compensation risk is the most critical in Vietnam based on this research (1st rank). Its issue related to legal policies and enforcement tool of the government. It also appears to resemble with findings in India (4th rank, 2010) and Vietnam (4th rank, 2008). In Singapore, a developed country, site availability (35th rank, 2012) is clearly not the dominant factor affecting PPP projects. Lack of support from their government (1st rank, 2012) is the most critical factor in Singapore that will influence the performance of PPP projects.

Interestingly, in top five CRFs, approvals/permits issue is also recognized the most serious factor in Vietnam (2nd rank, 2015) and India (5th rank, 2010). In most cases, the Vietnamese government does not grant approval on project-related issues on time, and sometimes they even cancel these that had been approved previously (Ogunlana and Abednego, 2009), similar to situation of approvals/permits issue in India. The prolonged approval process is mostly due to a number causes such as incompetence and unprofessionalism of government officials, complex approval procedures, and change in laws and regulations. Reversely, approvals/permits problem was evaluated not so

serious in some other nations, such as Egypt (19th - Ezeldin and Badran, 2013), Singapore (15th - Hwang et al., 2013), and China (14th – Ke et al., 2011; 18th – Xu et al., 2010).

Finance risk issue occurs not only in Vietnam but in many other countries, such as Egypt (foreign exchange - 1st rank, inflation – 3rd rank), Singapore (availability of finance - 2nd rank), China (financial risk – rank, 3rd, respectively in 2010 and 2011), India (delay in financial closure – 2nd rank), and Vietnam (2008 - financial attraction – 1st rank, availability of finance – rank 2nd). In this study, finance risk (4th rank) is frequent and severe in Vietnam, thus making difficult for private investors to draw investment capitals into PPP projects.

Especially, inefficient feasibility study and subjective project evaluation method are two particular factors recognized in this study. These issues were not acknowledged in remaining research works. These problems may be caused by inefficient project evaluation, corruption, lack of PPP's experience by the public sector, and immature unique legal basis for PPP model in Vietnam. Therefore, project feasibility evaluation issue is extremely the most concern in the particular situation of Vietnam.

### 7.4 Factor analysis of risk levels

Concerning the attitudes of different sectors towards these risk factors, there were strong agreements on ranking based on the level of risk factor (RF). Hypothesis testing verifies these relations between rankings of two sectors at the 1% significant level. The Spearman's correlation coefficients for ranking of the Probability and Impact of the risk factors between the public and private sectors are 0.500, and 0.673, respectively. Similarly, the Spearman's correlation coefficients for ranking of risk levels between the public and private sectors is 0.711. Table 7-7 summarizes the Spearman's rank correlation coefficients and corresponding significant levels. It suggests that all the null hypotheses that no significant correlation between the public sector and private sectors can be rejected. It also implies a high degree of agreement (i.e., $r_s$ from 0.5 to 1.0) between two groups on the level of probability, impact as well as the degree of risk factors (Cohen, 1988). Therefore, factor analysis in the further research can use data collection from the public and private sectors without any matters.

Table 7-7 Spearman's rank correlation coefficient test between groups for risk factors

| Comparison | | $r_s$ | Sig. | Conclusion |
|---|---|---|---|---|
| Public sector ranking vs. Private sector ranking | Probability | .500 | .010 | Reject $H_o$ at 1% sig. level, and thus accept the $H_a$ |
| | Impact | .673 | .000 | Reject $H_o$ at 1% sig. level, and thus accept the $H_a$ |
| | Risk level | .711 | .000 | Reject $H_o$ at 1% sig. level, and thus accept the $H_a$ |

*$H_o$ = No significant correlation on the ranking of PPP's risk factors between two groups.*
*$H_a$ = Significant correlation on the ranking of PPP's risk factors between two groups.*
*Reject $H_o$ if the significant level (p-value) is less than the allowance value of 5% (2 tailed).*

Twenty-three high-risk level factors were then selected for factor analysis. That is, their means of risk level are approximate to or more than 0.8 on the scale of 0 to 1 in Table 7-5. However, 11 risk factors were ignored since they did not pass the tests for factor analysis. In this case, either communalities or their factor loadings of all components (ignored factors) were not equal or greater than 0.5 and 0.495, respectively. Each variable's communality, representing the amount of variance accounted for the factor solution for the variable, should be equal to, or greater than, 0.5 to have sufficient explanation (Hair, 2009). As recommended in Hair et al. (2009), with a sample size of this research around 123 - factor loading for each factor should exceed 0.495. Moreover, items had to display a 0.3 loading difference with any other factor to ensure discriminant validity (Jabnoun and Al-Tamimi, 2003).

The remaining 12 risk factors were appropriate for factor analysis. The value of Bartlett test of sphericity is 535.415, and associated significance level is small (p=0.000). These suggest that the population correlation matrix is not an identity matrix (Hair et al., 2009). The correlation matrix shows that all variables have a significant correlation at the 5% level. It implies that the deletion of any other problems is unnecessary. The value of the KMO MSA is 0.762, which is satisfactory for factor analysis (Hair et al., 2009) (see Table 7-8 and Table 7-9).

Principle component analysis carried out produced a four-factor solution with eigenvalues greater than one. The varimax orthogonal rotation of principal component analysis was used to interpret these factors. The factor grouping based on varimax is displayed in Table 7-10. Four groups retained represent 69.8 percent of the variance of the 12 risk factors, deemed sufficient concerning total variance explained. The groups and associated variables are explainable as group 1 concerns bidding process issues,

group 2 concerns finance issues, group 3 is laws and regulations issues, and group 4 concerns project evaluation related issues. The factor groups are elaborated further in the following section.

Table 7-8 KMO and Barlett's Test for risk factor analysis

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.762 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 535.415 |
| | df | 66 |
| | Sig. | 0 |

Table 7-9 Total variance explained

| Total Variance Explained | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 4.155 | 34.622 | 34.622 | 4.155 | 34.622 | 34.622 | 2.277 | 18.98 | 18.98 |
| 2 | 1.851 | 15.427 | 50.049 | 1.851 | 15.427 | 50.049 | 2.089 | 17.41 | 36.39 |
| 3 | 1.235 | 10.29 | 60.339 | 1.235 | 10.29 | 60.339 | 2.088 | 17.4 | 53.79 |
| 4 | 1.139 | 9.493 | 69.832 | 1.139 | 9.493 | 69.832 | 1.925 | 16.05 | 69.83 |
| 5 | 0.794 | 6.613 | 76.445 | | | | | | |
| 6 | 0.663 | 5.523 | 81.968 | | | | | | |
| 7 | 0.501 | 4.173 | 86.141 | | | | | | |
| 8 | 0.459 | 3.829 | 89.97 | | | | | | |
| 9 | 0.34 | 2.834 | 92.804 | | | | | | |
| 10 | 0.333 | 2.777 | 95.581 | | | | | | |
| 11 | 0.287 | 2.389 | 97.971 | | | | | | |
| 12 | 0.244 | 2.029 | 100 | | | | | | |

*Extraction Method: Principal Component Analysis.*

Table 7-10 Results of the factor analysis using varimax orthogonal rotation

| Groups | Group labels | Eigenvalue | Percentage of variance | Risk factors | Factor loading |
|---|---|---|---|---|---|
| 1 | Bidding process problems | 4.155 | 34.622 | - Lack of transparency in the bidding | 0.862 |
| | | | | - Unfair process of selection of the private sector | 0.846 |
| | | | | - Corruption | 0.766 |
| 2 | Finance issues | 1.851 | 15.427 | - Interest rate fluctuations | 0.837 |
| | | | | - Inflation | 0.758 |
| | | | | - Financial market risk | 0.671 |
| 3 | Laws and regulations issues | 1.235 | 10.290 | - Inadequate law and supervision system | 0.880 |
| | | | | - Change in laws and regulations | 0.854 |
| | | | | - Supporting incentive of government risk | 0.615 |
| 4 | Project evaluation issues | 1.139 | 9.493 | - Subjective project evaluation method | 0.787 |
| | | | | - Inefficient feasibility study | 0.757 |
| | | | | - Lack of supporting infrastructure | 0.698 |

## 7.5 Discussion of factor analysis results

### 7.5.1 Bidding process problems

This factor group consists of a *lack of transparency in the bidding* (D2), an *unfair process of selection of the private sector* (D9), and *corruption* (P3). These problems were clearly caused by activities of stakeholders throughout the tendering process of PPP projects. Open competitive bidding is widely required by the regulations of PPP. Based on approved feasibility study reports, the government agencies will issue bidding documents and organize international tendering process for selection of project investors (Decision 71, 2010; Decree 15, 2015).

Lack of transparency in the bidding (Ward and Sussman, 2005) and lack of competitive procurement (Cuttaree, 2008) are very common complaints of the private sector. Since inequity and fraud in the bidding process is a very common problem in Vietnam (Long et al., 2004), this has led to contracts being often awarded to incapable investors or contractors. Indeed, regarding the first PPP pilot project in Vietnam, Dau Giay-Phan Thiet Expressway, there was no tender or bidding process for this project even though the government had committed a fair playground in the PPP projects. As a result, Bitexco Group, a firm short on capital with a background in textiles, property and bottling water, was nominated as the first investor in this project (60% total investment capitals). Obviously, Bitexco Group was not the best choice to build a $757 million highway supported by World Bank in the first PPP pilot in Vietnam. Since 2008, the government has still been unable to find a second investor for this project through competitive tender. It had set a dangerous precedent for a country trying to shake off a notorious reputation for entrenched corruption, bureaucracy, and vested interests. Therefore, calling for investors to participate in PPP projects in Vietnam is facing several difficulties and challenges. Two root causes are visible evaluation system have not been carried out properly, and lack of ability of consultants and investors for undertaking PPP projects are common phenomena in Vietnam.

Moreover, the absence of transparent procurement processes can readily result in substantial corruption (ADB, 2000). The anti-corruption legal framework in Vietnam is considered the best legal framework for anti-corruption in Asia (Martini, 2012). However, its implementation is facing many problems such as lack of transparency,

accountability, as well as low pay for the government officials and inadequate system for holding officials accountable for their actions. Although corruption may cause quite a significant loss, however, it is considered to have a less severe impact on the Vietnam construction industry ($16^{th}$). The main reason could be because the majority of businessman and entrepreneurs in Vietnam have become accustomed to corruption (Ogunlana and Abednego, 2009; Ling and Bui, 2010), thus making it as a common and acceptable practice. Corruption, however, needs to be excreted out by applicable policies of the public sector to ensure fair competition and transparency in the future (Ling and Bui, 2010).

### 7.5.2 Finance issues

The factor grouping is made up of *interest rate fluctuations* (C2), *inflation* (C4), *and financial market risk* (C1). Finance is indispensable in any large construction project, especially PPP transportation projects. Indeed, the evaluation of their financial viability is the most commonly used in practice for assessing the potential of the project to achieve the financial targets of its various stakeholders (Pantelias and Zhang, 2010). The more attractive the financial market, the higher the possibility of PPP projects (Qiao et al., 2001).

Funding for transportation projects over the recent years mainly came from the state budget, government bonds, official development assistance (ODA), and private capital (domestic and international). Funds from the state budget, government bonds, and ODA cannot be expanded or still very ineffectively. Domestic private capital participation is tiny because the government's attitude about private investment is inconsistent. Besides, the government did not expect efficiency from this sector and still did not carry out enough guarantees. The stock market in Vietnam is still undeveloped, so to get long-term capital, investors could only rely on loans from commercial banks. However, since mobilized capital from domestic commercial banks is mostly short-term, it should not be able to meet the needs of private investors. Moreover, the inconsistent between the Vietnamese and International laws lead to difficulties in resolving disputes during the investment of international private capital in PPP projects.

The fluctuation of inflation and interest rate are considered macroeconomic conditions and are impossible to avoid. Instability of interest rate would cause the undesirable financial condition for all sectors in the projects regarding potential profit or return on equity. Furthermore, it makes private investors access to capital through loans from financial institutions very difficult (El-amm, 2003); and the private sector would then have to pay additional interest if they are unable to make the loan payments on time (Ozdoganm and Birgonoul, 2000).

Therefore, the Government should use a combination of concessional resources and appropriate support policies to enhance the viability of PPP projects (Ng et al., 2010), such as Project Development Facility (PDF) (a P3SP project of AFD in Vietnam) and Viability Gap Fund (VGF) to support viability of PPP projects which can attract the participation of both domestic and foreign investors.

### 7.5.3 Laws and regulations matters

This group consists of *inadequate law and supervision system* (L1), *change in laws and regulations* (L2), *and supporting incentive of government risk* (D4). These issues were clearly caused by deficiencies in the legal and institutional framework. Indeed, the Vietnamese laws and regulations system are very complicated, and some of them contradict each other (Long et al., 2004; Do and Veerasak, 2013). Besides, projects are required to be approved by several administration levels, from local to central (Thuyet et al., 2007). Bureaucratic administration systems, poor law implementation and the incompetence of government staff were considered the great explanations leading to the failure of PPP projects.

Regarding the recent legislation related to PPP regulations, a lot of investors expressed their desire to invest; however they are still afraid to face many legal issues related to private investment, unstable legal framework, as well as regulations about the incentive policies. Also, the public sector and private investors in Vietnam mostly have little experience in management and implementation of PPP projects. It is, therefore, tough for the private sector to deal and comply throughout regulations, especially new PPP laws in Vietnam.

As mentioned by Toan and Ozawa (2008), a high risk in a developing country as Vietnam in the private sector's perception and inappropriate policies of the government made it difficult to attract private investors. Moreover, in cases of Vietnam, whether facing too many problems related to entire projects, the respondents confirmed that current supports from the government are not attractive enough. Therefore, a solid legal framework is needed to specify special rule for the private investors and decrease the project risk, thus improving the success level of PPP projects in Vietnam (Cuttaree, 2008). The regulatory policies of government support are also required to increase the availability of private investment (Zhang et al., 1998).

### 7.5.4 Project evaluation issues

Included in this factor are *subjective project evaluation method* (D3), *inefficient feasibility study* (D8), *and lack of supporting infrastructure* (Co4). The inadequate project evaluation clearly caused these issues. Indeed, project assessment and feasibility study assessment are crucial for any PPP transportation projects. For the public sector, competent state agencies shall organize bidding under regulations to select professional consultants to assess the feasibility of PPP projects (Decision 71, 2010). For the private sector, assessing the viability of PPP projects could enable them to make decisions to invest (Ozdoganm and Birgonoul, 2000). The private sector then defines the risk sharing scenarios under which a project becomes viable, incorporates risks into cash flow analysis, and finally defines effective risk mitigation strategies. However, assessing the feasibility of the project in Vietnam is experiencing a lot of problems such as immature legal basis for PPP model (Ashurst, 2012), instability politics, lack of experience of the public sector (Ozdoganm and Birgonoul, 2000), unrealistic forecast on future economic development and demand, low actual traffic revenues (Ogunlana and Abednego, 2009) and undefined public contributions of funds (Cuttaree, 2008). It has led to the difficulties in evaluating the efficiency of PPP projects. Besides, the failure to appreciate fully the provision of infrastructure support is currently one of the most concerning issues in Vietnam (ADB, 2012). For instance, Binh Trieu II Road Bridge and Phu My Bridge have gone to the operation stage, while their ring roads have not been completed as pre-construction obligations by the government in contractual commitments. It has led to low traffic volume and also the actual flow of revenue lower

than estimated. These factors present major implications for PPP prospects in terms of the clear need for improved infrastructure coupled with the associated challenge of evaluating viable of PPP projects.

### 7.6 Group comparisons among risk's perceptions of stakeholders

While the results of the Spearman's correlation test was exposed that the public and private respondents shared a relatively consistent view of the ranking of risk factors in PPP projects in Vietnam, classification of critical risk level revealed some interesting results. As illustrated in Table 7-11, there are twenty-two critical risk factors (CRFs) based on the perception of the private sector's respondents whereas just ten CRFs were recognized by public sector's respondents ($RL \geq 0.8$). Figure 7-3 and Figure 7-4 can show clearly the different rankings amongst the public and private sectors. The private sector ranked "corruption" (P3) and "scope change of projects" (Co1) as the fourth and fifth CRFs, but the public sector ranked them $27^{th}$ and $22^{nd}$, respectively. Similar results were also found in "lack of transparency in the bidding" (D2), and "inflation" (C4). The ranking exercise further unveiled the different interest of the public sector to private investors, particularly on ranking of "Low capacity of concession company" (D11), "demand risk" (O5), and "foreign exchange fluctuations" (C3). As perceived by the public sector, "low capacity of concession company" (D11) and "demand risk" (O5) are their concerns. On the other hand, while the public sector supposed that corruption has no significant impact on the implementation of PPP projects, the private sector expressed their worries about corruption situation.

In order to clarify the different perceptions of stakeholders on critically of PPP projects risks in Vietnam, the public and private sectors' perceptions were compared through independent sample *t-test* to confirm any significant differences (at $\alpha$=5%). The null hypothesis was that there was no significant difference in the public and private sectors' perceptions. Finally, cross-comparison among respondents are shown in Figure 7-5 and factors with significant differences between public and private under *t*-test are displayed in Table 7-12 about the risk factors of PPP implementation in Vietnam.

Table 7-11 Perception of survey respondents concerning the level of CRFs in PPP projects

| ID | Critical risk factors (CRFs) | Overall | | Public sector | | Private sector | |
|---|---|---|---|---|---|---|---|
| | | Mean | Rank | Mean | Rank | Mean | Rank |
| Co2 | Land acquisition and compensation | 0.924 | 1 | 0.904 | 1 | 0.929 | 1 |
| P2 | Delay in project approvals and permits | 0.912 | 2 | 0.886 | 2 | 0.919 | 2 |
| D8 | Inefficient feasibility study | 0.878 | 3 | 0.830 | 7 | 0.891 | 3 |
| C1 | Financial market risk | 0.852 | 4 | 0.838 | 5 | 0.856 | 6 |
| D3 | Poor or incomplete project evaluations | 0.851 | 5 | 0.840 | 3 | 0.854 | 7 |
| L2 | Change in laws and regulations | 0.847 | 6 | 0.839 | 4 | 0.849 | 8 |
| C2 | Interest rate fluctuations | 0.837 | 7 | 0.799 | 11 | 0.846 | 9 |
| P3 | Corruption | 0.835 | 8 | 0.698 | 27 | 0.868 | 4 |
| Co1 | Scope change of projects | 0.834 | 9 | 0.736 | 22 | 0.859 | 5 |
| D4 | Supporting incentive of government risk | 0.829 | 10 | 0.803 | 9 | 0.837 | 11 |
| D1 | Poor decision-making process | 0.829 | 11 | 0.801 | 10 | 0.836 | 12 |
| D10 | Inadequate allocation of responsibility and risk | 0.829 | 12 | 0.787 | 13 | 0.840 | 10 |
| O5 | Demand risk | 0.828 | 13 | 0.829 | 8 | 0.827 | 17 |
| L1 | Inadequate law and supervision system | 0.823 | 14 | 0.790 | 12 | 0.831 | 13 |
| Co4 | Lack of supporting infrastructure | 0.813 | 15 | 0.766 | 18 | 0.824 | 18 |
| O1 | Completion risk | 0.812 | 16 | 0.780 | 15 | 0.820 | 19 |
| O4 | Payment risk | 0.811 | 17 | 0.739 | 20 | 0.829 | 15 |
| D2 | Lack of transparency in the bidding | 0.811 | 18 | 0.727 | 25 | 0.831 | 14 |
| C4 | Inflation | 0.809 | 19 | 0.727 | 24 | 0.829 | 16 |
| O3 | Toll fee issues | 0.808 | 20 | 0.773 | 16 | 0.818 | 20 |
| D9 | Unfair process of selection of the private sector | 0.804 | 21 | 0.753 | 19 | 0.816 | 21 |
| D6 | Conflicting or imperfect contract | 0.802 | 22 | 0.785 | 14 | 0.807 | 22 |
| D11 | Low capacity of concession company | 0.801 | 23 | 0.838 | 6 | 0.792 | 24 |

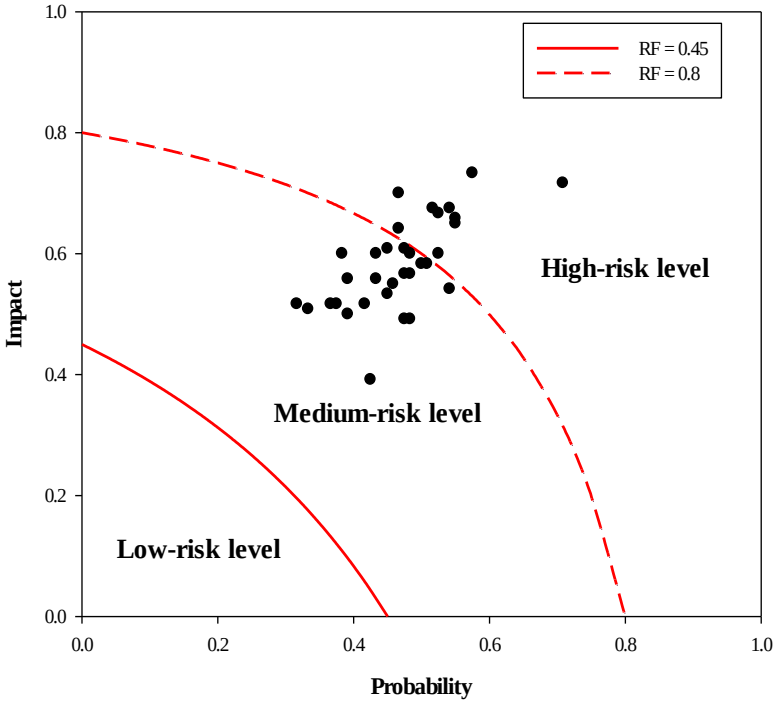



Figure 7-3 Risk perception of the public sector

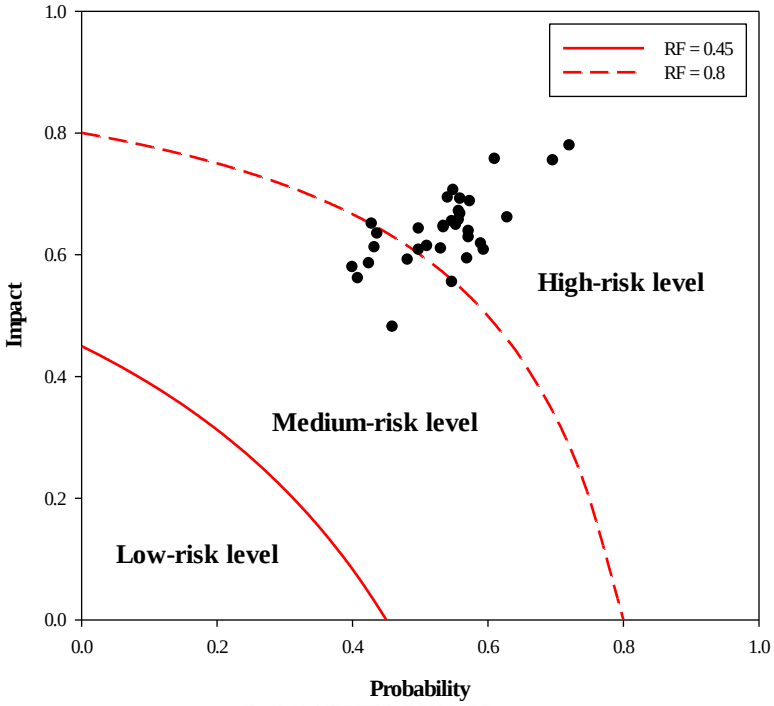



Figure 7-4 Risk perception of the private sector

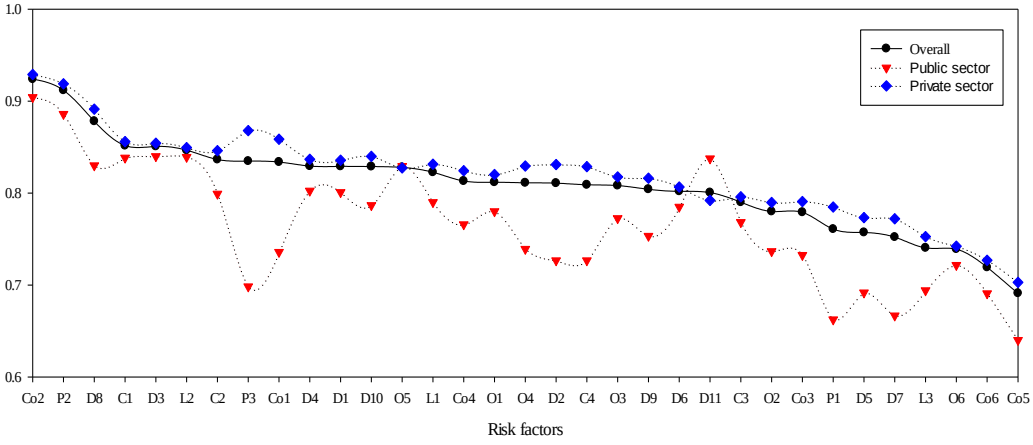



Figure 7-5 Cross-comparison of CRFs among respondents

Table 7-12 Factors with significant difference between public vs private under *t*-test

| No. | Risk factors | Levene's test for equality of variances | | | t-test for equality of means | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Assumption | F | Sig. | t | df | Sig. (2-tailed) | Mean Diff. | Std. Error Diff. |
| **Private sector vs. Public sector** | | | | | | | | | |
| P3 | Corruption | Equal variances not assumed | 14.580 | .000 | 4.875 | 28.32 | 0.000 | 0.164 | 0.034 |
| Co1 | Scope change of projects | Equal variances not assumed | 7.430 | .007 | 4.267 | 29.49 | 0.000 | 0.122 | 0.029 |
| D2 | Lack of transparency in the bidding | Equal variances assumed | 1.686 | .197 | 3.515 | 121 | 0.001 | 0.099 | 0.028 |
| C4 | Inflation | Equal variances assumed | 1.730 | .191 | 4.260 | 121 | 0.000 | 0.097 | 0.023 |
| O4 | Payment risk | Equal variances assumed | 3.431 | .066 | 3.888 | 121 | 0.000 | 0.090 | 0.023 |
| D8 | Inefficient feasibility study | Equal variances assumed | .003 | .957 | 2.948 | 121 | 0.004 | 0.064 | 0.022 |
| D10 | Inadequate allocation of responsibility and risk | Equal variances assumed | .168 | .682 | 3.028 | 121 | 0.003 | 0.055 | 0.018 |
| C2 | Interest rate fluctuations | Equal variances assumed | 1.550 | .216 | 2.280 | 121 | 0.024 | 0.047 | 0.021 |

The public and private sectors are “diverse actors” contractually bound to deliver “mutually agreed objectives” (Roumboutsos and Chiara, 2009). The survey findings reveal that around one-third of the CRFs (8 out of 23 factors) shows a significant difference in mean ratings as perceived by the respondents from the public sector and private consortium (see Table 7-12). Although the rankings of risk levels were different between the public and private sectors, both sectors ranked “land acquisition and compensation” aspect and “project approvals and permits” issue as the most important CRFs for PPP implementation. Factors with greatest difference between the private and public sectors are “corruption” (P3) (mean difference - MD = 0.164), “scope change of projects” (Co1) (MD = 0.122), and “lack of transparency in the bidding” (D2) (MD = 0.099). The result indicates that several factors concerning significant difference in the perception of public and private organizations, namely corruption (P3), scope change of projects (Co1), lack of transparency in the bidding (D2), inflation (C4), payment risk (O4), inefficient feasibility study (D8), inadequate allocation of responsibility and risk (D10), and interest rate fluctuations (C2). These difference can be recognized by the fact that the public and private sectors as a separate body with different points of views

and perspectives about risk factors (RFs) they evaluate critically for the performance of PPP projects (Babatunde et al., 2012). For instance, the private sector is more focusing on the risk factors related to feasibility stage of PPP projects such as feasibility study, projects scope, bidding transparency, risk allocation, and corruption. Moreover, the private sector is also concerned about some factors related to commercial and payment, i.e., inflation, interest rate fluctuations problem, and payment risk. Conversely, the public sector is more worried about the capacity of the private sector in PPP projects.

Fascinatingly, most of the different significant risks were mentioned in previous research by sharing these risks or negotiated based on specific circumstances between the public and private sectors. Indeed, based on research by Ke et al. (2010) and Hwang et al. (2013), lack of transparency in the bidding (D2), inadequate allocation of responsibility and risk (D10), corruption (P3), inflation (C4), and interest rate fluctuations (C2) should be shared by the public and private sectors. Therefore, among eight significant difference risk factors, the government must address and have appropriate strategies for three main different perceptions between public and private in PPP transportation, including issues related to tendering process, issues related to commercial, and issues related to payment.

**(a) Issues related to tendering process**

This concern consists of a lack of transparency in the bidding (D2), corruption (P3), inefficient feasibility studies (D8), scope change of projects (Co1), lack of supporting infrastructure (Co4), and inadequate allocation of responsibility and risk (D10). These issues were clearly caused by activities of stakeholders throughout the tendering process of PPP projects. Normally, open competitive bidding is widely required in the regulations of PPP. Lack of transparency in the tendering process is very common complaints by the private sector (Ward and Sussman, 2005; Cuttaree, 2008). In Vietnam, since inequity and fraud in the tendering process is a very common problem (Long et al., 2004), this has led to contracts being often awarded to incapable investors. Moreover, the absence of transparent procurement processes can readily result in substantial corruption (ADB, 2000). The anti-corruption legal framework in Vietnam is considered the best legal framework for anti-corruption in Asia (Martini, 2012). However, its implementation is facing with such problems as lack of transparency,

accountability, as well as low pay for government officials and inadequate system for holding officials accountable for their actions. Although corruption may cause a quite significant loss for the private sector ($4^{th}$) while it is considered by the public sector to have a less severe impact ($27^{th}$) in PPP projects in Vietnam.

Feasibility study assessment is crucial for any PPP transportation projects. It probably comes from the weak capacity of FS consultants and different viewpoints or disputes between stakeholder disputes (Kert and Izaguirre, 2007). Consequently, FS report regularly requires adjustments several times, even changes. For the public sector, competent state agencies shall organize bidding under regulations to select professional consultants to assess the feasibility of PPP projects (Decision 71, 2010). For the private sector, assessing the viability of PPP projects could enable them to make decisions to invest (Ozdoganm and Birgonoul, 2000). The private sector then defines the risk sharing scenarios under which a project becomes viable, incorporates risks into cash flow analysis, and finally defines effective risk mitigation strategies. However, assessing the feasibility of the project in Vietnam is experiencing a lot of problems such as immature legal basis for the model (Ashurst, 2012), instability politics, lack of experience of the public sector (Ozdoganm and Birgonoul, 2000), unrealistic forecast on future economic development and demand, low actual traffic revenues (Ogunlana and Abednego, 2009) and undefined public contributions of funds (Cuttaree, 2008). Inefficient FS has led to change the scope of PPP projects. Scope variation may have resulted by the innovative solutions proposed by the private sector and especially superior requirements from public sector (Hwang et al., 2013). For instance, due to the incompletion of the East ring road on schedule as BOT contract commitments of Phu My Bridge, the forecast of vehicles is under expectation. It implies that the revenue cannot offset the necessary amount to pay an annual debt. Moreover, some of competing/alternative projects around Phu My Bridge were approved by the Vietnamese government. Finally, the concession company of Phu My Bridge has early terminated concession and returned it back to the government. Therefore, utilizing a third-party consultant for the feasibility study and demand forecasting ensures the highest level of objectively possible (Valentine, 2008).

Besides, the complexity of contractual relationships between stakeholders and the long concession periods make PPPs distinct from a traditional transportation contract in that there are a large number of uncertainties and risks associated with the PPP (Kwak et al., 2009). This PPP contract must assume more responsibilities for participants, the risk allocation among stakeholders is more difficult. There are much different between the public and private sectors' perceptions about risk allocation in PPP projects. The public sector often transfers most of the risks to the private sector whereas the private sector would like to responsible for risks with guarantee policies from the public sector. In fact, most of the risks were allocated to the private sector without guarantees from the government by improper contracts. Therefore, standardized bidding documents and contracts should be prepared carefully by the government to attract the participation of private investors in PPP transportation projects in Vietnam.

**(b) Issues-related to commercial: inflation, and interest rate fluctuations**

The concern group is made up of *interest rate fluctuations* (C2), and *inflation* (C4). These issues were clearly caused by instability commercial indexes in Vietnam. Indeed, fluctuation of inflation and interest rate led to the crisis in the construction industry in the year 2008 and 2011 in Vietnam. Unfortunately, these risk factors are considered to be macroeconomic conditions and are impossible to avoid. Instability of interest rate and inflation would cause the undesirable financial condition of all sectors in the projects concerning potential profit. Furthermore, access to capital through loans by the private investor from financial institutions is very difficult. Fluctuations in inflation and interest rate should be shared because both parties not deal with them well alone (Ke et al., 2010; Hwang et al., 2013). Vietnamese government still did not find appropriate strategies to support private investor. Therefore, the Vietnamese government should determine appropriate policies to share and support these risk factors with private investors (e.g., sharing risks, minimum revenue guarantees, and compensation clauses in PPP contract) to cope with these issues.

**(c) Issues-related to payment: payment risk**

The private sector was not paid until the start of the operation phase of PPP projects. Payment risk occurs when the government or consumers (users) is not able to or willing to pay, due to social or other reasons. Therefore, unavailability of financial instrument,

which leads to difficulty in financing, would cause project termination and loss of the funds invested (Hwang et al., 2013). Delays in the disbursement of the public sector lead to many difficulties for private investors and projects. Moreover, risks related to unrealistic forecast on future demand, low actual traffic revenues (Ogunlana and Abednego, 2009) would cause payment problems. Yen Lenh Bridge is a typical failure example of actual traffic revenues affecting payment of BOT projects in Vietnam. After this project was completed, actual traffic revenues were lower than estimated, toll fees from real vehicles (one year after the operation) crossing the bridge just sufficient enough to pay interest on bank loans. It means that the investment capitals cannot be returned to operation stage, this projects was a burden for investors. In order to solve problems for investors in this situation, Vietnamese ministry of finance official reported to the government to switch from BOT (Build-Operate-Transfer) form to BT (Build-Transfer) form for this project.

### 7.7 Risk management actions

The main purpose of risk management is to find acceptable solutions to manage the risks identified in privately-promoted infrastructure projects by reducing the potential impact of the various types of risks and by allocating these risks to those participants best able to manage them. Within the framework of risk management, risk management is classified into five groups: avoidance, prevention, retention, transfer, and insurance. Therefore, the risk management process consists of creating measures aimed at avoiding or reducing the probability and/or potential severity of losses and generating provisions to finance the losses that might occur during the project lifetime.

The risk allocation process should be performed with the following question in mind: “Who is better able to manage that risk?” Two factors - responsibility and potential reward - should be used to determine where the various risks will ultimately lie. As a general rule, the host government should be prepared to hold and/or minimize the risks that are largely outside the control of the private sector (e.g., political, procurement and force majeure). Conversely, the private sector should retain the risks that can be managed and have potential for efficiency gains (e.g., construction and operation). However, the interdependence between the risks complicates this general rule. In

particular, financial risk is largely outside the control of the private sector, but the taking on of this risk by the private sector will have a favorable incentive effect on project cost elements which are widely subject to “controllable risk,” such as construction and operation. The impact of the project as a whole must therefore be carefully considered. Based on the results of risk allocation in some previous research works such as Wang and Tiong (2000), Thomas et al. (2003), Grimsey and Lewis (2004), Bing et al. (2005), Singh and Kalidindi (2006), Roumboutsos and Anagnostopoulos (2008), Ke et al. (2010), Hwang et al. (2013), and pilot test, the reference for risk allocation in PPP transportation projects was contructed in Table 7-13.

Risk management strategies are rarely used alone to handle a particular risk; it is much more frequent to use several of these strategies in combination for each type of risk. Table 7-13 and Table 7-14 lists some of the risk actions and strategies that could be used to ensure that the risks faced by the private sector of PPP transportation projects are reduced and the private sector can willing to get involved with that kind of projects. Full of risk strategies of the private sector to cope with such risk factors are shown in Apendix G.

Table 7-13 Reference for risk allocation in PPP transportation projects in Vietnam

| No. | Code | Risk factors | References | | | | | | | | | Allocation | | | | | Allocation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wang and Tiong (2000) | Thomas et al. (2003) | Grimsey and Lewis (2004) | Bing et al. (2005) | Singh and Kalidindi (2006) | Roumboutsos and Anagnostopoulos (2008) | Ke et al. (2010) | Hwang et al. (2013) | Pilot test | Public | Private | Shared | Negotiated | | Public | Private | Shared | Negotiated | |
| 1 | P1 | Government's intervention | S | | | | Pu | | Pu | | | 66.7 | 0 | 33.3 | 0 | | v | | | | |
| 2 | P2 | Delay in project approvals and permits | S | | Pu | Ne | Pu | Ne | Pu | Ne | | 42.9 | 0 | 14.3 | 42.9 | | | | | | v |
| 3 | P3 | Corruption | | | | | Pu | | Pu | S | | 66.7 | 0 | 33.3 | 0 | | v | | | | |
| 4 | L1 | Inadequate law and supervision system | | | | | | | | Pu | | 100 | 0 | 0 | 0 | | v | | | | |
| 5 | L2 | Change in laws and regulations | Pu | | Pr | S | S | Pu | Pu | Pu | | 57.1 | 14.3 | 28.6 | 0 | | v | | | | |
| 6 | L3 | Change in tax regulation (Tariff change) | S | | Pr | Pr | | Pu | Pu | Pu | | 50 | 33.3 | 16.7 | 0 | | v | | | | |
| 7 | C1 | Financial market risk | | | | Pr | | S | Pr | Pr | | 0 | 75 | 25 | 0 | | | v | | | |
| 8 | C2 | Interest rate fluctuations | Pr | | S | Pr | Pr | Ne | S | S | | 0 | 42.9 | 28.6 | 14.3 | | | | | | v |
| 9 | C3 | Foreign exchange fluctuations | Pu | | | | | | S | | | 50 | 0 | 50 | 0 | | | | | | |
| 10 | C4 | Inflation | S | | S | Pr | | Ne | S | S | | 0 | 16.7 | 66.7 | 16.7 | | | | v | | |
| 11 | D1 | Poor public decision-making process | | | | Pu | | Pu | Pu | | | 100 | 0 | 0 | 0 | | v | | | | |
| 12 | D2 | Lack of transparency in the bidding | | | | | | | Pu | | | 100 | 0 | 0 | 0 | | v | | | | |
| 13 | D3 | Subjective project evaluation method | | | | | | | S | | | 0 | 0 | 100 | 0 | | | | v | | |
| 14 | D4 | Supporting incentive of government risk | | | | | | | | Pu | | 100 | 0 | 0 | 0 | | v | | | | |
| 15 | D5 | Unclear about state participant portion | | | | | | | | | Ne | 0 | 0 | 0 | 100 | | | | | | v |
| 16 | D6 | Conflicting or imperfect contract | S | | | | | | S | | | 0 | 0 | 100 | 0 | | | | v | | |

| No. | Code | Risk factors | References | | | | | | | | | Allocation | | | | Allocation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wang and Tiong (2000) | Thomas et al. (2003) | Grimsey and Lewis (2004) | Bing et al. (2005) | Singh and Kalidindi (2006) | Roumboutsos and Anagnostopoulos (2008) | Ke et al. (2010) | Hwang et al. (2013) | Pilot test | Public | Private | Shared | Negotiated | Public | Private | Shared | Negotiated |
| 17 | D7 | Breach of contract by government | Pu | | Pu | | Pu | | | | | 100 | 0 | 0 | 0 | v | | | |
| 18 | D8 | Inefficient feasibility study | | | | | | | | | S | 0 | 0 | 100 | 0 | | | v | |
| 19 | D9 | Unfair process of selection of the private sector | | | | | | | | | Pu | 100 | 0 | 0 | 0 | v | | | |
| 20 | D10 | Inadequate allocation of responsibility and risk | | | | | | Pr | | S | | 0 | 50 | 50 | 0 | | | v | |
| 21 | D11 | Low capacity of concession company | | | | | | | Pr | | Pu | 50 | 50 | 0 | 0 | | | v | |
| 22 | Co1 | Scope change of projects | | | Pr | | Pu | | | S | | 33.3 | 33.3 | 33.3 | 0 | | | v | |
| 23 | Co2 | Land acquisition and compensation | Pu | | Pu | Pu | Pu | Pu | Pu | | | 100 | 0 | 0 | 0 | v | | | |
| 24 | Co3 | Problems due to partner's different practice | | | | Pr | | Pr | | S | | 0 | 66.7 | 33.3 | 0 | | v | | |
| 25 | Co4 | Lack of supporting infrastructure | | | | | | | | | Ne | 0 | 0 | 0 | 100 | | | | v |
| 26 | Co5 | Environmental protection risk | Pr | | | Pr | | S | S | Pr | | 0 | 60 | 40 | 0 | | v | | |
| 27 | Co6 | Force majeure risk | S | | S | S | | S | S | S | | 0 | 0 | 100 | 0 | | | v | |
| 28 | O1 | Completion risk | | Pr | Pr | | | | Pr | | | 0 | 100 | 0 | 0 | | v | | |
| 29 | O2 | Early termination of concession by concession company | S | | Pr | | | | | | | 0 | 50 | 50 | 0 | | v | v | |
| 30 | O3 | Toll fee issues | S | | Pr | | | | S | | | 0 | 33.3 | 66.7 | 0 | | | v | |
| 31 | O4 | Payment risk | | | | | Pu | | S | | | 50 | 0 | 50 | 0 | v | | v | |
| 32 | O5 | Demand risk | Pu | S | Pr | Pr | | Pu | S | Pr | | 28.6 | 42.9 | 28.6 | 0 | | | v | |
| 33 | O6 | Operator inability | Pr | | | | | | | | | 0 | 100 | 0 | 0 | | v | | |

Table 7-14 Risk strategies of the private sector of "political" risk group

| No. | Code | Risk factors | Allocation | | | | Risk management actions | |
|---|---|---|---|---|---|---|---|---|
| | | | Pu | Pr | S | Ne | Private sector | Public sector |
| 1 | P1 | Government's intervention | ✓ | | | | - Maintain a close relationship with government officers | - Establish an inter-sector working team<br>- Implement training for government staff |
| 2 | P2 | Delay in project approvals and permits | | | | ✓ | - Maintain a close relationship with government officers<br>- Minimize the bureaucracy and the procedures for approvals by the government<br>- Select reputable partners<br>- Add contingency fund for delay of late approvals | - Perform transparent and streamline the approvals and permits process<br>- Restrict corruption in the process of approvals and permits for projects |
| 3 | P3 | Corruption | ✓ | | | | - Investors should avoid compromise with corruption<br>- Select prestigious partners (state-owned companies)<br>- Carry out all procedures, prepare complete dossier as required, to minimize corruption and bribery of local officials<br>- Maintain good relationships with local officials, and agencies<br>- Sign the contract with an organization good relationship with local official to undertake the approvals procedures | - Establish transparent procurement process<br>- Adhere strictly the anti-corruption legal framework<br>- Raise salaries for government officials |



## 7.8 Conclusion

The PPP form has been proclaimed as bringing a new age to infrastructure development in Vietnam. New PPP laws/regulations and PPP pilot projects are expected to open up opportunities for foreign and domestic investors to penetrate into new markets in Vietnam. However, the risky environment of the PPP transportation projects in Vietnam are extremely critical and thus considered to be barriers to attracting further investment from private investors. The primary objective of the paper is to study of project risk factors and then to uncover their underlying interrelationships. The respondents from the public and private sectors were asked to specify all of 33 risk factors affecting implementation of PPP projects in this research. As the results, there are none risk factors in low-risk level, ten risks in medium-risk level, and 23 risks in high-risk level. The top ten critical risk factors in descending order of importance are

(1) Land acquisition and compensation

(2) Delay in project approvals and permits

(3) Inefficient feasibility study

(4) Financial market risk

(5) Subjective project evaluation method

(6) Change in laws and regulations

(7) Interest rate fluctuations

(8) Corruption

(9) Scope change of projects

(10) Supporting incentive of government risk

Clearly, these issues are directly associated with the entrance of private investors to capitalize in PPP transportation projects in Vietnam. Acquisition/compensation problems, approvals/permits issues, and financial market matters were critical factors that have an enormous impact on the success and/or failure of PPP projects. Project evaluation problems (i.e., inefficient feasibility studies, subjective evaluation method) should be considered and assessed carefully by both the public and private sectors. Besides, feasibility studies of PPP projects must be evaluated by the third party. The legal framework for PPP form was also the critical issue that needs to be addressed thoroughly, especially for the foreign investors.

Additionally, factor analysis was applied to deeper analyze the interrelationship existing between critical risk factors. Most of the critical risk factors have been grouped into one of the four groups:

(1) Bidding process problem

(2) Finance issue

(3) Laws and regulations matter

(4) Project evaluation issue

“Bidding process” problems requires the transparency, fairness, and incorruption in the tendering process. The bidding process must be constructed carefully. The government should establish clear statements of evaluation criteria in bidding documents (Ahadzi and Bowles, 2004). “Finance” issues such as interest rate, inflation, especially financial market should be concerned by the government to ensure stability. The government can perform some support policies such as guarantees and insurances, increase the toll levels in agreement with inflation (El-amm, 2003). On the other hand, private investors must construct financial risk profile, for instance to illustrate the impact of the financial price risk on the project value (El-amm, 2003). This enables investors to be assured when participating in PPP projects. “Laws and regulations” matters helps clarify and disseminate all necessary PPP regulations and supporting incentive policies of Government in any PPP form. The state agencies should establish stable legal framework and policies for PPP (Toan and Ozawa, 2008), such as suitable guarantees, insurance for political risk (Wang et al., 2000), and supporting incentives. Sponsors of PPP projects would like to obtain tariff adjusting or concession period extension guarantees (Wang et al., 2000). Furthermore, maintaining a good relationship with government authorities is very necessary for the success of the private sector. “Project evaluation” helps certify that project is economically feasible with the public sector and is financially viable with the private sector. The public sector should select appropriately third-party consultants to ensure the highest possible level of PPP projects.

Moreover, the factors that would be different perceptions among stakeholders on criticality of the risk of PPP transportation projects have also been identified and discussed. There are eight significant different risk factors, then grouped into three main concern issues, including issues-related to tendering process, issues-related to commercial, issues-related to payment. The findings from these results would also be helpful for Vietnam’s government to understand the concern and expectation of private investors. Moreover, the government would have to change the policies to reduce the criticality of risks in private’ perception and then to make PPP transportation projects more attractable. This research also helps private investors to recognize the risk perceptions of the public sector and then to prepare responsive strategies/actions when they decide to make an investment in PPP transportation projects in Vietnam.

# CHAPTER 8
# A RISK-BASED INVESTMENT WILLINGNESS ASSESSMENT MODEL (RIWAM)

This chapter proposes the risk-based investment willingness assessment model (RIWAM) for private investors in Public-Private Partnership (PPP) transportation projects in Vietnam. The first section discusses the structure of the RIWAM model. The next section introduces the research framework process and data collection for the RIWAM model. The definitions of constructs in this model are described to show all variables such as observed, endogenous, and exogenous variables. The fourth section establishes a hypothetical model in this research. Finally, the RIWAM model is established with the interrelationship among risk perceptions, investment willingness, and responsive strategies. A validation process is then to validate the results of RIWAM model.

## 8.1 Interrelationships among risk perceptions, investment willingness and responsive strategies

When making investment decisions on PPP schemes, the private sector should not lose sight of external factors (e.g., government policies, social expectations, and political environment) (Ng et al., 2010; Piyatrapoomi et al., 2004) and project-specific factors (e.g., profitability, risk sharing) (Schaufelberger and Wipadapisut, 2003). The willingness of private investors and lenders to develop public infrastructure projects depends on the environment where these projects operate (Zhang, 2005b). Thus, addressing investment environment risk and specifying investment willingness criteria for decision-making of the private sector are critically required for decision makers in PPP projects. Simultaneously, appropriate responsive strategies essentially affect the success of the private sector when deciding to invest in PPP projects.

Understanding PPP projects risks is vital to the investment willingness of the private sector. The influence of risk perceptions to the investment willingness of the private sector is analyzed. The private sector can then answer the question: **"should the private**

**sector get involved with the investment of PPP transportation projects?"** for their investment decision. Figure 8-1 shows the process of decision-making by private investors. As can be seen, if private investors say "No", they will give up or try to find another PPP project. Moreover, if private investors would like to seek involvement in PPP projects, they might prepare some responsive strategies before proceeding to investment. The influence of risk perceptions and investment willingness to responsive strategies will also be assessed. As a result, the risk-based investment willingness assessment model (RIWAM) is established to help private investors during the initial phases of PPP transportation projects. The process for RIWAM model is shown in Figure 8-2. Results of the RIWAM also suggest risk management strategies that give better control and reduce the impact of project risks on the private sector participants.

Research framework for RIWAM model

A descriptive analysis is first carried out on the collection data, using the statistical package for the social sciences (SPSS) in which the means and standard derivations (SD) were computed. A framework is then established through factor analysis (FA) and structural equation model (SEM) approach to unveil the relationships among various risk factors affecting PPP projects, the level of investment willingness of the private sector, and suitable responsive strategies. It is considered as an efficient method for establishing the structural relationships among the latent variables, and for testing the hypothetical model. Finally, three experts from the government, private sectors and academic area are invited to participate in the validation interviews over the outcomes derived from the willingness assessment model.

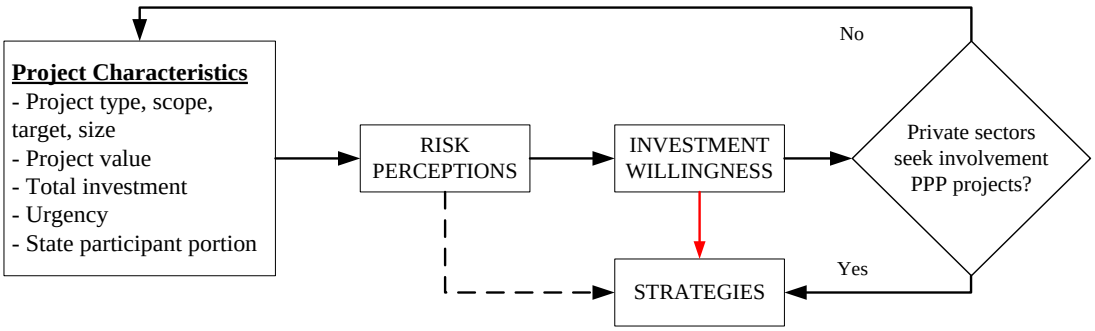



Figure 8-1 Interrelationships among risk perceptions, investment willingness, and responsive strategies

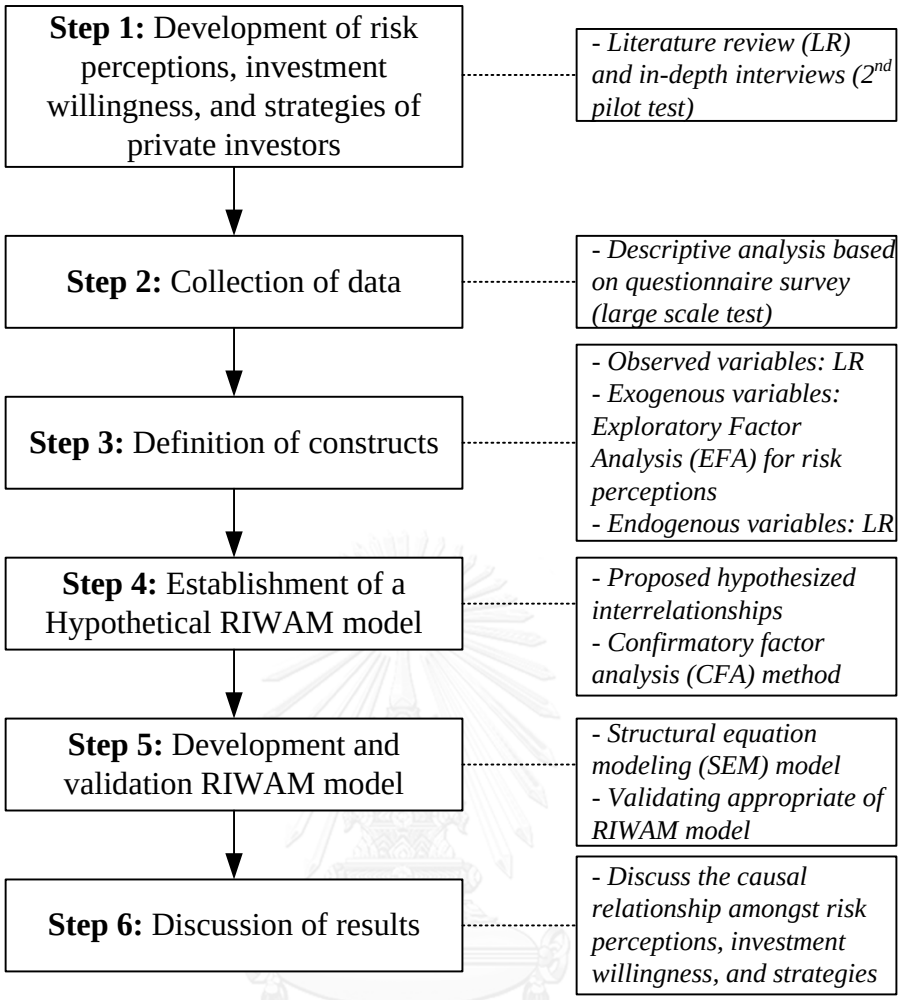



Figure 8-2 Research framework for RIWAM model



### 8.2 Data collection

For the consistency of data collection, the reliability of each item must be satisfied. To check the reliability of each item asked in each group of risk perceptions, investment willingness criteria, and responsive strategies, Cronbach Alpha scores for such groups, are calculated. The Alpha scores of risk perceptions, investment willingness, and responsive strategies calculated by SPSS 22 are 0.906, 0.863, and 0.740 respectively. We found that the Cronbach Alpha coefficient of each group is higher than 0.6, which indicates that the scale has fine internal consistency [the minimum acceptable can be more than 0.60 based on Slater (1995)].

### 8.2.1 Respondents' profiles

The details of respondents profile are discussed in section 5.7, a large-scale test in Chapter 5. In summary, the respondents are divided into two main groups: 1) the public sector (i.e., government agencies) and 2) the private sector (i.e., private investors, consultants, contractors, financiers and designers). Responding rates for different groups are: 20.3% for the public sector and 79.7% for the private sector. The responding rates from different stakeholders are: 20.3% (government agencies), 44.7% (private investors), 22.0% (consultants), 8.1% (contractors), 4.1% (financiers), and 0.8% (designers). The proportions of the respondents by construction experience (in years) are: 43.1% (between 5 and 10 years) and 56.9% (10 years or more). More than 90% of respondents had been involved in one or more PPP projects.

### 8.2.2 The research questions in questionnaire survey

Three key research questions are:

(1) Which risk factors influence the investment willingness of private investors?

(2) Is investment willingness related to the private sector's likelihood of performing responsive strategies?

(3) Is risk perception related to the level of implementing of responsive strategies of private investors?

More specifically, the main hypothesis of this research is:

"Understanding risk perceptions (e.g., politics, law, commerce, design and procurement, construction, and operation) will increase the investment willingness of private investors, which in turn will improve the investment environment of a PPP project by performing appropriate responsive strategies".

This hypothesis is verified in a large-scale test. Some examples of questionnaire survey results are shown in Table 8-a, b, and c. These results are then used to calculate the means and standard deviations of risk perception, investment willingness criteria, and responsive strategies, as shown in Table 8-, Table 8-, and Table 8-4.

Table 8-1 Research questions for RIWAM model

***a. Questionnaire: Do you think these factors can influence on PPP projects?***

| **Risk factors** | **Agreement level** | | | | |
|---|---|---|---|---|---|
| | **Strongly disagree -----> Totally agree** | | | | |
| | **1** | **2** | **3** | **4** | **5** |
| Government's intervention *can influence PPP projects* | | | | ✓ | |
| Delay in project approvals and permits *can influence PPP projects* | | | | | ✓ |
| Corruption | | | ✓ | | |

***b. Questionnaire: Agreement level of respondents about the investment willingness criteria affecting the investment willingness of the private sector***

| **Investment willingness criteria** | **Agreement level** | | | | |
|---|---|---|---|---|---|
| | **Strongly disagree -----> Totally agree** | | | | |
| | **1** | **2** | **3** | **4** | **5** |
| Ability to supply capital for the project *affect the investment willingness of the private sector* | | | | | ✓ |
| Credibility to call loan for the project *affect the investment willingness of the private sector* | | | | | ✓ |
| Ability to fund initial project costs | | | | | ✓ |

***c. Questionnaire: Agreement level of respondents on the response strategies of the private sector after they are ready to invest in PPP transportation projects***

| **Responsive strategies** | **Agreement level** | | | | |
|---|---|---|---|---|---|
| | **Strongly disagree -----> Totally agree** | | | | |
| | **1** | **2** | **3** | **4** | **5** |
| Select a capable partners | | | | ✓ | |
| Maintain long-term relationships with industrial partners | | | | | ✓ |
| Maintain good relationship with local government and higher officials | | | ✓ | | |

Table 8-2 Mean and S.D. of risk perceptions

| **Group** | **Code** | **Risk factors** | **Mean** | **SD** | **Rank** |
|---|---|---|---|---|---|
| **Politics risks** | P1 | Government's intervention | 3.81 | 0.91 | 9 |
| | P2 | Delay in project approvals and permits | 4.16 | 0.62 | 2 |
| | P3 | Corruption | 3.67 | 0.88 | 18 |
| **Law risks** | L1 | Inadequate law and supervision system | 3.76 | 0.79 | 10 |
| | L2 | Change in laws and regulations | 3.99 | 0.84 | 4 |
| | L3 | Change in tax regulation | 3.34 | 0.70 | 28 |
| **Commerce risks** | C1 | Financial market risk | 3.96 | 0.73 | 5 |
| | C2 | Interest rate fluctuations | 3.72 | 0.73 | 11 |
| | C3 | Foreign exchange fluctuations | 3.54 | 0.83 | 22 |
| | C4 | Inflation | 3.44 | 0.76 | 25 |
| **Design and procure** | D1 | Poor public decision-making process | 3.60 | 0.88 | 20 |
| | D2 | Lack of transparency in the bidding | 3.70 | 0.86 | 14 |

| Group | Code | Risk factors | Mean | SD | Rank |
|---|---|---|---|---|---|
| | D3 | Subjective project evaluation method | 3.95 | 0.77 | 6 |
| | D4 | Supporting incentive of government risk | 3.86 | 0.78 | 7 |
| | D5 | Unclear state participant portion | 3.60 | 0.78 | 20 |
| | D6 | Conflicting or imperfect contract | 3.32 | 0.67 | 29 |
| | D7 | Breach of contract by government | 3.46 | 0.80 | 23 |
| | D8 | Inefficient feasibility study | 4.15 | 0.74 | 3 |
| | D9 | Unfair process of selection of the private sector | 3.71 | 0.81 | 13 |
| | D10 | Inadequate allocation of responsibility and risk | 3.72 | 0.70 | 12 |
| | D11 | Low capacity of concession company | 3.39 | 0.81 | 27 |
| **Construction risks** | Co1 | Scope change of projects | 3.68 | 0.77 | 17 |
| | Co2 | Land acquisition and compensation | 4.50 | 0.63 | 1 |
| | Co3 | Problems due to partner's different practice | 3.12 | 0.61 | 31 |
| | Co4 | Lack of supporting infrastructure | 3.70 | 0.70 | 14 |
| | Co5 | Environmental protection risk | 2.76 | 0.92 | 33* |
| | Co6 | Force majeure risk | 3.07 | 0.75 | 32 |
| **Operation risks** | O1 | Completion risk | 3.45 | 0.74 | 24 |
| | O2 | Early termination of concession by concession company | 3.64 | 0.90 | 19 |
| | O3 | Toll fee issues | 3.69 | 0.73 | 16 |
| | O4 | Payment risk | 3.41 | 0.78 | 26 |
| | O5 | Demand risk | 3.84 | 0.80 | 8 |
| | O6 | Operator inability | 3.22 | 0.81 | 30 |



Table 8-3 Mean and S.D. of investment willingness

| Attribute | Code | Willingness criteria | Mean | SD | Rank |
|---|---|---|---|---|---|
| **Wil1. Finance** | WF1 | Ability to supply capital for the project | 4.40 | 0.58 | 1 |
| | WF2 | Credibility to call loan for the project | 4.39 | 0.62 | 2 |
| | WF3 | Ability to fund initial project costs | 3.88 | 0.73 | 8 |
| | WF4 | Efficiency of domestic capital market | 3.31 | 0.65 | 25 |
| | WF5 | Suitability of equity/debt ratio | 3.82 | 0.79 | 10 |
| **Wil2. Profitability** | WP1 | Revenues from operating the vicinity of project | 3.43 | 0.98 | 22 |
| | WP2 | Revenues from the services of project | 4.01 | 0.88 | 6 |
| | WP3 | Stability of project's cash flow | 3.99 | 0.82 | 7 |
| | WP4 | Ability of new markets' seeking and penetration | 3.30 | 0.79 | 26 |
| **Wil 3. Leg.** | WL1 | Transparency and adequacy of legal framework | 3.82 | 0.82 | 10 |

| Attribute | Code | Willingness criteria | Mean | SD | Rank |
|---|---|---|---|---|---|
| | WL2 | Advantage of legal framework for investment | 4.20 | 0.72 | 4 |
| | WL3 | Efficiency of State's incentive policies for investment | 4.14 | 0.75 | 5 |
| | WL4 | Clarity of State participant portion | 3.53 | 0.77 | 20 |
| | WL5 | Facilitation for procedures of land acquisition and compensation | 4.25 | 0.72 | 3 |
| **Wil4. Partner selection** | WS1 | Accessibility to reliable partners | 3.37 | 0.76 | 24 |
| | WS2 | Capacity of partners | 3.61 | 0.76 | 18 |
| | WS3 | Favorable investment environment for seeking partners | 3.42 | 0.75 | 23 |
| | WS4 | Competitiveness and transparency of bidding process | 3.73 | 0.91 | 14 |
| **Wil5. Risk sharing** | WR1 | Less risky in project | 3.83 | 0.62 | 9 |
| | WR2 | Efficient legal framework about project risk sharing | 3.75 | 0.75 | 12 |
| | WR3 | Clear risk allocation among parties | 3.74 | 0.81 | 13 |
| | WR4 | Clear supporting condition about risk sharing by the State | 3.63 | 0.87 | 17 |
| **Wil6. Macroeconomics** | WM1 | Changes of macroeconomics policies | 3.19 | 0.88 | 28 |
| | WM2 | Favorable conditions by the State for investment operation of the private sector | 3.49 | 0.76 | 21 |
| | WM3 | Attractiveness of investment environment | 3.67 | 0.71 | 16 |
| | WM4 | Efficiency of the monetary policy of the state | 3.61 | 0.81 | 18 |
| | WM5 | Stability of macroeconomic indicators (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI...) | 3.69 | 0.79 | 15 |
| | WM6 | Effectiveness of environmental impact assessment | 3.30 | 0.90 | 26 |



Table 8-4 Mean and S.D. of responsive strategies

| Strategy | Code | Responsive Strategies | Mean | SD | Rank |
|---|---|---|---|---|---|
| **Stra1. Cooperation** | SC1 | Select a capable partners (technical capacity and financial resources) | 4.31 | 0.62 | 2 |
| | SC2 | Maintain long-term relationships with industrial partners | 4.47 | 0.56 | 1 |
| | SC3 | Maintain good relationship with local government and higher officials | 3.60 | 0.67 | 12 |
| | SC4 | Improve capacity of professionals involved | 3.76 | 0.69 | 10 |
| **Stra2. Finance** | SF1 | Establish detailed plan for loan capitals and long-term financing | 4.17 | 0.70 | 6 |
| | SF2 | Evaluate carefully the incentive policies and the state participation portion | 4.22 | 0.77 | 4 |

| Strategy | Code | Responsive Strategies | Mean | SD | Rank |
|---|---|---|---|---|---|
| | SF3 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | 4.15 | 0.69 | 7 |
| | SF4 | Seek government support and guarantees | 4.20 | 0.73 | 5 |
| **Stra3. Evaluation** | SE1 | Develop a project evaluation tool | 3.56 | 0.80 | 14 |
| | SE2 | Hire experienced consultants to assess the feasibility of the project | 3.51 | 0.72 | 15 |
| | SE3 | Analyze appropriate allocation of responsibility and risk | 3.43 | 0.79 | 16 |
| | SE4 | Evaluate concession period for projects | 3.63 | 0.78 | 11 |
| **Stra4. Suggestions for government** | SS1 | Acquire proposals from the private sector | 3.16 | 1.07 | 18 |
| | SS2 | Build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | 4.23 | 0.76 | 3 |
| | SS3 | Establish adequate legal and regulatory framework | 3.90 | 0.59 | 8 |
| | SS4 | Establish an inter-sector working team | 3.90 | 0.75 | 8 |
| | SS5 | Develop a database for historical PPP projects | 3.59 | 0.76 | 13 |
| | SS6 | Adjust the appropriate risk allocation between the private and public sectors | 3.33 | 0.70 | 17 |

### 8.3 Exploratory factor analysis model

As an early step in data analysis, all questionnaire responses are checked to ensure completeness and readability before the data is processed using the Statistical Package for Social Sciences (SPSS) version 22. The questionnaire (Appendix C) comprises 33 variables dealing with risk factors affecting PPP projects. Data collection is analyzed by factor analysis to examine the interrelationships to decrease the number of original variables into a smaller set of factors. Thirty-two high-risk factors are then selected for factor analysis. That is, their means of risks are appropriate to or more than 3 (average) on the scale of 1 to 5 (environment protection risk is removed due to its mean less than 3).

Some of the requirements for implementing the EFA models are:

- Checking adequacy of the sample size. Factor analysis prefers sample size larger than 100 or at least five-time of variables (observations) (Hair et al., 2009). The sample size in this research is 123 and number of observations are 32, which satisfied the requirements.
- Factor loading of each factor should exceed 0.495 with sample size around 123 in this research (Hair et al., 2009).

- At least one-half of the variance of each variance must be taken into consideration. Thus, each variable's communality, representing the amount of variance accounted for by the factor solution for the variable, should be equal to, or more than, 0.5 to have sufficient explanation (Hair et al., 2009).
- Each item has to display a 0.3 factor loading difference among maximum factor loading and minimum factor loading $[(Factor\ loading)_{max} - (Factor\ loading)_{min} \geq 0.3]$ (Jabnoun and Al-Tamimi, 2003).
- Extraction Sums of Squared Loadings should exceed 50% (Gerbing & Anderson, 1988).
- The value of KMO should higher than 0.5, and the Barlett's test must have a statistical significance (Sig. <0.05).

Finally, the remaining 16 risk factors are found to be appropriate for factor analysis. The value of Bartlett test of sphericity is 521.312, and the associated significance level is small (p=0.000). The correlation matrix shows that all variables have a significant correlation at the 5% level. It implies that the deletion of any other risk factors is not necessary. The value of the KMO MSA is 0.635, which is satisfactory for exploratory factor analysis (Table 8-5). Routinely, the varimax orthogonal rotation of principle component analysis is used to interpret the components. Table 8-6 presents the results of the factor analysis using varimax rotation method. The factor analysis extracts six components which total amounts of variance explained was around two-third (68.145%, Table 8-6).

The components and associated variables (risk factors) are labeled for convenience as follows: component 1 is finance-related risk, component 2 is laws and regulations-related risk, component 3 is partners' capacity-related risk, component 4 is bidding process-related risk, component 5 is feasibility-related risk, and component 6 is interference-related risk (Table 8-7).

Table 8-5 KMO and Barlett's Test

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .635 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 521.312 |
| | df | 120 |
| | Sig. | .000 |

Table 8-6 Results of the factor analysis using varimax rotation method

| Comp | Eigenvalue | Percentage of variance | Risk factors | Factor loading | Cronbach's Alpha | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|---|---|
| 1 | 3.406 | 21.288 | Interest rate fluctuations | 0.826 | 0.718 | 0.646 | 0.495 |
| | | | Inflation | 0.723 | | 0.505 | 0.670 |
| | | | Financial market risk | 0.710 | | 0.471 | 0.708 |
| 2 | 2.166 | 13.535 | Inadequate law and supervision system | 0.854 | 0.683 | 0.621 | 0.417 |
| | | | Change in laws and regulations | 0.749 | | 0.524 | 0.556 |
| | | | Change in tax regulation | 0.664 | | 0.367 | 0.737 |
| 3 | 1.698 | 10.613 | Operator inability | 0.835 | 0.718 | 0.545 | 0.623 |
| | | | Low capacity of concession company | 0.751 | | 0.55 | 0.617 |
| | | | Problems due to partner's different practice | 0.715 | | 0.544 | 0.642 |
| 4 | 1.297 | 8.107 | Lack of transparency in the bidding | 0.822 | 0.615 | 0.441 | 0.490 |
| | | | Unfair process of selection of the private sector | 0.764 | | 0.461 | 0.463 |
| | | | Corruption | 0.702 | | 0.372 | 0.587 |
| 5 | 1.251 | 7.818 | Unclear state participant portion | 0.889 | 0.511 | 0.344 | . |
| | | | Inefficient feasibility study | 0.721 | | 0.344 | . |
| 6 | 1.085 | 6.784 | Government's intervention | 0.757 | 0.274 | 0.161 | . |
| | | | Force majeure risk | 0.725 | | 0.161 | . |

Table 8-7 Principle components of risk perceptions

| Influencing components | Principle components | | | | | |
|---|---|---|---|---|---|---|
| | **Comp 1** | **Comp 2** | **Comp 3** | **Comp 4** | **Comp 5** | **Comp 6** |
| | **Finance** | **Laws and regulations** | **Partners' capacity** | **Bidding process** | **Feasibility** | **Interference** |
| 1 | Interest rate fluctuations | Inadequate law and supervision system | Operator inability | Lack of transparency in the bidding | Unclear state participant portion | Government's intervention |
| 2 | Inflation | Change in laws and regulations | Low capacity of concession company | Unfair process of selection of the private sector | Inefficient feasibility study | Force majeure risk |
| 3 | Financial market risk | Change in tax regulation | Problems due to partner's different practice | Corruption | | |

## 8.4 Establishment of a hypothetical model

The investment willingness of the private sector in PPP projects are assessed by considering the six categories of risk factors. In other words, addressing the risk factors contribute to investment willingness, and hence, making an investment decision. Since an investment decision-making is also along with the responsive strategies of the private sector, it is hypothesized that a relationship exists between the investment willingness to responsive strategies on the PPP transportation projects. Thirteen assumptions are used to construct the hypothetical structural model in Figure 8-3. All of the risk factors, investment willingness criteria, and responsive strategies as listed in the questionnaire are regarded as observed variables and given in rectangles, and the six risk categories are used to measure the latent factors in the SEM model. Each of these six risk categories, their corresponding risk factors, investment willingness, and responsive strategies for the private sector are then connected by one-headed arrows to represent the hypothesized influence (Hoyle, 1995). For instance, “bidding process” issues is believed to have a direct influence on “investment willingness” of the private sector. Hence, the one-headed arrow originates from “bidding process” to “investment willingness”. This study hypothesizes the following 13 relationship statements for structural model as follow:

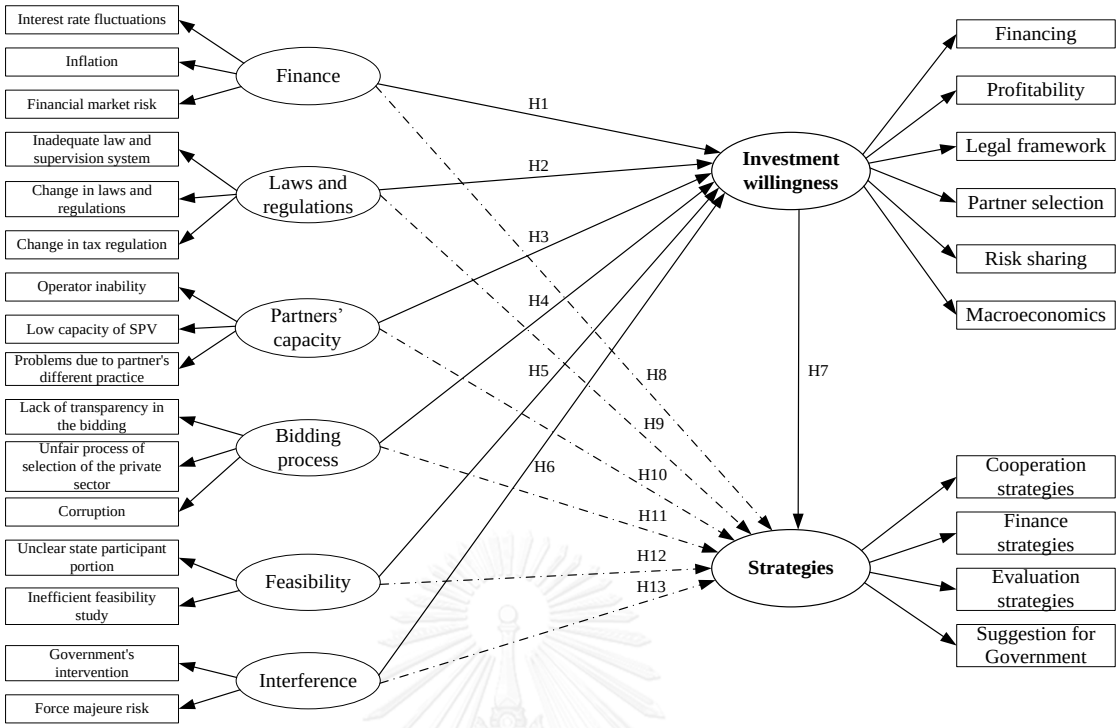



Figure 8-3 Hypothesized model of risk groups, investment willingness, and responsive strategies

H1: Finance-related issues have a direct influence on the private sector's investment willingness;

H2: Laws and regulations-related issues have a direct influence on the private sector's investment willingness;

H3: Partners' capacity-related problems have a direct influence on the private sector's investment willingness;

H4: Bidding process-related problems have a direct influence on the private sector's investment willingness;

H5: Feasibility-related risks have a direct influence on the private sector's investment willingness;

H6: Interference-related risks have a direct influence on the private sector's investment willingness;

H7: The private sector's investment willingness has a direct influence on the private sector's responsive strategies.

H8: Finance-related issues have a direct influence on the private sector's responsive strategies;

H9: Laws and regulations-related issues have a direct influence on the private sector's responsive strategies;

H10: Partners' capacity-related problems have a direct influence on the private sector's responsive strategies;

H11: Bidding process-related problems have a direct influence on the private sector's responsive strategies;

H12: Feasibility-related risks have a direct influence on the private sector's responsive strategies;

H13: Interference-related risks have a direct influence on the private sector's responsive strategies.

Moreover, certain two-headed arrows are added to the six categories of evaluation factors to examine the degree of mutual relationships (intercorrelations) between them although these arrows are not shown in Figure 8-3 due to the legibility.

Despite debates on the sample size for SEM analysis, especially as the complexity of the model grows, there has been no consensus on what is regarded as reasonable. Different rules of thumb had been proposed to warrant the stability of a SEM, and they include soliciting 15 respondents for each parameter (Hair et al., 2009) or 10 respondents per parameter with a minimum critical ratio of 5:1 (Kline, 2005). However, Bentler and Chou (1987) argued that a ratio of as low as five respondents per parameter be also acceptable if the collected data is reliable. As a general guideline, Hair et al. (2009) considered a sample size less than 50 as small; 200 as a sound basis for estimation, and greater than 400 as large. As a result, the sample size in the range of 100 to 400 are suggested for general SEM model (Hair et al., 2009). Therefore, the sample size of 123 cases in this study should be sufficient to support a stable model.

## 8.5 A risk-based investment willingness assessment model

### 8.5.1 Significant risk factors, willingness criteria, and responsive strategies

Based on the Hypothetical model, we can check the interrelationships (direct and indirect) of six main groups of risk factors, six investment willingness attributes, and four responsive strategies by referring to the mean ratings (Table 8-8). As we can see, all risk factors, willingness attributes, and responsive strategies which have an average rating higher than three (i.e., about the midpoint of the 5-point Likert scale) indicate that they are critical to the investment willingness of the private sector into PPP projects.

An "inefficient feasibility study" (D8) is the most important factor affecting the investment willingness of the private sector into PPP projects in Vietnam. Moreover, "change in laws and regulations" (L2), "financial market risk" (C1) and "government's intervention" (P1) are also perceived by the respondents as important risk factors.

Table 8-8 Means and S.D. of the risk factors, willingness criteria, responsive strategies

| Components | Code | Risk factors | Mean | SD | Rank |
|---|---|---|---|---|---|
| Finance | C2 | Interest rate fluctuations | 3.72 | 0.73 | 6 |
| | C4 | Inflation | 3.44 | 0.76 | 11 |
| | C1 | Financial market risk | 3.96 | 0.73 | 3 |
| Laws and regulations | L1 | Inadequate law and supervision system | 3.76 | 0.79 | 5 |
| | L2 | Change in laws and regulations | 3.99 | 0.84 | 2 |
| | L3 | Change in tax regulation | 3.34 | 0.70 | 13 |
| Partners' capacity | O6 | Operator inability | 3.22 | 0.81 | 14 |
| | D11 | Low capacity of concession company | 3.39 | 0.81 | 12 |
| | Co3 | Problems due to partner's different practice | 3.12 | 0.61 | 15 |
| Bidding process | D2 | Lack of transparency in the bidding | 3.70 | 0.86 | 8 |
| | D9 | Unfair process of selection of the private sector | 3.71 | 0.81 | 7 |
| | P3 | Corruption | 3.67 | 0.88 | 9 |
| Feasibility | D5 | Unclear state participant portion | 3.60 | 0.78 | 10 |
| | D8 | Inefficient feasibility study | 4.15 | 0.74 | 1 |
| Interference | P1 | Government's intervention | 3.81 | 0.91 | 4 |
| | Co6 | Force majeure risk | 3.07 | 0.75 | 16 |

| Components | Code | Risk factors | Mean | SD | Rank |
|---|---|---|---|---|---|
| Investment Willingness attributes | Wil1 | Financing | 3.96 | 0.45 | 2 |
| | Wil2 | Profitability | 3.68 | 0.54 | 4 |
| | Wil3 | Legal framework | 3.99 | 0.47 | 1 |
| | Wil4 | Partner selection | 3.53 | 0.56 | 5 |
| | Wil5 | Risk sharing | 3.74 | 0.53 | 3 |
| | Wil6 | Macroeconomics | 3.49 | 0.49 | 6 |
| Responsive strategies | Stra1 | Cooperation strategies | 4.04 | 0.43 | 2 |
| | Stra2 | Financing strategies | 4.18 | 0.48 | 1 |
| | Stra3 | Evaluation strategies | 3.53 | 0.57 | 4 |
| | Stra4 | Suggestions for government | 3.69 | 0.46 | 3 |

The investment willingness of private investors should be recognized in which they satisfy with "legal framework" issues (Wil3), "finance" matters (Wil1), and appropriate "risk sharing" manners (Wil5). Indeed, these three investment willingness attributes, namely, finance, legal framework, and risk sharing, are ranked 2nd, 1st, and 3rd, respectively.

Predictably, the private investors might perform "financing strategies" (Stra2), "cooperation strategies" (Stra1), and "suggestions for government" (Stra4), which were ranked 1st, 2nd, and 3rd, respectively to improve their investment willingness into PPP projects.



### 8.5.2 Assessing model fit by confirmatory factor analysis method

The CFA models are calculated by SPSS 22 combined with AMOS 21.0 software under AMOS graphics. The result of the first CFA model are shown in Figure 8-4. This model consists of 209 degrees of freedom. The CFA is verified by evaluating its appropriateness. If its appropriateness is not good, it needs to be developed and revised. The appropriateness is assessed form the results of the covariance structural analysis, which is indicated by the goodness-of-fit (GOF) indexes. Table 8-10 shows the results of GOF measures of the hypothetical model. The ratios of $\chi^2/df$ (which was 1.993 < 2), TLI (0.679), CFI (0.735), and RMSEA (0.090 > 0.080) show that the hypothetical

model is not sufficiently appropriate to explain the relationships among the risk perceptions, investment willingness, and responsive strategies. Therefore, the hypothetical model must be revised.

Based on Rule of Thumb 5 (Hair et al., 2009), standardized regression weights should be 0.5 or higher, and ideally 0.7 or higher to achieve convergent validity value. Variables which have standardized regression weights less than 0.5 are respectively removed. Then based on the values of standardized regression weights in Table 8-9, factors are removed from the refined model including Co6 in the "interference" category, Wil4 related to 'investment willingness', Stra3 from 'responsive strategies', and P3 in the 'bidding process' category. Then the results of the second CFA model are shown in Figure 8-5. Degree of freedom of 2nd CFA model is of 120, and ratios of $\chi^2 = 237.968$ with p = 0.000, TLI = 0.767 and CFI = 0.818, ratio of $\chi^2/df = 1.983 < 2$ and RMSEA = 0.090 > 0.080.

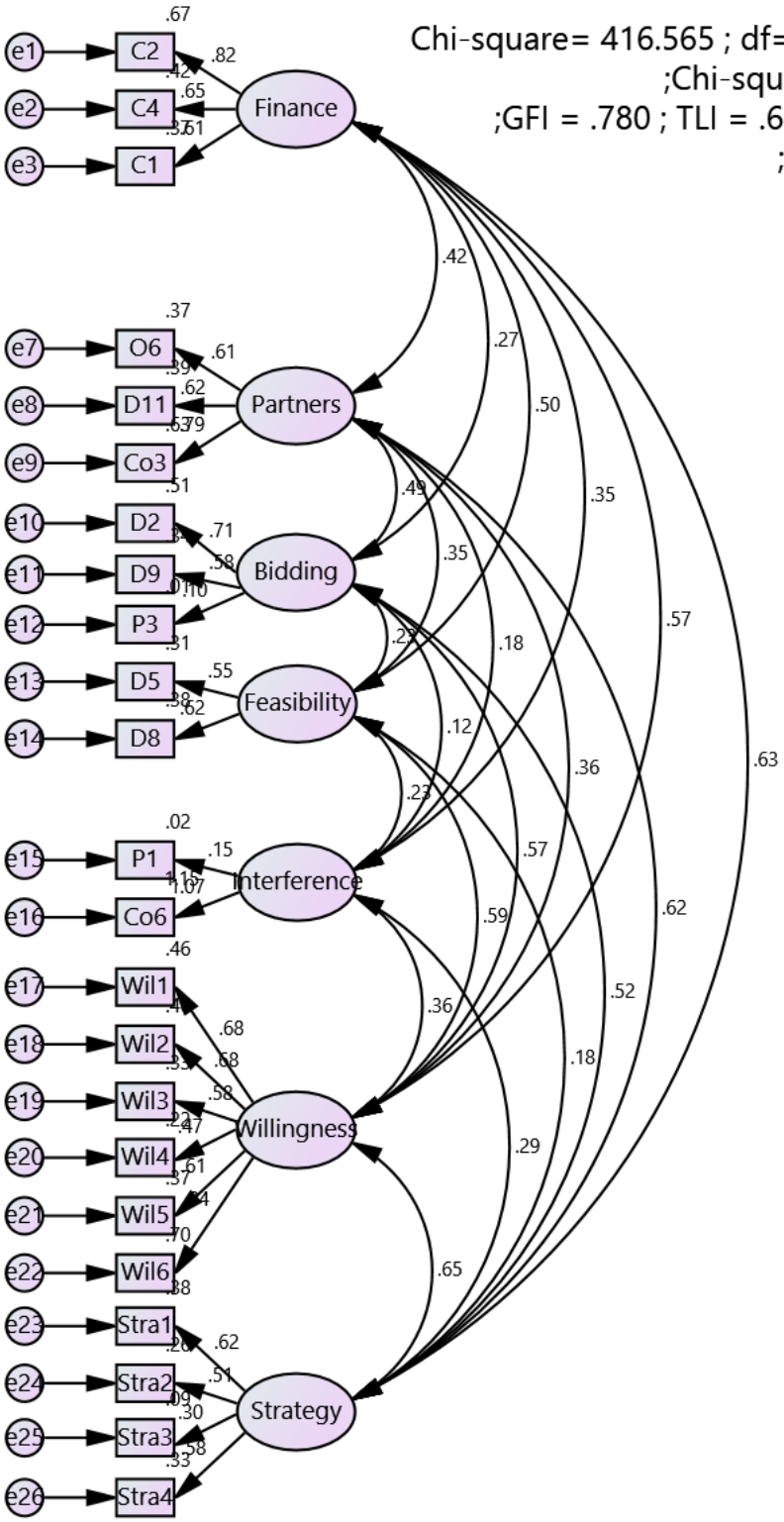



Figure 8-4 Results of standardized the first CFA model

Table 8-9 Standardized regression weights for the first CFA model

| | | | Estimate |
|---|---|---|---|
| C1 | <--- | Finance | 0.606 |
| C4 | <--- | Finance | 0.647 |
| C2 | <--- | Finance | 0.82 |
| Co3 | <--- | Partners' capacity | 0.794 |
| D11 | <--- | Partners' capacity | 0.623 |
| O6 | <--- | Partners' capacity | 0.607 |
| D9 | <--- | Bidding process | 0.584 |
| D2 | <--- | Bidding process | 0.714 |
| D5 | <--- | Feasibility | 0.554 |
| D8 | <--- | Feasibility | 0.62 |
| P1 | <--- | Interference | 0.15 |
| Co6 | <--- | Interference | 1.074 |
| Stra2 | <--- | Responsive strategies | 0.507 |
| Stra1 | <--- | Responsive strategies | 0.617 |
| Wil3 | <--- | Investment Willingness | 0.579 |
| Wil2 | <--- | Investment Willingness | 0.682 |
| Wil1 | <--- | Investment Willingness | 0.679 |
| Wil5 | <--- | Investment Willingness | 0.611 |
| Wil6 | <--- | Investment Willingness | 0.838 |
| Stra4 | <--- | Responsive strategies | 0.578 |
| Wil4 | <--- | Investment Willingness | 0.467 |
| Stra3 | <--- | Responsive strategies | 0.304 |
| P3 | <--- | Bidding process | 0.097 |

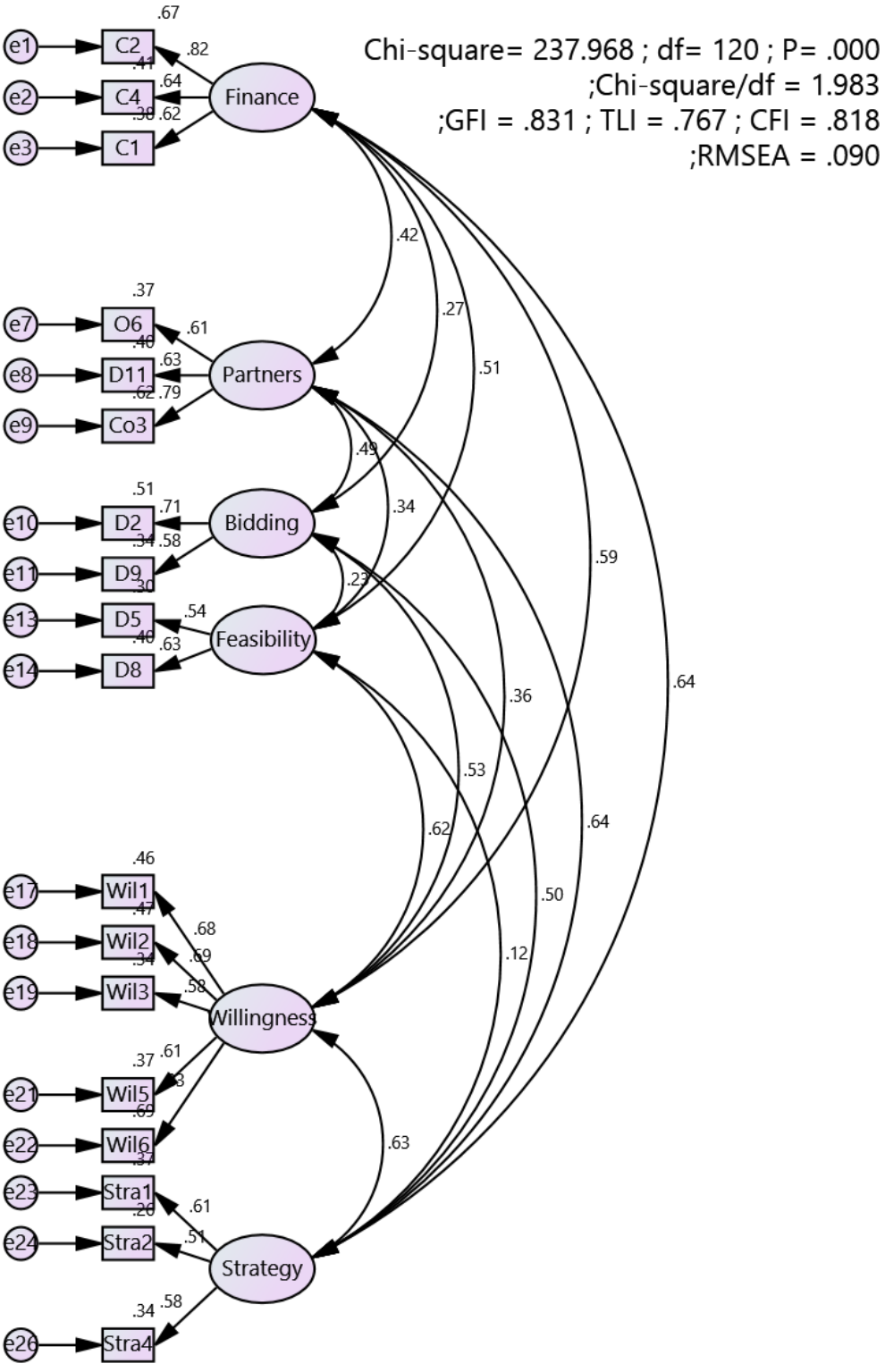



Figure 8-5 Results of standardized the second CFA model

### 8.5.3 Development of RIWAM model by SEM method (Structural model)

Structural equation modeling (SEM) is performed to establish the model for explaining the investment process of private investors. This technique is applied by using AMOS 21.0 software. The SEM is verified by evaluating its appropriateness. If its appropriateness is not satisfactory, it needs to be revised. The appropriateness is assessed form the results of the covariance structural analysis, which is indicated by the goodness-of-fit (GOF) indexes. Figure 8-6 shows the first SEM model, which has the same ratio of $\chi^2/df$ (which was 1.983), TLI (0.767), CFI (0.818), and RMSEA (0.090) with the second CFA model. Table 8-10 highlights the results of the goodness-of-fit tests of the first SEM model. The first SEM model established did not appear to fit well with the data, as it is merely an initial model. Based on this preliminary model, several attempts of refinement are made to improve the model fit. We then test the theoretical or structural models.

***Model modification:*** Two methods can be used to revise the model. The first method involves deleting the path that showed a weak causal relationship, and the second method involves an additional causal relationship (Cho et al., 2009). In this study, the first method is used. This study then uses the modification index, one of the output of AMOS 21.0 software, which is the most widely used method of refining the SEM model.

Based on the regression weights of the first SEM model as shown in Table 8-11, the path relationship among latent variables must have a statistically significant at the 90% confidence level, otherwise we must remove this path from our model.

After testing many different types of model (e.g., delete inappropriate path 'partners' capacity' → 'investment willingness') throughout removing some relationship paths. Apart from reducing certain factors and relationship paths, the modification indexes (covariance) also confirm the presence of interrelations between the error terms of C1 and O6; O6 and D2; O6 and D9; Wil1 and Stra2; Wil2 and Stra2; as well as the error terms of Wil3 and Stra1, and the model should be improved by adding these interrelations. Consequently, the final model (Figure 8-7) which has the fit indexes fall within the recommend intervals, solidifying the reliability of the model (Table 8-10).

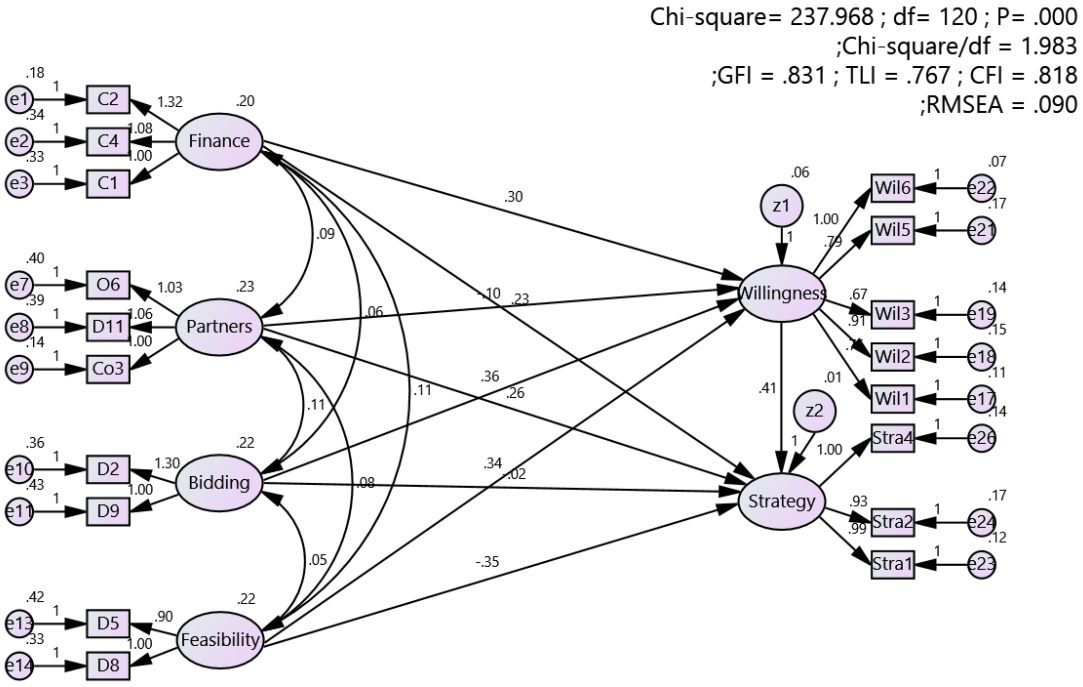



Figure 8-6 Results of the first SEM model

Table 8-10 Goodness-of-fit measure in hypothetical and revised model

| **Goodness-of-fit (GOF) measure** | **Recommended level of GOF measure** | **Hypothetical model (CFA 1)** | **CFA 2 model** | **SEM 1 model** | **SEM 2 model** |
|---|---|---|---|---|---|
| X2/df | Recommended level from 1 to 2 | 1.993 | 1.983 | 1.983 | 1.728 |
| GFI | Goodness of fit | 0.780 | 0.831 | 0.831 | 0.854 |
| NNFI or TLI | 0 (no fit) to 1 (perfect fit) | 0.679 | 0.767 | 0.767 | 0.828 |
| CFI | 0 (no fit) to 1 (perfect fit) | 0.735 | 0.818 | 0.818 | 0.868 |
| RMSEA | <0.05, very good fit; 0.05-0.08, fairly good fit; 0.08-0.10, acceptable fit; >0.1, unacceptable fit | 0.090 | 0.090 | 0.090 | 0.077 |

Table 8-11 Regression weights of the first SEM model

| | | | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| Investment Willingness | <--- | Finance | 0.299 | 0.133 | 2.253 | 0.024 |
| Investment Willingness | <--- | Partners' capacity | -0.102 | 0.123 | -0.83 | 0.407* |
| Investment Willingness | <--- | Bidding | 0.356 | 0.137 | 2.606 | 0.009 |
| Investment Willingness | <--- | Feasibility | 0.344 | 0.16 | 2.149 | 0.032 |
| Responsive strategies | <--- | Finance | 0.233 | 0.12 | 1.946 | 0.052 |
| Responsive strategies | <--- | Partners' capacity | 0.264 | 0.115 | 2.304 | 0.021 |
| Responsive strategies | <--- | Bidding | -0.021 | 0.13 | -0.163 | 0.871* |
| Responsive strategies | <--- | Feasibility | -0.351 | 0.186 | -1.89 | 0.059 |
| Responsive strategies | <--- | Willingness | 0.414 | 0.196 | 2.115 | 0.034 |

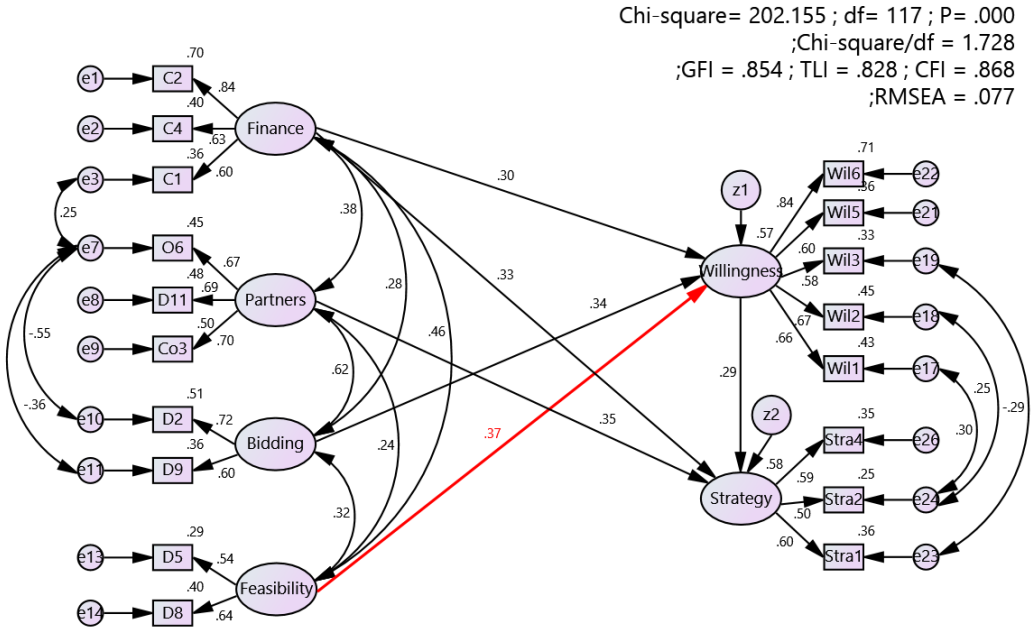



Figure 8-7 Results of the second SEM model

Among the hypothesized relationships, six relationships are confirmed, whereas the other seven relationships are proved as unacceptable. The data verifies only the hypotheses that "finance", "bidding process", and "feasibility" directly influence "investment willingness" of the private sector, and that "finance", "partners' capacity" and "investment willingness" directly influence "responsive strategies" of the private sector (Figure 8-8).

As for risk factors perceptions, the results indicate that the "finance" category can be adequately measured by *interest rate fluctuations* (C2), *inflation* (C4) and *financial market risk* (C1). To determine the "partners' capacity" category, *operator inability*

(O6), *low capacity of concession company (D11)* and *problems due to partner's different practice* (Co3) shall be examined. The "bidding process" category is represented by a *lack of transparency in the bidding* (D2) and *unfair process of selection of the private sector* (D9). Finally, "feasibility" category is represented by *unclear state participation portion* (D5), and *inefficient feasibility study* (D8).

As for investment willingness perceptions, the investment willingness of the private sector should be measured or analyzed throughout many criteria, namely *financing criteria* (Wil1), *profitability* (Wil2), *legal framework* (Wil3), *risk sharing* (Wil5) and *macroeconomics* (Wil6).

Moreover, for the responsive strategies of the private sector, they should consider carefully to carry out approximately responsive strategies such as *cooperation strategies* (Stra1), *financing strategies* (Stra2), and *suggestions for the government* (Stra4).

Table 8-12 Estimates of structural parameters

| Endogenous construct | | Exogenous construct | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| Willingness | <--- | Finance | 0.279 | 0.121 | 2.306 | 0.021* |
| Willingness | <--- | Bidding process | 0.291 | 0.103 | 2.82 | 0.005* |
| Willingness | <--- | Feasibility | 0.321 | 0.153 | 2.092 | 0.036* |
| Strategy | <--- | Finance | 0.205 | 0.098 | 2.089 | 0.037* |
| Strategy | <--- | Partners' capacity | 0.219 | 0.087 | 2.511 | 0.012* |
| Strategy | <--- | Willingness | 0.187 | 0.1 | 1.868 | 0.062** |

*Note: **p<0.1; *p<0.05*

Table 8-13 SEM standardized regression weights

| SEM standardized regression weights | | | Estimate |
|---|---|---|---|
| Willingness | <--- | Finance | 0.30 |
| Willingness | <--- | Bidding process | 0.34 |
| Willingness | <--- | Feasibility | 0.37 |
| Strategy | <--- | Finance | 0.33 |
| Strategy | <--- | Partners' capacity | 0.35 |
| Strategy | <--- | Willingness | 0.29 |

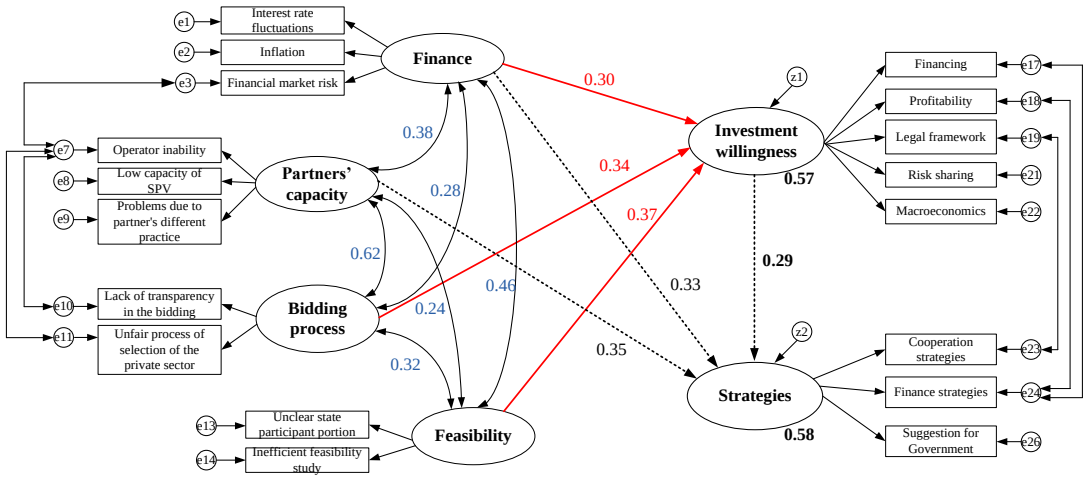



Figure 8-8 Results of risk – based investment willingness assessment model

Standardized coefficients or regression coefficients can be used to calculate estimated value for dependent variables (i.e., investment willingness of private investors). Those values are denoted to as $\hat{y}$. Therefore, within particular values of independent variables (i.e., finance, bidding process, and feasibility), a predicted value for the result can be obtained. In our model, if we take any values for "finance", "bidding process", and "feasibility", we can predict the "investment willingness" of private investors by using the following equation:

$$\hat{y}_{investmentwillingness} = 0.3(finance) + 0.34(bidding) + 0.37(feasibility)$$

Similarly, the predicted values for "responsive strategies" of private sector can be achieved:

$$\hat{y}_{responsivestrategies} = 0.33(finance) + 0.35(partner) + 0.29(investment\ willingness)$$

$$= (0.33 + 0.29 \times 0.3)(finance) + 0.35(partner) + 0.29 \times 0.34(bidding) + 0.29 \times 0.37(feasibility)$$

$$= 0.417(finance) + 0.35(partner) + 0.11(feasibility) + 0.10(bidding)$$

It presents how path analysis in Figure 8-8 can be used to calculate predicted values for "investment willingness" and "responsive strategies" for private investors in PPP projects in Vietnam.

Based on the results of SEM model, “finance”, “bidding process”, and “feasibility” groups directly influence “investment willingness” of the private sector (Figure 8-8). It can be interpreted as if the financial matters, bidding process and feasibility issues worse, the private sector will be an unwillingness to invest in PPP projects. Among the three categories of risk factors influencing investment willingness of the private sector, the “feasibility” category and “bidding process” category (standardized coefficients = 0.37 and 0.34, respectively) are more important than “finance” category (standardized coefficients = 0.30) (Table 8-12). For instance, effective feasibility studies and transparent state participation portion in PPP transportation projects would have massive affects on the private sector to determine whether or not a PPP scheme attractive in the early planning stages.

Additionally, transparency and clarity of the tendering process would go a long way to attracting the participation of private investors. Certainly, lack of transparency in the bidding (Ward and Sussman, 2005) and lack of competitive procurement (Cuttaree, 2008) are common complaints of the private sector in PPP projects. Inequity and fraud in the bidding process are a very common problem in Vietnam (Long et al., 2004). Therefore, the transparency of the tendering process of PPP transportation projects would be a major factor affecting investment decisions of private investors.

Moreover, the situation of financial matters such as financial market, interest rate, and inflation also directly affect the investment decision-making of the private sector. Indeed, the evaluation of their financial viability is the most commonly used industry practice of assessing the potential of the project to achieve the financial targets of its various stakeholders (Pantelias and Zhang, 2010). The more attractive the financial market, the higher possibility of PPP projects (Qiao et al., 2001). It also leads to the readiness of the private sector into PPP projects.

Besides, “finance”, “partners’ capacity”, and “investment willingness” of the private sector have positive influences on “responsive strategies”. The results from Figure 8-8 also shows that positive relationships between “partners’ capacity”, “finance”, and “investment willingness” to “responsive strategies” (standardized coefficient = 0.35, 0.33, 0.29, respectively). According to the predicted values for “responsive strategies” of private sector, “finance”, “partners’ capacity”, “feasibility”, and “bidding process”

issues have optimistic influences on “responsive strategies”. Their estimated coefficients are 0.417, 0.35, 0.11, and 0.10, respectively. The coefficient indexes indicate that “finance” has the biggest impact on “responsive strategies”, whereas “partners’ capacity” is somewhat less, as well as “feasibility” and “bidding process” have the smallest influent. Moreover, this indicates that private investors currently concern about a financial situation and capable partners’ selection when they decide to invest and perform responsive strategies to cope with PPP transportation projects in Vietnam. The financial market in Vietnam is now facing numerous issues, such as state budget, government bonds, ODA, and private capital problems. Vietnamese government does not have the ability to expand state budget funding anymore. Moreover, attracting investment through government bonds is also ineffective because of a low rate of return and illiquidity. Besides, since Vietnam has been excluded from underdeveloped countries list, the ODA fund is limited. Domestic private capital participation is tiny because the government's attitude is inconsistent with private investment. State-owned enterprise companies have performed almost previous BOT/BT/BTO projects in Vietnam. Specifically, the government does not carry out enough guarantees and incentives, as well as the inconsistent between the Vietnamese and international laws. Stock market in Vietnam is still undeveloped, so to get long-term capital, investors could only rely on loans from commercial banks. Mobilized capital from domestic commercial banks is mostly short-term. Thus, it might not be able to meet the needs of private investors.

Table 8-14 highlights the intercorrelations between the four categories of latent risk factors. All the four categories are shown to be intercorrelated to some degrees. Strong interrelations were found between “partners’ capacity” and “bidding process” (correlation coefficient = 0.622); “finance” and “feasibility” (correlation coefficient = 0.463); as well as “finance” and “partners’ capacity” (correlation coefficient = 0.377). The correlation differs from a causal relationship because the change of one variable does not necessarily lead to a change in the other variable (Chen et al., 2012).

Table 8-14 Correlation coefficients between the latent factors

| Correlation path | | | Estimate |
|---|---|---|---|
| Finance | <--> | Partners' capacity | **0.377** |
| Finance | <--> | Bidding process | 0.281 |
| Finance | <--> | Feasibility | **0.463** |
| Partners' capacity | <--> | Bidding process | **0.622** |
| Partners' capacity | <--> | Feasibility | 0.244 |
| Bidding | <--> | Feasibility | 0.325 |
| e24 | <--> | e18 | 0.253 |
| e24 | <--> | e17 | 0.296 |
| e7 | <--> | e10 | -0.547 |
| e3 | <--> | e7 | 0.247 |
| e23 | <--> | e19 | -0.29 |
| e7 | <--> | e11 | -0.363 |

As an SEM model depicts a system of regression equations (Molenaar et al., 2000), a squared multiplied correlation (R-square) is associated with the error term in each equation, as shown in Figure 8-7. The error terms represent the portion of the variables that are not explained. Since the R-square value between the three risk categories and the investment willingness is 0.57, the RIWAM model explains about 57% of the variability in the investment willingness of the private sector. Moreover, the R-square value between finance, partner abilities, investment willingness and responsive strategies is 0.58; the RIWAM model explains about 58% of the variability in responsive strategies of the private sector.

## 8.6 Validation

To confirm the accuracy of evaluation framework model for the investment willingness of the private sector developed in this study, three PPP experts, one from the government, and two from the private sector are invited to participate in the validation interviews. Although the relationships and correlations between variables of the model are subjected to some controversy, interviews agreed with the results and confirm the validity of the eastablished SEM model. All interviewees agree that the four categories of risk factors and their corresponding factors are important to be considered by the

private sector to make investment decisions and to prepare responsive strategies in PPP transportation projects. Some diverse opinions about the order of importance of risk factors in the model still exist among the interviewees. They totally agree that the "feasibility", "finance", and "bidding process" should have the significant impact investment willingness of the private sector, and also the "finance", "partners' capacity" and "investment willingness" of private investors have the essential influence into performing responsive strategies of private investors during initial stages of PPP transportation projects.

The participants are also asked to comment on the inter-correlations between the risk perception groups. They agreed that the "finance", "partner's capacity", "bidding process", and "feasibility" are intercorrelated. It implies the existence of interdependence among various evaluation factors for investment willingness criteria of private investors. For instance, if the financial market is a very advantage for PPP projects, it may increase the possibility of feasibility studies of its project. Then, this might lead to more investment willingness of private investors. The results of validation phase for causal relationships and correlation among latent variables are shown in Table 8-15, and Table 8-16.

As a result, feedbacks from experienced professionals are consistent with the results of this research. Therefore, the results of RIWAM model can help private investors to make decision based on their investment willingness and responsive strategies when assessing the investment into PPP transportation projects in Vietnam.

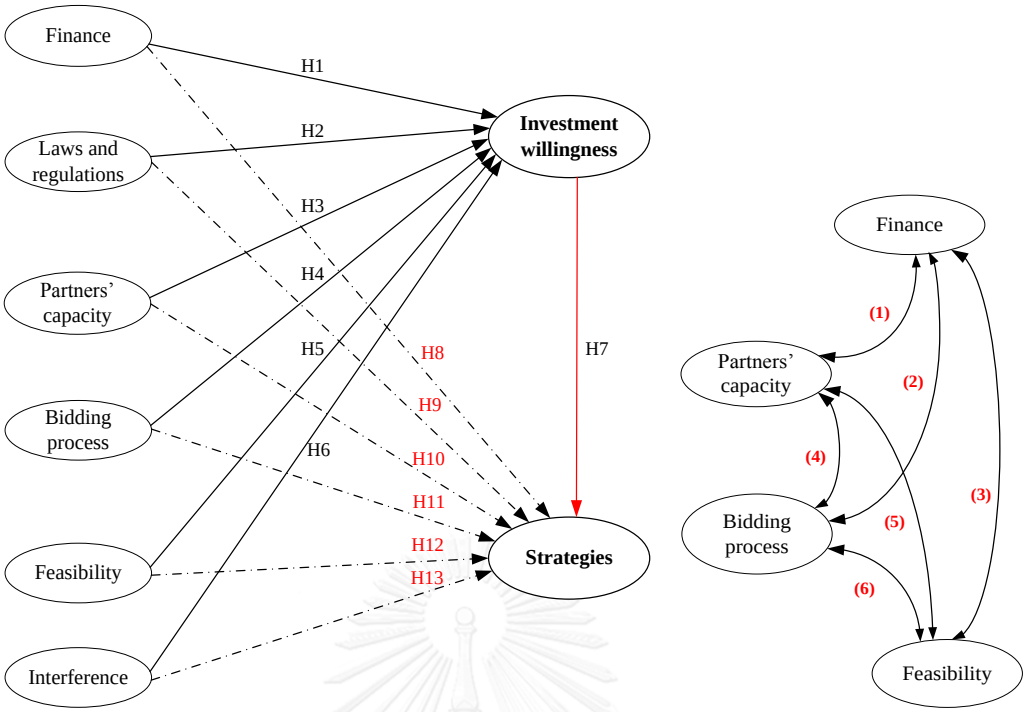



Figure 8-9 Causal relationships and correlation among latent variables in RIWAM model

Table 8-15 Validation for causal relationship among variable groups in a RIWAM model

| | No. | Causal relationship | | | Standardized regression weights | Opinions | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Res1 | Res2 | Res3 |
| RIWAM model | **H1** | Finance | --> | Investment willingness | 0.3 | Okie | Okie | Okie |
| | **H4** | Bidding process | --> | Investment willingness | 0.34 | Okie | Okie | Okie |
| | **H5** | Feasibility | --> | Investment willingness | 0.37 | Okie | Okie | - |
| | **H7** | Investment willingness | --> | Responsive strategies | 0.29 | Okie | Okie | Okie |
| | **H8** | Finance | --> | Responsive strategies | 0.33 | Okie | Okie | Okie |
| | **H10** | Partners' capacity | --> | Responsive strategies | 0.35 | Okie | Okie | Okie |
| Remaining | **H2** | Laws and regulations | --> | Investment willingness | - | Okie | Okie | Okie |
| | **H3** | Partners' capacity | --> | Investment willingness | - | - | Okie | - |
| | **H6** | Interference | --> | Investment willingness | - | Okie | - | - |
| | **H9** | Laws and regulations | --> | Responsive strategies | - | Okie | Okie | - |
| | **H11** | Bidding process | --> | Responsive strategies | - | - | - | - |
| | **H12** | Feasibility | --> | Responsive strategies | - | - | - | Okie |
| | **H13** | Interference | --> | Responsive strategies | - | - | Okie | - |

Table 8-16 Validation for correlation among variable groups in a RIWAM model

| No. | Correlation | | Correlation coefficients | Opinions | | |
|---|---|---|---|---|---|---|
| | | | | Res1 | Res2 | Res3 |
| **1** | Finance | <--> Partners' capacity | 0.377 | Okie | Okie | Okie |
| **2** | Finance | <--> Bidding process | 0.281 | Okie | Okie | Okie |
| **3** | Finance | <--> Feasibility | 0.463 | Okie | Okie | Okie |
| **4** | Partners' capacity | <--> Bidding process | 0.622 | Okie | Okie | Okie |
| **5** | Partners' capacity | <--> Feasibility | 0.244 | Okie | Okie | Okie |
| **6** | Bidding | <--> Feasibility | 0.325 | Okie | Okie | Okie |

## 8.7 Conclusion

The PPP form has been proclaimed as bringing a new age to infrastructure development in Vietnam. New PPP regulations are expected to open up opportunities for foreign and domestic investors to penetrate into new markets in Vietnam. However, the risky environment of the PPP transportation projects in Vietnam are extremely critical and thus be considered to be barriers to attracting further investment capitals from private investors. This research establishes a risk-based investment willingness assessment model for evaluating the influence of risk factors on the investment willingness of the private sector. Critical risk factors, significant willingness attributes and responsive strategies of the private sector towards investment environment risk are then recognized.

Firstly, thirty-three risk factors are identified specifically for previous PPP transportation projects. Factor analysis uncovered that these risk factors can be grouped under six components, namely finance, laws and regulations, partners' capacity, bidding process, feasibility, and interference. The determinants of the private sector's investment willingness can be assessed throughout six key attributes as financing, profitability, legal framework, partner selection, risk sharing, and macroeconomics. Moreover, the responsive strategies of private investors can be analyzed by assessing four strategies, namely cooperation, finance, evaluation, suggestions for the government. Through the structural equation model (SEM) approach, data attained from a questionnaire survey conducted in Vietnam is analyzed and an RIWAM model is developed to examine the relationships between different risk factors affecting a PPP transportation project, investment willingness and responsive strategies of the private

sector. The results indicate that “feasibility”, “bidding process”, and “finance” aspects have a positive influence on the investment willingness of the private sector in PPP projects, and thus, are the determinants factors for attracting investment from the private sector. “Partners’ capacity”, “finance” matters, and “investment willingness” of the private sector have a strong influence on responsive strategies of investors. Finally, the results of RIWAM model examined how to incorporate risk perceptions with investment willingness and responsive strategies for the private sector in PPP transportation projects which have rarely been made in previous research.

A successful PPP scheme should satisfy the needs of the community, the government, as well as the private sector. In this research, the SEM model can clarify the sector’s perceptions of risk factors affecting the performance of PPP transportation projects and also their responsive actions/strategies. Revelations of the viewpoints and requirements of the private sector in PPP transportation project investment play a supportive role in establishing necessary policies to attract both domestic and foreign private investors.

# CHAPTER 9
# AN INVESTMENT DECISION-MAKING ASSISTANT TOOL (DMAT) FOR PRIVATE INVESTORS

This chapter defines a decision-making assistant tool (DMAT) to help private investors to make investment decisions during the tendering process for Public-Private Partnership (PPP) transportation projects in Vietnam. The first part describes the necessity of a decision-making supporting tool during the investment decision process of private investors. The next section introduces the research framework and collection data for DMAT tool. The third section defines the weight assignment for such investment willingness attributes and criteria in this DMAT tool. Then the fourth part shows how to use DMAT tool to help private investors to make investment decisions into potential PPP transportation projects. Finally, discussion about results is to show the advantages and disadvantages of DMAT tool.

## 9.1 An investment decision-making assessment tool

One of the most critical factors in winning PPP contracts is to identify and select the right projects on the list of potential PPP projects in each host country. Private investors can choose and propose proposals for their interesting projects or initiate competitive tenders for specific PPP projects. Thus, the private sector must be cautious in selecting the right project to prepare the proposal. In this research, twenty-eight investment willingness criteria are identified and applied to a decision-making assessment tool (DMAT) to support private investors in their investment decision-making process. A list of investment willingness criteria is shown in Chapter 5. The investment decision-making process of private investors in PPP transportation projects is shown in Figure 9-1. The DMAT tool will support the private sector to answer the significant question:

‘Should the private sector be willing to participate in the tendering process of PPP transportation projects?”

As can be seen, private investors make their investment decisions after analyzing potential tender documents to analysis the feasibility of such potential PPP projects

(Figure 9-2) in the list of PPP projects. The DMAT tool can propose a multiple attribute decision-making (MADM) method to analyze the feasibility level of such PPP projects. This tool can support decision makers who encounter numerous and conflicting alternatives to make an optimal decision. To achieve this purpose, the relative weights of investment willingness criteria and the preference structure of decision makers should be identified.

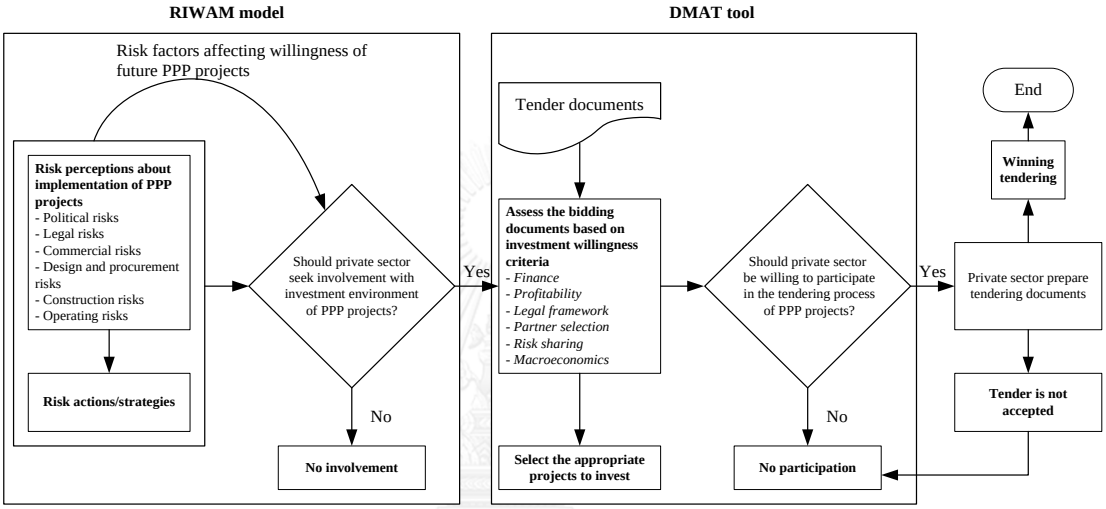



Figure 9-1 Decision-making process of private investors

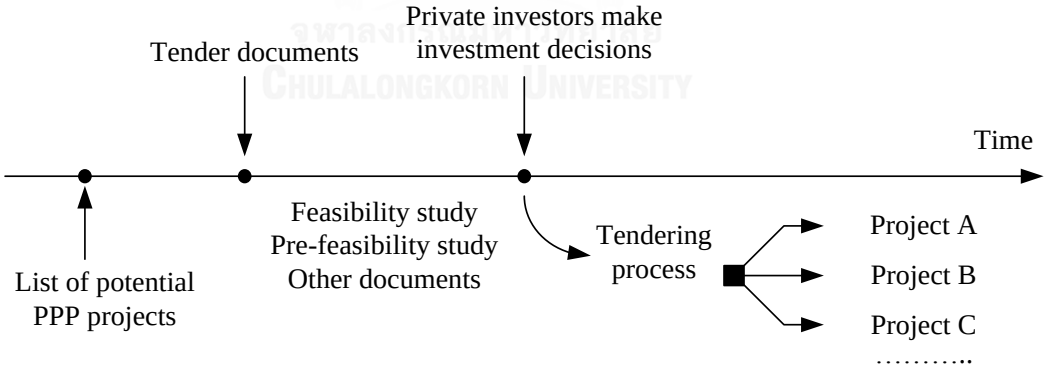



Figure 9-2 The investment decisions period of private investors

## 9.2 Reliability analysis of scale

To check the reliability of each item asked in each group of investment willingness attributes, the Cronbach Alpha scores for such groups is considered. The obtained

Alpha scores of financing, profitability, legal framework, partner selection, risk sharing, macroeconomics attributes are calculated by SPSS 22 of 0.673, 0.600, 0.610, 0.656, 0.625, and 0.649, respectively. It is found that the Cronbach Alpha coefficient of each group is higher than 0.6 which indicates that the scale has fine internal consistency (the minimum acceptable can be more than 0.60 (Slater, 1995)). For instance, considering the reliability table of the "financing criteria" investment willingness attributes as shown in Table 9-1, under the "Cronbach's Alpha if Item Deleted" the reliability of 0.671 is the highest (less than 0.673). So it is not required to delete any item to enhance the reliability of this scale.

Table 9-1 Reliability statistics for "financing criteria" investment willingness attributes

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .673 | 5 |

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Ability to supply capital for the project | 15.3984 | 3.815 | 0.378 | 0.644 |
| Credibility to call loan for the project | 15.4065 | 3.407 | 0.531 | 0.580 |
| Ability to fund initial project costs | 15.9187 | 3.124 | 0.525 | 0.574 |
| Efficiency of domestic capital market | 16.4878 | 3.613 | 0.392 | 0.638 |
| Suitability of equity/debt ratio | 15.9756 | 3.401 | 0.340 | 0.671 |



## 9.3 Weight assignment for criteria and attributes of investment willingness factors by FAHP method

The process of DMAT tool consists of seven steps as shown in Figure 9-3 as following

### Step 1: Develop the hierarchical structures

The hierarchy structure adopted in this study to deal with problems of investment decision-making into PPP transportation projects is shown in Figure 9-4. The key attributes and criteria are derived through literature review and consultation with several experts.

Given a set of decision makers, $K = \{D_1, D_2, D_3\}$, a set of alternatives, $A = \{A_1, A_2, \dots, A_m\}$, and a set of criteria, $C = \{C_1, C_2, \dots, C_n\}$, where $X = \{x_{ij}, i =$

$1,2,\dots,m; j = 1,2,\dots,n\}$ denotes the set of performance ratings and $W = \{W_1, W_2, \dots, W_n\}$ is the set of weights of investment willingness criteria.

**Step 2: Develop fuzzy judgment matrix using pairwise comparisons (FAHP)**

For illustration purpose, a comparison is sought between six attributes as shown in Figure 9-4, $X_{1,1}^2, X_{2,1}^2, X_{3,1}^2, X_{4,1}^2, X_{5,1}^2$and $X_{6,1}^2$, using the relative importance given in Table 3-2; the opinion of the first respondent let the level of importance (or dominance) of $X_{1,1}^2$ to $X_{2,1}^2$ is a fuzzy number $\tilde{2}$, $X_{1,1}^2$ to $X_{3,1}^2$ is a fuzzy number $\tilde{1}$; $X_{1,1}^2$to $X_{4,1}^2$ is a fuzzy number $\tilde{2}$; $X_{1,1}^2$ to $X_{5,1}^2$ is a fuzzy number $\tilde{2}$; and $X_{1,1}^2$ to $X_{6,1}^2$ is a fuzzy number $\tilde{3}$. The judgment matrix $\tilde{J}$ of the first respondent is populated as following:

$\tilde{J}=$

| | $X_{1,1}^2$ | $X_{2,1}^2$ | $X_{3,1}^2$ | $X_{4,1}^2$ | $X_{5,1}^2$ | $X_{6,1}^2$ |
|---|---|---|---|---|---|---|
| $X_{1,1}^2$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{3}$ |
| $X_{2,1}^2$ | $1/\tilde{2}$ | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{2}$ |
| $X_{3,1}^2$ | $\tilde{1}$ | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{3}$ |
| $X_{4,1}^2$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| $X_{5,1}^2$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ |
| $X_{6,1}^2$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{3}$ | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |

The concept of fuzzification factor Δ is introduced in Table 3-2. For this example, the value of fuzzification factor Δ is assumed "1", i.e., $\tilde{3}$ meaning a TFN (2,3,4). So the judgment matrix $\tilde{J}$ of the first respondent is

$\tilde{J}=$

| | $X_{1,1}^2$ | $X_{2,1}^2$ | $X_{3,1}^2$ | $X_{4,1}^2$ | $X_{5,1}^2$ | $X_{6,1}^2$ |
|---|---|---|---|---|---|---|
| $X_{1,1}^2$ | (1,1,1) | (1,2,3) | (1,1,1) | (1,2,3) | (1,2,3) | (2,3,4) |
| $X_{2,1}^2$ | (1/3,1/2,1) | (1,1,1) | (1,1,1) | (1,2,3) | (1,2,3) | (1,2,3) |
| $X_{3,1}^2$ | (1,1,1) | (1,1,1) | (1,1,1) | (1,2,3) | (1,2,3) | (2,3,4) |
| $X_{4,1}^2$ | (1/3,1/2,1) | (1/3,1/2,1) | (1/3,1/2,1) | (1,1,1) | (1/3,1/2,1) | (1,1,1) |
| $X_{5,1}^2$ | (1/3,1/2,1) | (1/3,1/2,1) | (1/3,1/2,1) | (1,2,3) | (1,1,1) | (1,2,3) |
| $X_{6,1}^2$ | (1/4,1/3,1/2) | (1/3,1/2,1) | (1/4,1/3,1/2) | (1,1,1) | (1/3,1/2,1) | (1,1,1) |

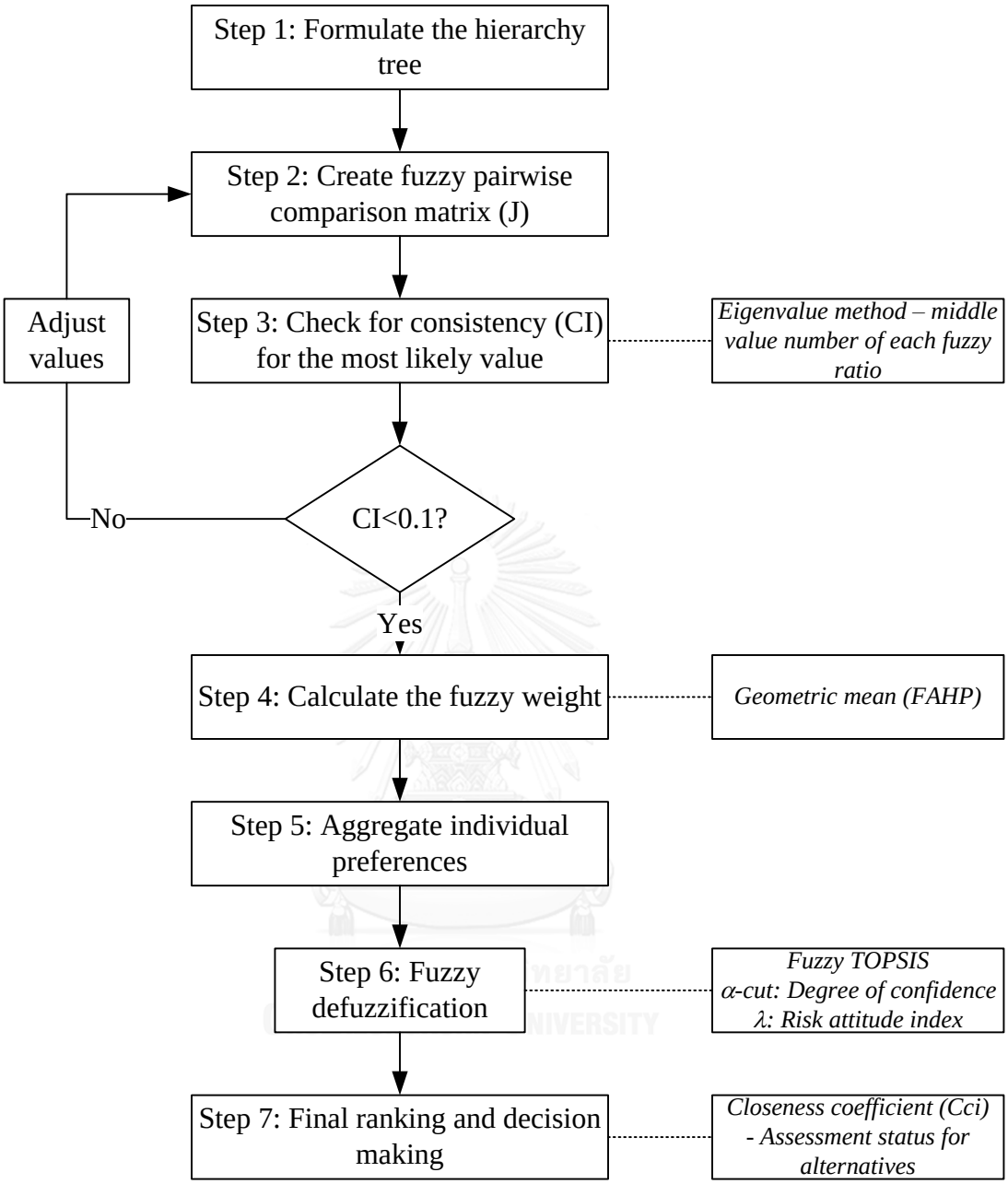



Figure 9-3 The structure process of DMAT tool

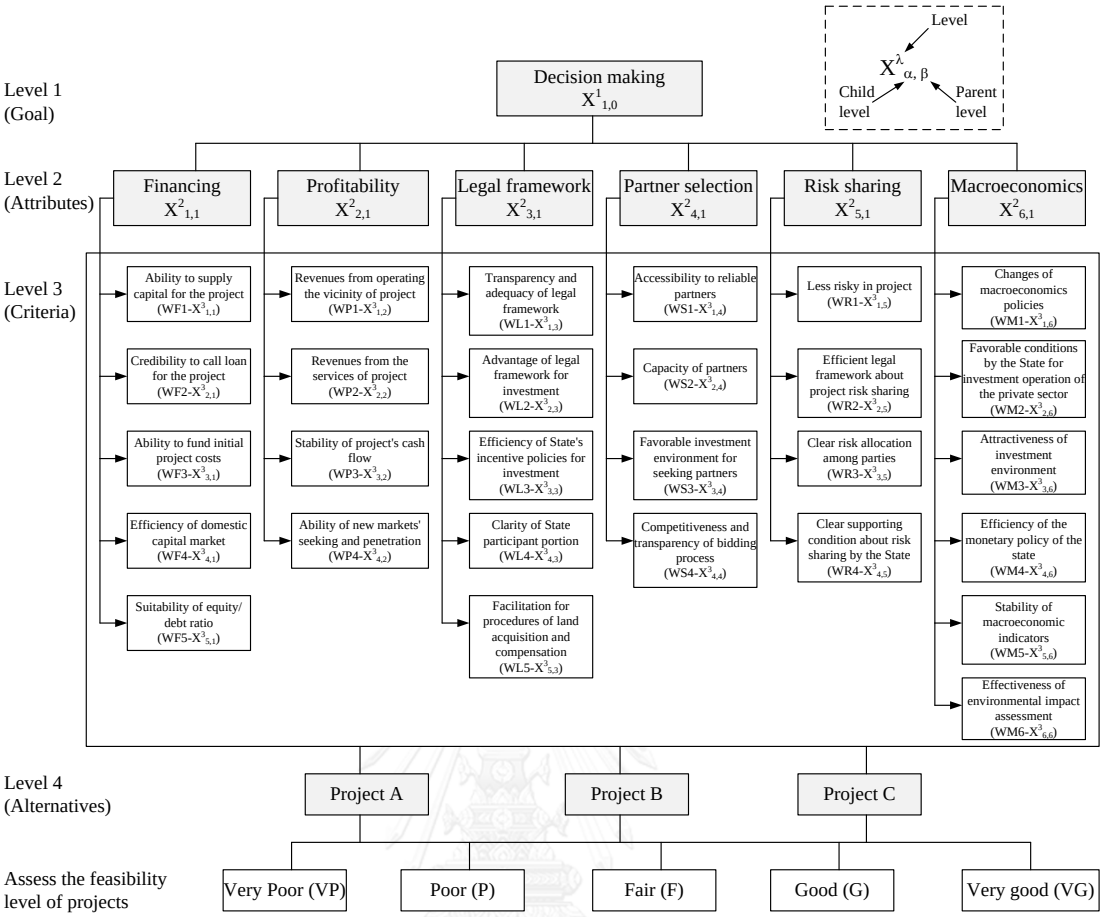



Figure 9-4 The hierarchy structure for investment decision alternatives assessment

**Step 3: Check for consistency (CI)**

Buckley (1985) has proved that if a reciprocal matrix by using crisp number is consistent, then the corresponding matrix by using fuzzy ratios is also consistent. The large eigenvalue method is used to judge the consistency of the matrixes that adopted the middle number of each fuzzy ratio as the crisp representative ratio. (Stated by Li and Zou, 2011).

Following the example of the judgment matrix of the first respondent illustrated in Step 2, the CI is computed. The eigenvalue evaluated is $\lambda_{max} = 6.115$. Thus, for n=6, the CI = 0.023 and the random index, RI=1.25. Finally, the consistency ratio CR (=CI/RI) is computed to be 1.8% (<10%) (see Table 9-2). This value is below the 10% threshold, and hence, the judgment matrix is acceptable. The same procedure is followed throughout the hierarchical structure.

Table 9-2 Consistency ratio of the judgment matrix of the first respondent

| | $X^2_{1,1}$ | $X^2_{2,1}$ | $X^2_{3,1}$ | $X^2_{4,1}$ | $X^2_{5,1}$ | $X^2_{6,1}$ | Multiply | N$^{th}$ root | Normalized | Priority | $\lambda$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $X^2_{1,1}$ | 1 | 2 | 1 | 2 | 2 | 3 | 24 | 1.698 | 0.260 | 1.593 | 6.138 |
| $X^2_{2,1}$ | 1/2 | 1 | 1 | 2 | 2 | 2 | 4 | 1.260 | 0.193 | 1.187 | 6.163 |
| $X^2_{3,1}$ | 1 | 1 | 1 | 2 | 2 | 3 | 12 | 1.513 | 0.231 | 1.401 | 6.057 |
| $X^2_{4,1}$ | 1/2 | 1/2 | 1/2 | 1 | 1/2 | 1 | 1/16 | 0.630 | 0.096 | 0.590 | 6.130 |
| $X^2_{5,1}$ | 1/2 | 1/2 | 1/2 | 2 | 1 | 2 | 1/2 | 0.891 | 0.136 | 0.839 | 6.159 |
| $X^2_{6,1}$ | 1/3 | 1/2 | 1/3 | 1 | 1/2 | 1 | 1/36 | 0.550 | 0.084 | 0.508 | 6.044 |
| **$\lambda_{max} = 6.115$** | | | **CI = 0.02** | | | | **RI = 1.25** | | **CR = 0.018 < 0.1** | | |

**Step 4: Calculate the fuzzy weight**

**The combination of experts' judgments:** This research synthesizes all 17 experts' judgments to be a comprehensive judgment. This comprehensive judgment could represent the opinions of the entire group of experts for the multiple criteria decision. The geometric mean method could be used to calculate triangular fuzzy numbers from the judgments of experts as equations suggested by Meixner (2009):

$$l_{ij} = \left(\prod_{k=1}^{k} l_{ijk}\right)^{1/k} ; m_{ij} = \left(\prod_{k=1}^{k} m_{ijk}\right)^{1/k} ; r_{ij} = \left(\prod_{k=1}^{k} r_{ijk}\right)^{1/k}$$

Where $(l_{ijk}, m_{ijk}, r_{ijk})$ = triangular fuzzy numbers evaluated by the k$^{th}$ expert.

Fuzzy arithmetic operations (described in Table 3-4) are utilized over matrix J to compute the fuzzy weights.

Then, based on the geometric mean technique, the fuzzy geometric mean and fuzzy weights of such attributes and criteria are defined as follows:

$$\tilde{J}_i = (\tilde{J}_{i1} \otimes \ldots \otimes \tilde{J}_{in})^{1/n}$$

$$\widetilde{w}_i = \tilde{J}_i \otimes (\tilde{J}_1 \oplus \ldots \oplus \tilde{J}_n)^{-1}$$

Where $\widetilde{w}_i$ is the fuzzy weight ($i = 1$ to $n$).

- According to the results from interviewing with 17 the private sector's experts about the measurement scale of investment willingness criteria, a combination of expert's judgment is constructed. For instance, pairwise comparison matrices of 17 experts for six investment willingness attributes are as follows:

Respondent 1

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil2** | $1/\tilde{2}$ | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{2}$ |
| **Wil3** | $\tilde{1}$ | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil4** | $1/\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil5** | $1/\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{3}$ | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |

Respondent 2

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{1}$ | $1/\tilde{4}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{2}$ |
| **Wil2** | $\tilde{1}$ | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil3** | $\tilde{4}$ | $\tilde{3}$ | $\tilde{1}$ | $\tilde{5}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil4** | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{5}$ | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ |
| **Wil5** | $1/\tilde{2}$ | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{3}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | $1/\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ |

Respondent 3

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $x$ | $\tilde{2}$ | $\tilde{3}$ | $\tilde{2}$ | $1/\tilde{2}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $1/\tilde{2}$ | $1/\tilde{4}$ | $1/\tilde{2}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{3}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 4

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{2}$ | $1/\tilde{3}$ | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{4}$ | $1/\tilde{3}$ | $\tilde{1}$ | $1/\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{5}$ | $\tilde{4}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 5

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{4}$ | $\tilde{3}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $1/\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 6

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{2}$ | $\tilde{3}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{5}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{3}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 7

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| Wil1 | $\tilde{1}$ | $1/\tilde{2}$ | $1/\tilde{3}$ | $\tilde{2}$ | $\tilde{4}$ | $\tilde{3}$ |
| Wil2 | | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{5}$ | $\tilde{3}$ |
| Wil3 | | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{6}$ | $\tilde{4}$ |
| Wil4 | | | | $\tilde{1}$ | $\tilde{4}$ | $\tilde{2}$ |
| Wil5 | | | | | $\tilde{1}$ | $1/\tilde{3}$ |
| Wil6 | | | | | | $\tilde{1}$ |

Respondent 8

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{4}$ | $1/\tilde{3}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{4}$ | $1/\tilde{2}$ | $1/\tilde{3}$ | $\tilde{1}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{5}$ | $\tilde{3}$ | $\tilde{6}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{3}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 9

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $\tilde{3}$ | $1/\tilde{3}$ | $1/\tilde{2}$ |
| **Wil2** | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{7}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{5}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{6}$ | $1/\tilde{4}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 10

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{2}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{3}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{2}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 11

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{2}$ | $1/\tilde{4}$ | $1/\tilde{3}$ | $\tilde{2}$ | $1/\tilde{2}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{5}$ | $1/\tilde{4}$ | $\tilde{2}$ | $1/\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{5}$ | $\tilde{3}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{4}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $1/\tilde{3}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 12

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{3}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 13

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{3}$ | $\tilde{3}$ | $\tilde{4}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 15

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{1}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{4}$ | $1/\tilde{3}$ | $1/\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $1/\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil4** | | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{1}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 14

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{4}$ | $\tilde{3}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{2}$ | $1/\tilde{2}$ | $1/\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $\tilde{1}$ | $\tilde{1}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{2}$ | $1/\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{1}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 16

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{3}$ | $1/\tilde{2}$ | $\tilde{4}$ | $\tilde{1}$ | $\tilde{3}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{3}$ | $\tilde{2}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil3** | | | | $\tilde{5}$ | $\tilde{2}$ | $\tilde{3}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

Respondent 17

| | Wil1 | Wil2 | Wil3 | Wil4 | Wil5 | Wil6 |
|---|---|---|---|---|---|---|
| **Wil1** | $\tilde{1}$ | $\tilde{4}$ | $\tilde{2}$ | $\tilde{3}$ | $\tilde{1}$ | $\tilde{2}$ |
| **Wil2** | | $\tilde{1}$ | $1/\tilde{3}$ | $1/\tilde{2}$ | $1/\tilde{4}$ | $1/\tilde{2}$ |
| **Wil3** | | | $\tilde{1}$ | $\tilde{2}$ | $1/\tilde{2}$ | $\tilde{2}$ |
| **Wil4** | | | | $\tilde{1}$ | $1/\tilde{2}$ | $\tilde{1}$ |
| **Wil5** | | | | | $\tilde{1}$ | $\tilde{2}$ |
| **Wil6** | | | | | | $\tilde{1}$ |

- Elements of the synthetic pairwise comparison matrix were calculated using the geometric mean method suggested by Buckley (1985), that is: $\tilde{a}_{ij} = (\tilde{a}_{ij}^1 \otimes \tilde{a}_{ij}^2 \otimes \tilde{a}_{ij}^3 \otimes \ldots \otimes \tilde{a}_{ij}^{17})^{1/17}$, for $\tilde{a}_{12}$ as an example:

$$\tilde{a}_{12} = \left[\tilde{2} \otimes \tilde{1} \otimes \tilde{2} \otimes \ldots \otimes \tilde{4}\right]^{\frac{1}{17}} = \left((1,2,3) \otimes (1,1,1) \otimes (1,2,3) \otimes \ldots \otimes (3,4,5)\right)^{\frac{1}{17}}$$

$$= \left((1 \times 1 \times 1 \times \ldots \times 3)^{\frac{1}{17}}, (2 \times 1 \times 2 \times \ldots \times 4)^{\frac{1}{17}}, (3 \times 1 \times 3 \times \ldots \times 5)^{\frac{1}{17}}\right)$$

$$= (1.165, 1.770, 2.464).$$

The same procedure can obtain the other matrix elements. Thus, the synthetic pairwise comparison matrices of the 17 experts can be constructed as shown in Table 9-3.

Table 9-3 The synthetic pairwise comparison matrix of investment willingness attributes

| | **Wil1** | **Wil2** | **Wil3** | **Wil4** | **Wil5** | **Wil6** |
|---|---|---|---|---|---|---|
| **Wil1** | (1, 1, 1) | (1.165, 1.770, 2.464) | (0.670, 0.928, 1.299) | (1.340, 1.994, 2.694) | (1.177, 1.838, 2.537) | (1.409, 2.246, 3.218) |
| **Wil2** | (0.406, 0.565, 0.858) | (1, 1, 1) | (0.464, 0.597, 0.796) | (0.682, 1.033, 1.571) | (0.691, 0.950, 1.317) | (0.852, 1.303, 1.928) |
| **Wil3** | (0.770, 1.077, 1.492) | (1.256, 1.676, 2.154) | (1, 1, 1) | (1.268, 2.038, 2.938) | (0.986, 1.467, 2.175) | (1.404, 1.928, 2.515) |
| **Wil4** | (0.371, 0.502, 0.747) | (0.637, 0.968, 1.467) | (0.340, 0.491, 0.788) | (1, 1, 1) | (0.566, 0.804, 1.201) | (0.762, 1.185, 1.735) |
| **Wil5** | (0.394, 0.544, 0.850) | (0.759, 1.053, 1.448) | (0.46, 0.682, 1.014) | (0.833, 1.243, 1.768) | (1, 1, 1) | (0.810, 1.330, 1.941) |
| **Wil6** | (0.311, 0.445, 0.710) | (0.519, 0.767, 1.174) | (0.398, 0.519, 0.712) | (0.576, 0.844, 1.312) | (0.515, 0.752, 1.235) | (1, 1, 1) |

- Therefore, for $X_{1,1}^2, X_{2,1}^2, X_{3,1}^2, X_{4,1}^2, X_{5,1}^2$and $X_{6,1}^2$ attributes, the fuzzy weights of attributes for investment willingness of private sector are computed as:

$$\tilde{J}_1 = (\tilde{a}_{11} \otimes \tilde{a}_{12} \otimes \tilde{a}_{13} \otimes \tilde{a}_{14} \otimes \tilde{a}_{15} \otimes \tilde{a}_{16})^{\frac{1}{6}}$$

$$= ((1,1,1) \otimes (1.165, 1.770, 2.464) \otimes \ldots \otimes (1.409, 2.246, 3.218))^{\frac{1}{6}}$$

$$= \Big( (1 \times 1.165 \times \ldots \times 1.409)^{\frac{1}{6}}, (1 \times 1.770 \ldots \times 2.246)^{\frac{1}{6}}, (1 \times 2.464 \times \ldots \times 3.218)^{\frac{1}{6}} \Big) = (1.096, 1.543, 2.032).$$

Likewise, we can obtain the remaining $\tilde{J}_i$, that is,

$\tilde{J}_2 = (0.650, 0.869, 1.182)$; $\tilde{J}_3 = (1.092, 1.478, .930)$; $\tilde{J}_4 = (0.571, 0.781, 1.103)$;

$\tilde{J}_5 = (0.673, 0.930, 1.274)$; $\tilde{J}_6 = (0.517, 0.695, 0.993)$

The weight of each attribute can be obtained as follows:

$$\widetilde{w}_{a1} = \tilde{J}_1 \otimes (\tilde{J}_1 \oplus \tilde{J}_2 \oplus \tilde{J}_3 \oplus \tilde{J}_4 \oplus \tilde{J}_5 \oplus \tilde{J}_6)^{-1}$$

$$= (1.096, 1.543, 2.032) \otimes (4.599, 6.296, 8.514)^{-1} = (0.129, 0.245, 0.442)$$

Where $\widetilde{w}_{a1}$ is local weight of a "financing" attribute

Likewise, the local weight of "profitability", "legal framework", "partner selection", "risk sharing", and "macroeconomics" attributes are constructed

$\widetilde{w}_{a2} = (0.076,0.138,0.257)$; $\widetilde{w}_{a3} = (0.128,0.235,0.420)$;

$\widetilde{w}_{a4} = (0.067,0.124,0.240)$; $\widetilde{w}_{a5} = (0.079,0.148,0.277)$;

$\widetilde{w}_{a6} = (0.061,0.110,0.216)$.

Sum of the most likely values of weights $\widetilde{w}_{ax}$, $x = 1,2,3,4$, is equal to 1 (0.245 + 0.138 + 0.235 + 0.124 + 0.148 + 0.110 = 1), which is the basic axiom of AHP. Therefore, crisp AHP is a special case of FAHP, when fuzzification factor reduces to zero. The difference between sum of minimum value 0.540 (0.129+ 0.076+ 0.128+ 0.067+ 0.079+ 0.061) and the maximum value 1.851 (0.442+ 0.257+ 0.420+ 0.240+ 0.277+ 0.216) represent a range of uncertainty or fuzziness in the computed weight, and can be viewed as belief and plausibility, respectively.

- To employ the center of area (CoA) method to compute the best non-fuzzy performance (BNP) value of the fuzzy weights for each attribute:

Taking the BNP value of the weight of Financing attribute (WF) for the private sector as an example, the calculation process is as follows.

$\widetilde{w}_{a1} = (0.129,0.245,0.442)$

$BNP_{wa1} = [(Uw_{a1} - Lw_{a1}) + (Mw_{a1} - Lw_{a1})]/3 + Lw_{a1}$

$= [(0.442 - 0.129) + (0.245 - 0.129)]/3 + 0.129 \ = 0.272$

Similarly, the weights for the remaining attributes and criteria for investment willingness of the private sector can be shown in Table 9-4. The composite fuzzy weightings of each criterion $W_{axj}$ in the each attribute need to be computed by using equation:

$W_{axj} = w_{ax} \times w_j$

Where l = [1,2,…,a] (attribute); j = [1,2,…,n]; n: number of criteria of each attribute l

Table 9-4. The weights of the attributes and criteria of investment willingness of the private sector

| Code | Attribute/Criteria Ref. | Local Weight | | | Overall Weight | | | Weight (BNP method) | | Rank | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $w_{ax}/w_j$ | | | $W_{axj} = w_{ax} \times w_j$ | | | $C_{ax}$ | $C_j$ | $C_a$ | $C_{aj}$ |
| **FINANCING ATTRIBUTE** | | **0.129** | **0.245** | **0.442** | | | | **0.272** | | **1** | |
| WF1 | Ability to supply capital for the project | 0.212 | 0.318 | 0.458 | 0.027 | 0.078 | 0.202 | | 0.102 | | 1 |
| WF2 | Credibility to call loan for the project | 0.174 | 0.264 | 0.388 | 0.022 | 0.065 | 0.171 | | 0.086 | | 2 |
| WF3 | Ability to fund initial project costs | 0.112 | 0.164 | 0.246 | 0.014 | 0.040 | 0.109 | | 0.054 | | 11 |
| WF4 | Efficiency of domestic capital market | 0.072 | 0.105 | 0.164 | 0.009 | 0.026 | 0.072 | | 0.036 | | 18 |
| WF5 | Suitability of equity/debt ratio | 0.102 | 0.150 | 0.233 | 0.013 | 0.037 | 0.103 | | 0.051 | | 12 |
| **PROFITABILITY ATTRIBUTE** | | **0.076** | **0.138** | **0.257** | | | | **0.157** | | **4** | |
| WP1 | Revenues from operating the vicinity of project | 0.101 | 0.142 | 0.212 | 0.008 | 0.020 | 0.055 | | 0.027 | | 26 |
| WP2 | Revenues from the services of project | 0.202 | 0.302 | 0.446 | 0.015 | 0.042 | 0.115 | | 0.057 | | 8 |
| WP3 | Stability of project's cash flow | 0.235 | 0.345 | 0.495 | 0.018 | 0.048 | 0.127 | | 0.064 | | 6 |
| WP4 | Ability of new markets' seeking and penetration | 0.140 | 0.211 | 0.320 | 0.011 | 0.029 | 0.082 | | 0.041 | | 16 |
| **LEGAL FRAMEWORK ATTRIBUTE** | | **0.128** | **0.235** | **0.420** | | | | **0.261** | | **2** | |
| WL1 | Transparency and adequacy of legal framework | 0.120 | 0.178 | 0.269 | 0.015 | 0.042 | 0.113 | | 0.057 | | 9 |
| WL2 | Advantage of legal framework for investment | 0.165 | 0.241 | 0.352 | 0.021 | 0.057 | 0.148 | | 0.075 | | 4 |
| WL3 | Efficiency of State's incentive policies for investment | 0.147 | 0.222 | 0.333 | 0.019 | 0.052 | 0.140 | | 0.070 | | 5 |
| WL4 | Clarity of State participant portion | 0.064 | 0.094 | 0.148 | 0.008 | 0.022 | 0.062 | | 0.031 | | 22 |
| WL5 | Facilitation for procedures of land acquisition and compensation | 0.170 | 0.265 | 0.401 | 0.022 | 0.062 | 0.168 | | 0.084 | | 3 |
| **PARTNER SELECTION ATTRIBUTE** | | **0.067** | **0.124** | **0.240** | | | | **0.144** | | **5** | |
| WS1 | Accessibility to reliable partners | 0.156 | 0.209 | 0.287 | 0.010 | 0.026 | 0.069 | | 0.035 | | 19 |
| WS2 | Capacity of partners | 0.187 | 0.256 | 0.353 | 0.013 | 0.032 | 0.085 | | 0.043 | | 15 |
| WS3 | Favorable investment environment for seeking partners | 0.143 | 0.202 | 0.291 | 0.010 | 0.025 | 0.070 | | 0.035 | | 20 |

| Code | Attribute/Criteria Ref. | Local Weight | | | Overall Weight | | | Weight (BNP method) | | Rank | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $w_{ax}/w_j$ | | | $W_{axj} = w_{ax} \times w_j$ | | | $C_{ax}$ | $C_j$ | $C_a$ | $C_{aj}$ |
| WS4 | Competitiveness and transparency of bidding process | 0.238 | 0.333 | 0.451 | 0.016 | 0.041 | 0.108 | | 0.055 | | 10 |
| **RISK SHARING ATTRIBUTE** | | **0.079** | **0.148** | **0.277** | | | | **0.168** | | **3** | |
| WR1 | Less risky in project | 0.235 | 0.320 | 0.434 | 0.019 | 0.047 | 0.120 | | 0.062 | | 7 |
| WR2 | Efficient legal framework about project risk sharing | 0.182 | 0.254 | 0.352 | 0.014 | 0.037 | 0.098 | | 0.050 | | 13 |
| WR3 | Clear risk allocation among parties | 0.159 | 0.224 | 0.309 | 0.013 | 0.033 | 0.086 | | 0.044 | | 14 |
| WR4 | Clear supporting condition about risk sharing by the State | 0.146 | 0.203 | 0.289 | 0.012 | 0.030 | 0.080 | | 0.040 | | 17 |
| **MACROECONOMICS ATTRIBUTE** | | **0.061** | **0.110** | **0.216** | | | | **0.129** | | **6** | |
| WM1 | Macroeconomics policies | 0.070 | 0.109 | 0.181 | 0.004 | 0.012 | 0.039 | | 0.018 | | 28 |
| WM2 | Favorable conditions by the State for investment operation of the private sector | 0.122 | 0.188 | 0.286 | 0.007 | 0.021 | 0.062 | | 0.030 | | 23 |
| WM3 | Attractiveness of investment environment | 0.126 | 0.199 | 0.312 | 0.008 | 0.022 | 0.067 | | 0.032 | | 21 |
| WM4 | Efficiency of the monetary policy of the state | 0.110 | 0.172 | 0.265 | 0.007 | 0.019 | 0.057 | | 0.028 | | 25 |
| WM5 | Stability of economic indicators (e.g., GDP, CPI, Inflation...) | 0.111 | 0.176 | 0.275 | 0.007 | 0.019 | 0.059 | | 0.028 | | 24 |
| WM6 | Effectiveness of environmental impact assessment | 0.101 | 0.155 | 0.244 | 0.006 | 0.017 | 0.053 | | 0.025 | | 27 |

From the FAHP results, we find the two most important feasibility measurement aspects are financing attribute ($w_1 = (0.129, 0.245, 0.442) \rightarrow C_1$ (BNP) $= 0.272$), and legal framework ($w_3 = (0.128, 0.235, 0.420) \rightarrow C_3$ (BNP) $= 0.261$) whereas the least important attribute is macroeconomics ($w_6 = (0.061, 0.110, 0.216) \rightarrow C_6$ (BNP) $= 0.129$).

As for the weight ranking of investment willingness criteria, ability to supply capital for the project ($w_{11} = (0.027, 0.078, 0.202) \rightarrow C_{11}$ (BNP) $= 0.102$) and credibility to call loan for project ($w_{12} = (0.022, 0.065, 0.171) \rightarrow C_{12}$ (BNP) $= 0.086$) are the

highest overall weights whereas the least important criterion is macroeconomics policies($w_{61} = (0.004, 0.012, 0.039) \rightarrow \mathrm{C}_{12}\ (\mathrm{BNP}) = 0.018$).

### 9.4 Measurement of feasibility of potential PPP projects

#### 9.4.1 Project feasibility score measure

**Step 5: Aggregate individual preferences**

This research proposed a measurement scale to evaluate the criteria of investment willingness in PPP projects. The linguistic scales (Figure 9-5) are offered to measure feasibility for each criterion. The scale is from "(0, 0, 20) - very poor" to "(80, 100, 100) – extremely high", where "(30, 50, 70) = fair" (Table 9-5). This scale enables participants to provide a feasibility score for each investment willingness criterion in potential PPP projects in a consistent manner.

Feasibility score matrix is shown as follows:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \cdots & \cdots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{jn} \\ \vdots & \vdots & \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mj} & \cdots & x_{mn} \end{bmatrix}$$

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \cdots \\ w_j \\ \cdots \\ w_n \end{bmatrix}$$

Where i=1-m: alternatives; j=1-n: criteria

Finally, the feasibility level (FL) is proposed as an overall feasibility measure. FL is determined as in the following equation:

$$FL = W_j \times X_{ij} = \begin{bmatrix} w_1.x_{11} & w_2.x_{12} & \cdots & w_n.x_{1n} \\ w_1.x_{21} & w_2.x_{22} & & w_n.x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ w_1.x_{m1} & w_2.x_{m2} & \cdots & w_n.x_{mn} \end{bmatrix}$$

Where $X_{ij}$ = feasibility score of criterion Cj; $W_j$= overall weight of parameter Cj; $X_{ij}$ is rated by professional directly involved in a project under assessment, and $W_j$ is the weights of investment willingness criteria in PPP projects as shown in Table 9-4.

Table 9-5 Measurement scale

| **Linguistic Scales** | | **Scale of Fuzzy number** | | |
|---|---|---|---|---|
| Very Poor (VP) | VP | 0 | 0 | 20 |
| Poor (P) | P | 10 | 25 | 40 |
| Fair (F) | F | 30 | 50 | 70 |
| Good (G) | G | 60 | 75 | 90 |
| Very Good (VG) | VG | 80 | 100 | 100 |

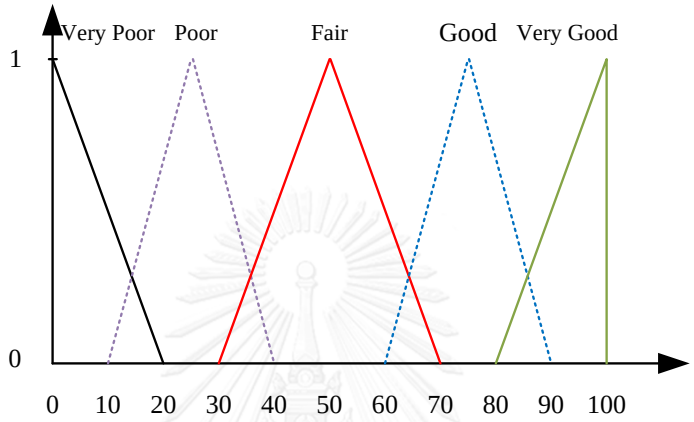



Figure 9-5 Linguistic variables for measurement scale

### 9.4.2 Potential PPP transportation projects

**Step 6 and Step 7: Linear scale transformation, fuzzy defuzzification, and final ranking and decision-making**

Three experts of private investors have had more than ten years' experience in transportation projects and have also experienced in investment aspects. The respondents are requested to rate the feasibility of criteria in this PPP transportation project on the scale from "very poor" to "very good" (Table 9-5). In fact, selection process of PPP transportation projects in Vietnam of private investors might occur two basic circumstances

- Circumstance 1: private investors acquire proposal of an interesting PPP transportation project to the government (the public sector) or at the moment the government does not have much potential PPP transportation projects (just only have one key project).
- Circumstance 2: private investors have chance to participate in the bidding process of some potential PPP projects.

### 1. Circumstance 1: One potential PPP project

Table 9-6 shows the general information for PM Bridge project. Three experienced experts participating in in-depth interviews analyze the feasibility score of each investment willingness criterion. Table 9-7 presents the scores of the project feasibility measure for this project.

Table 9-6 Profile of PM Bridge project

| **Project ref.** | **Project type** | **Project finance** | **Contract form** | **Project cost (Billion VND - million USD)** |
|---|---|---|---|---|
| Project PM | Bridge | Public-Private Partnership | Build-Operate-Transfer | 1,633 Billion VND |

Table 9-7 Data collection from three experts for PM Bridge project

| **Attribute** | **Code** | **Criteria** | **Project PM** | | |
|---|---|---|---|---|---|
| | | | **Res 1** | **Res 2** | **Res 3** |
| Wil1. Financing attribute | WF1 | Ability to supply capital for the project | F | F | F |
| | WF2 | Credibility to call loan for the project | F | F | P |
| | WF3 | Ability to fund initial project costs | G | G | F |
| | WF4 | Efficiency of domestic capital market | F | F | F |
| | WF5 | Suitability of equity/debt ratio | F | F | F |
| Wil2. Profitability attribute | WP1 | Revenues from operating the vicinity of project | P | P | F |
| | WP2 | Revenues from the services of project | G | G | G |
| | WP3 | Stability of project's cash flow | G | F | F |
| | WP4 | Ability of new markets' seeking and penetration | G | F | P |
| Wil3. Legal framework attribute | WL1 | Transparency and adequacy of legal framework | P | P | P |
| | WL2 | Advantage of legal framework for investment | F | F | F |
| | WL3 | Efficiency of State's incentive policies for investment | G | G | G |
| | WL4 | Clarity of State participant portion | G | G | G |
| | WL5 | Facilitation for procedures of land acquisition and compensation | P | P | F |
| Wil4. Partner selection attribute | WS1 | Accessibility to reliable partners | G | F | G |
| | WS2 | Capacity of partners | G | G | G |
| | WS3 | Favorable investment environment for seeking partners | F | F | F |
| | WS4 | Competitiveness and transparency of bidding process | F | F | P |
| Wil5. Risk sharing attribute | WR1 | Less risky in project | F | P | P |
| | WR2 | Efficient legal framework about project risk sharing | P | P | F |
| | WR3 | Clear risk allocation among parties | G | F | F |
| | WR4 | Clear supporting condition about risk sharing by the State | G | G | G |

| Attribute | Code | Criteria | Project PM | | |
|---|---|---|---|---|---|
| | | | Res 1 | Res 2 | Res 3 |
| Wil6. Macroeconomics attribute | WM1 | Macroeconomics policies | G | F | G |
| | WM2 | Favorable conditions by the State for investment operation of the private sector | G | G | F |
| | WM3 | Attractiveness of investment environment | F | F | G |
| | WM4 | Efficiency of the monetary policy of the state | F | F | P |
| | WM5 | Stability of economic indicators (e.g., GDP, CPI, Inflation...) | F | F | F |
| | WM6 | Effectiveness of environmental impact assessment | G | G | G |

Computing the elements of the synthetic scores of three experts using the geometric mean method suggested by Buckley (1985), that is $\tilde{x}_j = (\tilde{x}_{ij}^1 \otimes \tilde{x}_{ij}^2 \otimes \tilde{x}_{ij}^3)^{1/3}$, for $\tilde{x}_2$ as an example:

$$\tilde{x}_2 = [\tilde{x}_{12} \otimes \tilde{x}_{22} \otimes \tilde{x}_{32}]^{\frac{1}{3}} = \big((30,50,70) \otimes (30,50,70) \otimes (10,25,40)\big)^{\frac{1}{3}}$$
$$= \left((30 \times 30 \times 10)^{\frac{1}{3}}, (50 \times 50 \times 25)^{\frac{1}{3}}, (70 \times 70 \times 40)^{\frac{1}{3}}\right)$$
$$= (20.80, 39.69, 58.09).$$

Considering the different importance of each criterion, the weighted normalized fuzzy-decision matrix is constructed as:

$$FL_2 = \tilde{w}_2 \otimes \tilde{x}_2 = (0.022,0,078,0.171) \otimes (20.80,39.69,58.09)$$
$$= (0.466,2.567,9.947)$$

Then composite weighted normalized fuzzy-decision for Phu My Bridge project (Table 9-8) is constructed as:

$$FL_{PM} = \sum W_j \times X_j = (12.43,51.60,188.71)$$

- To employ the center of area (CoA) method to compute the non-fuzzy performance (BNP) value of the fuzzy feasibility measurement score of a potential project as an example, the calculation process is as follows.

$$BNP_{FL_{PM}} = [(UFL_{PM} - LFL_{PM}) + (MFL_{PM} - LFL_{PM})]/3 + LFL_{PM}$$

$$= [(188.71 - 12.43) + (51.60 - 12.43)]/3 + 12.43 = 84.23$$

Table 9-8 Feasibility score measurement for PM Bridge project

| Code | Investment willingness criteria | Aggregated fuzzy weights | | | Aggregated fuzzy ratings | | | Weighted Normalized fuzzy-decision matrix | | |
|---|---|---|---|---|---|---|---|---|---|---|
| WF1 | Ability to supply capital for the project | 0.027 | 0.078 | 0.202 | 30.00 | 50.00 | 70.00 | 0.820 | 3.895 | 14.157 |
| WF2 | Credibility to call loan for the project | 0.022 | 0.065 | 0.171 | 20.80 | 39.69 | 58.09 | 0.466 | 2.567 | 9.947 |
| WF3 | Ability to fund initial project costs | 0.014 | 0.040 | 0.109 | 47.62 | 65.52 | 82.77 | 0.685 | 2.631 | 8.994 |
| WF4 | Efficiency of domestic capital market | 0.009 | 0.026 | 0.072 | 30.00 | 50.00 | 70.00 | 0.280 | 1.288 | 5.064 |
| WF5 | Suitability of equity/debt ratio | 0.013 | 0.037 | 0.103 | 30.00 | 50.00 | 70.00 | 0.393 | 1.833 | 7.200 |
| WP1 | Revenues from operating the vicinity of project | 0.008 | 0.020 | 0.055 | 14.42 | 31.50 | 48.20 | 0.111 | 0.619 | 2.628 |
| WP2 | Revenues from the services of project | 0.015 | 0.042 | 0.115 | 60.00 | 75.00 | 90.00 | 0.927 | 3.128 | 10.324 |
| WP3 | Stability of project's cash flow | 0.018 | 0.048 | 0.127 | 37.80 | 57.24 | 76.12 | 0.679 | 2.725 | 9.688 |
| WP4 | Ability of new markets' seeking and penetration | 0.011 | 0.029 | 0.082 | 26.21 | 45.43 | 63.16 | 0.281 | 1.322 | 5.188 |
| WL1 | Transparency and adequacy of legal framework | 0.015 | 0.042 | 0.113 | 10.00 | 25.00 | 40.00 | 0.154 | 1.045 | 4.512 |
| WL2 | Advantage of legal framework for investment | 0.021 | 0.057 | 0.148 | 30.00 | 50.00 | 70.00 | 0.635 | 2.833 | 10.348 |
| WL3 | Efficiency of State's incentive policies for investment | 0.019 | 0.052 | 0.140 | 60.00 | 75.00 | 90.00 | 1.130 | 3.909 | 12.586 |
| WL4 | Clarity of State participant portion | 0.008 | 0.022 | 0.062 | 60.00 | 75.00 | 90.00 | 0.490 | 1.646 | 5.580 |
| WL5 | Facilitation for procedures of land acquisition and compensation | 0.022 | 0.062 | 0.168 | 14.42 | 31.50 | 48.20 | 0.315 | 1.958 | 8.085 |
| WS1 | Accessibility to reliable partners | 0.010 | 0.026 | 0.069 | 47.62 | 65.52 | 82.77 | 0.499 | 1.703 | 5.691 |
| WS2 | Capacity of partners | 0.013 | 0.032 | 0.085 | 60.00 | 75.00 | 90.00 | 0.751 | 2.382 | 7.622 |
| WS3 | Favorable investment environment for seeking partners | 0.010 | 0.025 | 0.070 | 30.00 | 50.00 | 70.00 | 0.287 | 1.251 | 4.882 |
| WS4 | Competitiveness and transparency of bidding process | 0.016 | 0.041 | 0.108 | 20.80 | 39.69 | 58.09 | 0.332 | 1.639 | 6.278 |
| WR1 | Less risky in project | 0.019 | 0.047 | 0.120 | 14.42 | 31.50 | 48.20 | 0.268 | 1.486 | 5.797 |
| WR2 | Efficient legal framework about project risk sharing | 0.014 | 0.037 | 0.098 | 14.42 | 31.50 | 48.20 | 0.208 | 1.180 | 4.703 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| WR3 | Clear risk allocation among parties | 0.013 | 0.033 | 0.086 | 37.80 | 57.24 | 76.12 | 0.476 | 1.895 | 6.514 |
| WR4 | Clear supporting condition about risk sharing by the State | 0.012 | 0.030 | 0.080 | 60.00 | 75.00 | 90.00 | 0.690 | 2.244 | 7.206 |
| WM1 | Macroeconomics policies | 0.004 | 0.012 | 0.039 | 47.62 | 65.52 | 82.77 | 0.203 | 0.790 | 3.229 |
| WM2 | Favorable conditions by the State for investment operation of the private sector | 0.007 | 0.021 | 0.062 | 47.62 | 65.52 | 82.77 | 0.352 | 1.361 | 5.111 |
| WM3 | Attractiveness of investment environment | 0.008 | 0.022 | 0.067 | 37.80 | 57.24 | 76.12 | 0.288 | 1.258 | 5.120 |
| WM4 | Efficiency of the monetary policy of the state | 0.007 | 0.019 | 0.057 | 20.80 | 39.69 | 58.09 | 0.139 | 0.754 | 3.321 |
| WM5 | Stability of economic indicators (e.g., GDP, CPI, Inflation...) | 0.007 | 0.019 | 0.059 | 30.00 | 50.00 | 70.00 | 0.203 | 0.971 | 4.151 |
| WM6 | Effectiveness of environmental impact assessment | 0.006 | 0.017 | 0.053 | 60.00 | 75.00 | 90.00 | 0.369 | 1.283 | 4.743 |
| | | | | | | | | **12.43** | **51.60** | **188.67** |
| | | | | | | | | **BNP value = 84.23** | | |

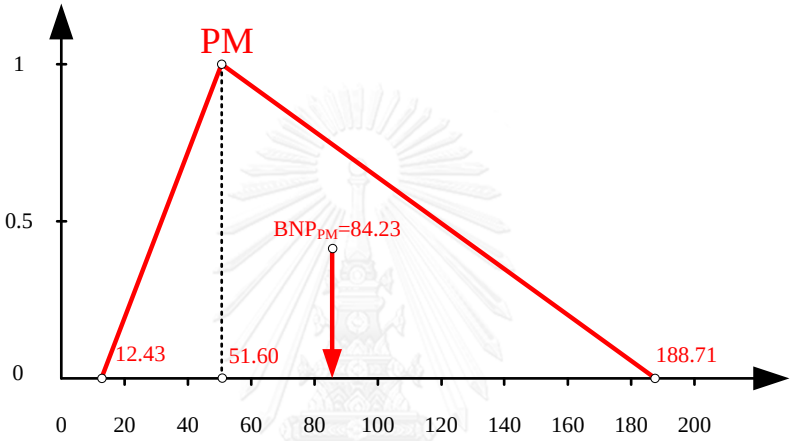
Similarly, the feasibility measurement score of Phu My Bridge PPP projects which hypothesis has very poor, poor, fair, good, very good criteria for investment willingness of the private sector can be shown in Table 9-9. Figure 9-6 shows the non-fuzzy performance value and feasibility measurement score of Phu My Bridge project. Recommendations for Phu My Bridge project from experts in this research are then indicated in Table 9-10. The score of feasibility measurement score of project is in "Fair, Good" area, so Phu My Bridge project are recommended with a lot of responsive strategies to enhance the feasibility of a project such as: improve the financial capability; adequate legal framework; appropriate incentive polices; land acquisition and compensation; select reputable partners; and appropriate risk allocation.

Table 9-9 The feasibility measurement score of PM Bridge project corresponding with hypothesis projects

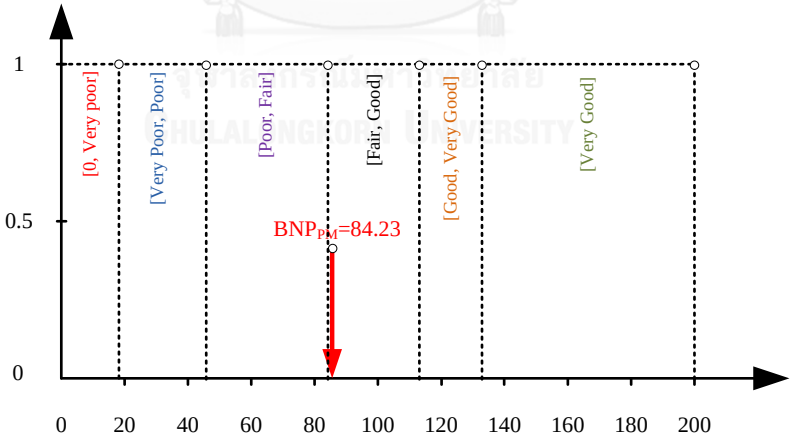
| **Hypothesis Projects** | **BNP value** | **Feasibility measurement** |
|---|---|---|
| A-VP | **18.12** | Very Poor (VP) |
| A-P | **45.80** | Poor (P) |
| A-F | **83.77** | Fair (F) |
| A-G | **113.91** | Good (G) |
| A-VG | **133.76** | Very Good (VG) |

Table 9-10 Recommendation for PM Bridge project

| Real Project | BNP value | Feasibility measurement | Recommend |
|---|---|---|---|
| PM-test | **84.23** | Fair ≅ PM < Good<br>Project with fair feasibility | PM Bridge project was recommended with a lot of responsive strategies to enhance the feasibility of a project (e.g., improve the financial capability, adequate legal framework, appropriate incentive policies, land acquisition and compensation, select reputable partners, and appropriate risk allocation) |




a. Non-fuzzy performance value of PM Bridge project by center of area method (CoA)




b. Feasibility measurement score of PM Bridge

Figure 9-6 Feasibility measurement score of Phu My Bridge

## 2. Circumstance 2: Three potential case studies PPP transportation projects in Vietnam

Table 9-11 shows the general information of three potential PPP transportation projects (Project A1, A2, and A3) in Vietnam. Three experienced experts participating in in-depth interviews assess the feasibility score of each investment willingness criterion of these projects. Table 9-12 presents the scores of the project feasibility measure for these potential projects. The computation of the component scores by three experts uses the geometric mean method suggested by Buckley (1985). There are three methods to calculate the feasibility measurement scores for the purpose of comparisons amongst the three potential PPP projects.

Table 9-11 Profile of three potential projects

| Project ref. | Project type | Contract form | Project cost (Billion VND - million USD) |
|---|---|---|---|
| Project A1 | Tunnel | Build-Operate-Transfer + Build - Transfer | 17,043 Billion VND (874 million USD) |
| Project A2 | Highway | Build-Operate-Transfer | 22,522 Billion VND |
| Project A3 | Highway | Build-Operate-Transfer | 757 Million USD |

Table 9-12 Data collection from three experts for three case studies (project A1, A2, and A3)

| Attr. | Code | Criteria | Respondent 1 | | | Respondent 2 | | | Respondent 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A1 | A2 | A3 | A1 | A2 | A3 |
| Wil1. Financing | WF1 | Ability to supply capital for the project | G | F | F | VG | F | G | G | F | G |
| | WF2 | Credibility to call loan for the project | G | F | G | VG | F | G | G | F | G |
| | WF3 | Ability to fund initial project costs | VG | G | G | G | G | VG | G | G | G |
| | WF4 | Efficiency of domestic capital market | VG | G | P | VG | G | P | VG | F | G |
| | WF5 | Suitability of equity/debt ratio | F | VG | G | G | G | G | G | G | VG |
| Wil2. Profitability | WP1 | Revenues from operating the vicinity of project | G | G | F | F | G | F | G | G | F |
| | WP2 | Revenues from the services of project | VG | G | G | VG | G | G | VG | G | F |
| | WP3 | Stability of project's cash flow | G | P | F | G | P | G | G | F | G |
| | WP4 | Ability of new markets' seeking and penetration | VG | VG | VG | VG | G | VG | VG | G | VG |
| Wil3. Legal | WL1 | Transparency and adequacy of legal framework | G | F | F | G | F | F | G | F | G |

| Attr. | Code | Criteria | Respondent 1 | | | Respondent 2 | | | Respondent 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1 | A2 | A3 | A1 | A2 | A3 | A1 | A2 | A3 |
| | WL2 | Advantage of legal framework for investment | VG | G | G | G | G | G | VG | G | G |
| | WL3 | Efficiency of State's incentive policies for investment | VG | F | VG | VG | F | VG | VG | F | VG |
| | WL4 | Clarity of State participant portion | VG | F | VG | G | F | VG | VG | F | VG |
| | WL5 | Facilitation for procedures of land acquisition and compensation | G | P | P | VG | P | P | G | P | P |
| Wil4. Partner selection | WS1 | Accessibility to reliable partners | VG | F | VG | VG | F | G | VG | F | G |
| | WS2 | Capacity of partners | VG | F | G | VG | F | VG | VG | P | G |
| | WS3 | Favorable investment environment for seeking partners | F | F | F | G | P | G | F | F | F |
| | WS4 | Competitiveness and transparency of bidding process | G | F | VG | G | F | VG | G | F | VG |
| Wil5. Risk sharing | WR1 | Less risky in project | P | VP | P | F | VP | F | P | P | F |
| | WR2 | Efficient legal framework about project risk sharing | F | F | VP | G | F | F | F | F | VP |
| | WR3 | Clear risk allocation among parties | P | F | P | G | F | F | F | F | P |
| | WR4 | Clear supporting condition about risk sharing by the State | F | F | P | P | P | P | F | F | P |
| Wil6. Macroeconomics | WM1 | Macroeconomics policies | VG | G | G | G | G | F | VG | G | G |
| | WM2 | Favorable conditions by the State for investment operation of the private sector | VG | G | VG | VG | G | VG | VG | F | G |
| | WM3 | Attractiveness of investment environment | F | P | P | F | P | F | F | P | P |
| | WM4 | Efficiency of the monetary policy of the state | p | F | F | p | F | F | P | F | F |
| | WM5 | Stability of economic indicators (e.g., GDP, CPI, Inflation...) | VP | VP | P | P | P | F | P | P | P |
| | WM6 | Effectiveness of environmental impact assessment | F | F | G | F | F | F | F | F | G |

**a. Method 1:** Center of area (CoA) method

Performing the same process for circumstance 1 with PM Bridge project, we can construct the composite weighted normalized fuzzy-decision of three potential projects in this circumstance 2 as:

$$FL_{A1} = \sum W_j \times X_j = (21.07, 74.85, 232.54)$$

Likewise, $FL_{A2} = (12.15, 49.91, 185.30)$; $FL_{A3} = (16.82, 62.62, 207.85)$

To employ the center of area (CoA) method to compute the non-fuzzy performance (BNP) value of the fuzzy feasibility measurement of three potential projects (A1, A2, and A3)

Taking the BNP value of the feasibility measurement score of project A1 as an example, the calculation process is as follows.

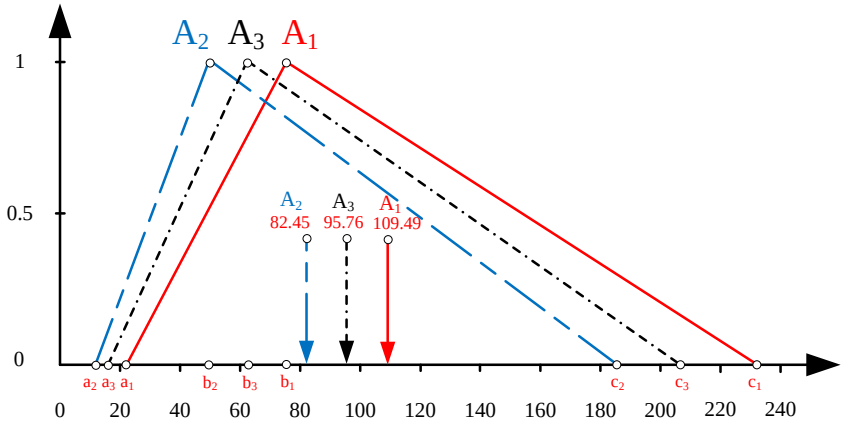
$$BNP_{FL_{A1}} = [(UFL_{A1} - LFL_{A1}) + (MFL_{A1} - LFL_{A1})]/3 + LFL_{A1}$$

$$= [(232.54 - 21.07) + (74.85 - 21.07)]/3 + 21.07 \ = 109.49$$

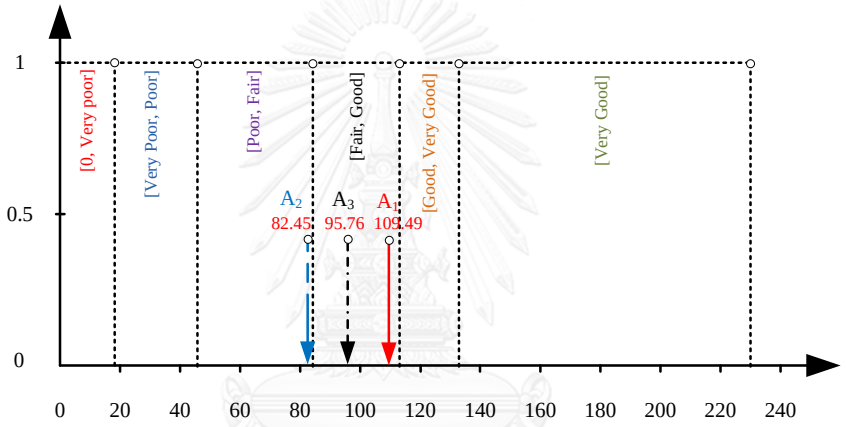
Similarly, the feasibility measurement score of project A2, and A3 are 82.45 and 95.76, respectively. Finally, the results of three potential PPP projects are as shown in Figure 9-7 and recommendations for decision makers as shown in Table 9-13.

Table 9-13 BNP value of three potential PPP transportation projects

| **Potential projects** | **BNP value** | **Feasibility measurement** | **Recommendations** |
|---|---|---|---|
| A1 | **109.51** | Fair < A1 ≅ Good | Approved with high recommend |
| A2 | **82.46** | A2 ≅ Fair | Recommend with low investment willingness of private investors. Private investors must perform a lot of responsive strategies or actions to invest in this project |
| A3 | **95.77** | Fair < A3 < Good | Recommend with normal investment willingness of private investors |




a. Non-fuzzy performance value of Project A1, A2, and A3 by center of area method




b. Feasibility measurement score of Project A1, A2, and A3

Figure 9-7 Feasibility measurement score of Project A1, A2, and A3

**b. Method 2:** 1st TOPSIS method

TOPSIS method consists of eight steps

**Step 1:** Three decision makers use linguistic rating variables shown in Table 9-5 to evaluate the ratings of PPP projects on such criteria. The ratings of three potential PPP projects by decision makers under various criteria are shown in Table 9-12.

**Step 2:** Then the linguistic evaluations shown in Table 9-12 are converted into fuzzy numbers to construct the fuzzy-feasibility matrix, as shown in Table 9-14, Table 9-15, and Table 9-16.

Table 9-14 Fuzzy-feasibility matrix of expert 1

| **Expert 1** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (60, 75, 90) | (60, 75, 90) | (80, 100, 100) | … | (30, 50, 70) |
| A2 | (30, 50, 70) | (30, 50, 70) | (60, 75, 90) | … | (30, 50, 70) |
| A3 | (30, 50, 70) | (60, 75, 90) | (60, 75, 90) | … | (60, 75, 90) |

Table 9-15 Fuzzy-feasibility matrix of expert 2

| **Expert 2** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (80, 100, 100) | (80, 100, 100) | (60, 75, 90) | | (30, 50, 70) |
| A2 | (30, 50, 70) | (30, 50, 70) | (60, 75, 90) | | (30, 50, 70) |
| A3 | (60, 75, 90) | (60, 75, 90) | (80, 100, 100) | | (30, 50, 70) |

Table 9-16 Fuzzy-feasibility matrix of expert 3

| **Expert 3** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (60, 75, 90) | (60, 75, 90) | (60, 75, 90) | | (30, 50, 70) |
| A2 | (30, 50, 70) | (30, 50, 70) | (60, 75, 90) | | (30, 50, 70) |
| A3 | (60, 75, 90) | (60, 75, 90) | (60, 75, 90) | | (60, 75, 90) |

Computing the synthetic scores of three experts using the geometric mean method suggested by Buckley (1985) as follow

$$\tilde{x}_1 = [\tilde{x}_{11} \otimes \tilde{x}_{21} \otimes \tilde{x}_{31}]^{\frac{1}{3}} = \left((60, 75, 90) \otimes (80, 100, 100) \otimes (60, 75, 90)\right)^{\frac{1}{3}}$$
$$= \left((60 \times 80 \times 60)^{\frac{1}{3}}, (75 \times 100 \times 75)^{\frac{1}{3}}, (90 \times 100 \times 90)^{\frac{1}{3}}\right)$$
$$= (66.04, 82.55, 93.22).$$

Table 9-17 Fuzzy-feasibility matrix and fuzzy weights of three experts

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (66.04, 82.55, 93.22) | (66.04, 82.55, 93.22) | (66.04, 82.55, 93.22) | … | (30, 50, 70) |
| A2 | (30, 50, 70) | (30, 50, 70) | (60, 75, 90) | … | (30, 50, 70) |
| A3 | (47.62, 65.52, 82.77) | (60, 75, 90) | (66.04, 82.55, 93.22) | … | (47.62, 65.52, 82.77) |
| Weight | (0.03, 0.08, 0.2) | (0.02, 0.06, 0.17) | (0.01, 0.04, 0.11) | … | (0.01, 0.02, 0.05) |

**Step 3:** The linear scale transformation is used to transform the various criteria scales on a comparable scale. The normalized fuzzy-feasibility matrix is constructed as in Table 9-18

Table 9-18 Normalized fuzzy-feasibility matrix

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (0.66, 0.825, 0.932) | (0.66, 0.825, 0.932) | (0.66, 0.825, 0.932) | … | (0.3, 0.5, 0.7) |
| A2 | (0.3, 0.5, 0.7) | (0.3, 0.5, 0.7) | (0.6, 0.75, 0.9) | … | (0.3, 0.5, 0.7) |
| A3 | (0.476, 0.655, 0.828) | (0.6, 0.75, 0.9) | (0.66, 0.825, 0.932) | … | (0.476, 0.655, 0.828) |
| Weight | (0.03, 0.08, 0.2) | (0.02, 0.06, 0.17) | (0.01, 0.04, 0.11) | … | (0.01, 0.02, 0.05) |

**Step 4:** Weighted normalized fuzzy-feasibility matrix is constructed as in Table 9-19

Table 9-19 Weighted normalized fuzzy-feasibility matrix

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (0.018, 0.064, 0.189) | (0.015, 0.053, 0.16) | (0.009, 0.033, 0.101) | … | (0.002, 0.009, 0.037) |
| A2 | (0.007, 0.024, 0.077) | (0.005, 0.021, 0.079) | (0.013, 0.042, 0.133) | … | (0.002, 0.009, 0.037) |
| A3 | (0.009, 0.029, 0.082) | (0.006, 0.024, 0.086) | (0.013, 0.042, 0.133) | … | (0.003, 0.011, 0.044) |

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A-VP | (0, 0, 0.04) | (0, 0, 0.034) | (0, 0, 0.022) | … | (0, 0, 0.011) |
| A-P | (0.003, 0.019, 0.081) | (0.002, 0.016, 0.068) | (0.001, 0.01, 0.043) | … | (0.001, 0.004, 0.021) |
| A-F | (0.008, 0.039, 0.142) | (0.007, 0.032, 0.12) | (0.004, 0.02, 0.076) | … | (0.002, 0.009, 0.037) |
| A-G | (0.016, 0.058, 0.162) | (0.013, 0.049, 0.137) | (0.009, 0.03, 0.087) | … | (0.004, 0.013, 0.042) |
| A-VG | (0.022, 0.078, 0.202) | (0.018, 0.065, 0.171) | (0.011, 0.04, 0.109) | … | (0.005, 0.017, 0.053) |

**Step 5:** According to the weighted fuzzy decision matrix of potential PPP projects (A1, A2, and A3) and hypothesis projects (A-VP, A-P, A-F, A-G, and A-VG). Then, the fuzzy positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS) can be defined as shown in Table 9-20.

$A^* = (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*)$ Where $\tilde{v}_j^* = max_i \ \{v_{ij3}\}$

$= ((0.202, 0.202, 0.202), (0.171, 0.171, 0.171), \dots, (0.053, 0.053, 0.053))$

$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-)$ Where $\tilde{v}_j^- = min_i \ \{v_{ij1}\}$

$= ((0, 0, 0), (0, 0, 0), \dots, (0, 0, 0))$

Table 9-20 FPIS and FNIS index

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| FPIS ($A^*$) | (0.202, 0.202, 0.202) | (0.171, 0.171, 0.171) | (0.109, 0.109, 0.109) | | (0.053, 0.053, 0.053) |
| FNIS ($A^-$) | (0, 0, 0) | (0, 0, 0) | (0, 0, 0) | | (0, 0, 0) |

**Step 6:** Calculate the distance of each potential project from FPIS and FNIS to each criterion, respectively. For instance, d(A1,A*) was calculated as follows:

$$d(A_1, A^*) = \sqrt{1/3[(0.018 - 0.202)^2 + (0.064 - 0.202)^2 + (0.189 - 0.202)^2]}$$
$$= 0.133$$

Computing the same procedure with remaining criteria, the distances between $A_i$ ($i$ =1, 2, 3) with $A^*$, and $A_i$ with $A^-$ with respect to each criterion are as shown in Table 9-21 and Table 9-22, respectively.

Table 9-21 Distance between $A_i$ ($i$ =1, 2, 3) and $A^*$ with respect to each criterion

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| d(A1,A*) | 0.133 | 0.113 | 0.072 | | 0.040 |
| d(A2,A*) | 0.151 | 0.128 | 0.074 | | 0.040 |
| d(A3,A*) | 0.141 | 0.116 | 0.072 | | 0.038 |

Table 9-22 Distance between $A_i$ ($i$ =1, 2, 3) and $A^-$ with respect to each criterion

| | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| d(A1,A-) | 0.115 | 0.098 | 0.062 | | 0.022 |
| d(A2,A-) | 0.085 | 0.072 | 0.059 | | 0.022 |
| d(A3,A-) | 0.101 | 0.094 | 0.062 | | 0.026 |

**Step 7:** Calculate $D_i^*$ and $D_i^-$ of three potential PPP projects $A_i$ ($i$ =1, 2, 3) as shown in Table 9-25.

$$Project\ A_1: D_1^* = \sum_{j=1}^{n} D(A_1, A^*) = 0.133 + 0.113 + 0.072 + \cdots + 0.040 = 1.872$$

Table 9-23 Computation of $D_i^*$, $D_i^-$ and $CC_i$ for hypothesis projects (A-VP, A-P, A-F, A-G, and A-VG)

| | **D*i** | **D-i** | **CCi** |
|---|---|---|---|
| A-VP | 2.550 | 0.314 | 0.110 |
| A-P | 2.305 | 0.644 | 0.219 |
| A-F | 2.032 | 1.138 | 0.359 |
| A-G | 1.862 | 1.334 | 0.417 |
| A-VG | 1.715 | 1.681 | 0.495 |

Table 9-24 Performance scores of hypothesis

| CCi | Linguistic Scales | Description |
|---|---|---|
| (0.110 - 0.219) | Very Poor - Poor | Do not recommend |
| (0.219 - 0.290) | Poor - Fair | Very high risk |
| (0.290 - 0.359) | Poor - Fair | Recommend with high risk |
| (0.359 - 0.417) | Fair - Good | Recommend with low risk |
| (0.417 - 0.495) | Good - Very Good | Approved and preferred |

Table 9-25 Computation of $D_i^*$, $D_i^-$ and $CC_i$ for project A1, A2, and A3

| | D*i | D-i | CCi | Ranking | Recommendations |
|---|---|---|---|---|---|
| A1 | 1.872 | 1.417 | 0.431 | 1 | Approved and preferred |
| A2 | 2.051 | 1.112 | 0.352 | 3 | High risk |
| A3 | 1.963 | 1.259 | 0.391 | 2 | Recommend with low risk |

**Step 8:** According to the computation of closeness coefficient, the ranking order of the three potential projects is A1, A3, and A2. Obviously, the best selection is **PPP project A1.** This PPP project A1 gets the 1st ranking, and the feasibility score is range from good to very good, so the recommendation for this project is "approved and preferred".

**c. Method 3:** 2nd TOPSIS method (Incorporate with risk attitude and confidence in decision-making)

Defuzzifying the weighted normalized fuzzy-feasibility matrix by $\alpha - cut$ method (confidence) and risk index $\lambda$

The $\alpha - cut$ method described earlier represents the decision maker's degree of confidence in the fuzzy assessment (i.e., $\alpha = 0$ entails lack of confidence in the fuzzy evaluation and then utilize the full range of uncertainty, whereas the higher value of $\alpha$ represents a more confident of decision maker, and reaches maximum when the value approaches the most likely value (Solomon and Rehan, 2006). For any given $\alpha - cut$ on a TFN, assuming $\tilde{A} = (a_1, a_2, a_3)$, the fuzzy interval$(a_1, a_3)$ will be reduced to $[a_1^\alpha, a_3^\alpha]$ after the $\alpha$-cutting:

$$a_1^\alpha = a_1 + \alpha(a_2 - a_1)$$

$$a_3^\alpha = a_3 - \alpha(a_3 - a_2)$$

Further, given the desired confidence over the data, the risk attitude has a significant effect on the defuzzified value. To get crisp weighting by considering risk index $\lambda$, we

incorporate the experts' attitude toward the investment willingness factors by using risk index $\lambda = 0, \lambda = 0.5, and\ \lambda = 1$ to indicate that they have optimistic, moderate and pessimistic attitudes toward investment willingness factors.

$$a = \lambda a_3^{\alpha} + (1 - \lambda) a_1^{\alpha}$$

For example, we choose the average degree of confidence and attitude towards risk of the decision maker ($\alpha = 0.5$ and $\lambda = 0.5$) to determine the crisp weighted normalized fuzzy-feasibility matrix.

By using $\alpha = 0.5$ on the weighted normalized fuzzy-feasibility matrix, an interval matrix can be derived as in Table 9-26

Table 9-26 Interval weighted normalized matrix

| **Project** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | (0.064, 0.064) | (0.053, 0.053) | (0.033, 0.033) | | (0.009, 0.009) |
| A2 | (0.039, 0.039) | (0.032, 0.032) | (0.03, 0.03) | | (0.009, 0.009) |
| A3 | (0.051, 0.051) | (0.049, 0.049) | (0.033, 0.033) | | (0.011, 0.011) |

| **Project** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A-VP | (0, 0) | (0, 0) | (0, 0) | | (0, 0) |
| A-P | (0.019, 0.019) | (0.016, 0.016) | (0.01, 0.01) | | (0.004, 0.004) |
| A-F | (0.039, 0.039) | (0.032, 0.032) | (0.02, 0.02) | | (0.009, 0.009) |
| A-G | (0.058, 0.058) | (0.049, 0.049) | (0.03, 0.03) | | (0.013, 0.013) |
| A-VG | (0.078, 0.078) | (0.065, 0.065) | (0.04, 0.04) | | (0.017, 0.017) |

Incorporated with the DM's attitude using moderate $\lambda = 0.5$, an overall crisp weighted normalized fuzzy-feasibility matrix is calculated as in Table 9-27

Table 9-27 Overall crisp weighted normalized matrix

| **Project** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A1 | 0.064 | 0.053 | 0.033 | | 0.009 |
| A2 | 0.039 | 0.032 | 0.030 | | 0.009 |
| A3 | 0.051 | 0.049 | 0.033 | | 0.011 |

| **Project** | **WF1** | **WF2** | **WF3** | **…** | **WM6** |
|---|---|---|---|---|---|
| A-VP | 0.000 | 0.000 | 0.000 | | 0.000 |
| A-P | 0.019 | 0.016 | 0.010 | | 0.004 |
| A-F | 0.039 | 0.032 | 0.020 | | 0.009 |
| A-G | 0.058 | 0.049 | 0.030 | | 0.013 |
| A-VG | 0.078 | 0.065 | 0.040 | | 0.017 |

Table 9-28 Computation of $D_i^*$, $D_i^-$ and $CC_i$

| | D*i | D-i | Cci | Ranking |
|---|---|---|---|---|
| A1 | 0.063 | 0.191 | **0.751** | 1 |
| A2 | 0.118 | 0.132 | **0.529** | 3 |
| A3 | 0.118 | 0.165 | **0.583** | 2 |

| | D*i | D-i | Cci | |
|---|---|---|---|---|
| A-VP | 0.230 | 0.000 | **0.000** | Very Poor |
| A-P | 0.174 | 0.056 | **0.242** | Poor |
| A-F | 0.103 | 0.127 | **0.552** | Fair |
| A-G | 0.057 | 0.172 | **0.750** | Good |
| A-VG | 0.000 | 0.230 | **1.000** | Very Good |

Similarly, letting $\alpha$ = 0, 0.1, 0.3, 0.5, 0.7, 0.9, 1 and $\lambda$ = 0 (pessimistic), $\lambda$ = 0.5 (moderate), and $\lambda$ = 1 (optimistic), we can calculate the overall feasibility index for each project and determine its corresponding ranking. The overall feasibility index for each project was constructed as following in Table 9-29.

Table 9-29 Overall feasibility index for three potential projects based on $\alpha$ and $\lambda$

| Project A1 | | λ | | |
|---|---|---|---|---|
| | | **0** | **0.5** | **1** |
| **α-cut** | **0** | 0.688 | 0.770 | 0.781 |
| | **0.1** | 0.698 | 0.767 | 0.779 |
| | **0.3** | 0.710 | 0.760 | 0.773 |
| | **0.5** | 0.717 | 0.751 | 0.765 |
| | **0.7** | 0.721 | 0.742 | 0.754 |
| | **0.9** | 0.724 | 0.731 | 0.737 |
| | **1** | 0.726 | 0.726 | 0.726 |

| Project A2 | | λ | | |
|---|---|---|---|---|
| | | **0** | **0.5** | **1** |
| **α-cut** | **0** | 0.417 | 0.558 | 0.577 |
| | **0.1** | 0.437 | 0.552 | 0.573 |
| | **0.3** | 0.460 | 0.541 | 0.563 |
| | **0.5** | 0.474 | 0.529 | 0.551 |
| | **0.7** | 0.483 | 0.515 | 0.533 |
| | **0.9** | 0.489 | 0.500 | 0.509 |
| | **1** | 0.492 | 0.492 | 0.492 |

| Project A3 | | λ | | |
|---|---|---|---|---|
| | | **0** | **0.5** | **1** |
| **α-cut** | **0** | 0.502 | 0.605 | 0.620 |
| | **0.1** | 0.516 | 0.601 | 0.617 |
| | **0.3** | 0.532 | 0.592 | 0.609 |
| | **0.5** | 0.542 | 0.583 | 0.599 |
| | **0.7** | 0.548 | 0.572 | 0.586 |
| | **0.9** | 0.552 | 0.560 | 0.567 |
| | **1** | 0.554 | 0.554 | 0.554 |

The results for feasibility index and degree of confidence are shown in Figure 9-8, Figure 9-9, and Figure 9-10, respectively.

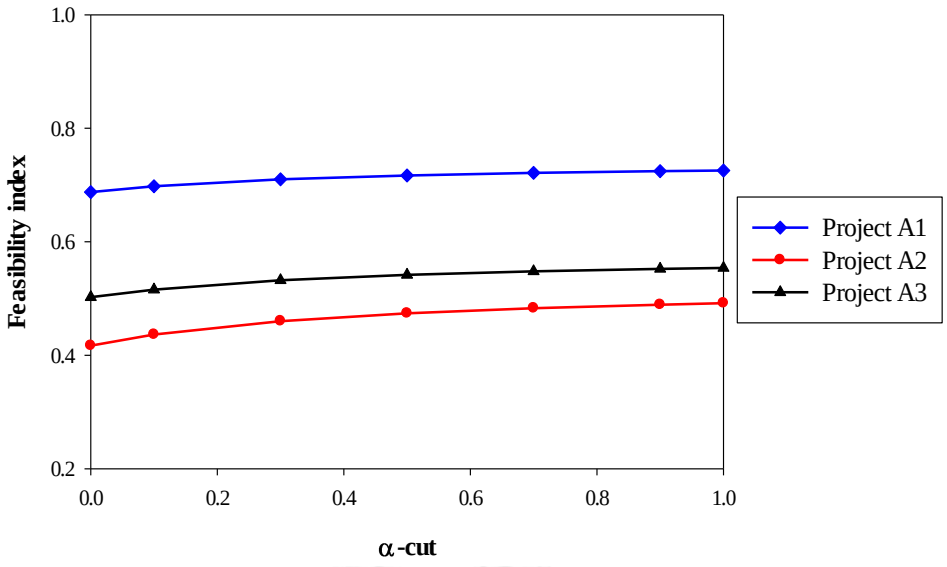



Figure 9-8 Feasibility index and ranking of potential projects for a pessimistic DM ($\lambda$=0)

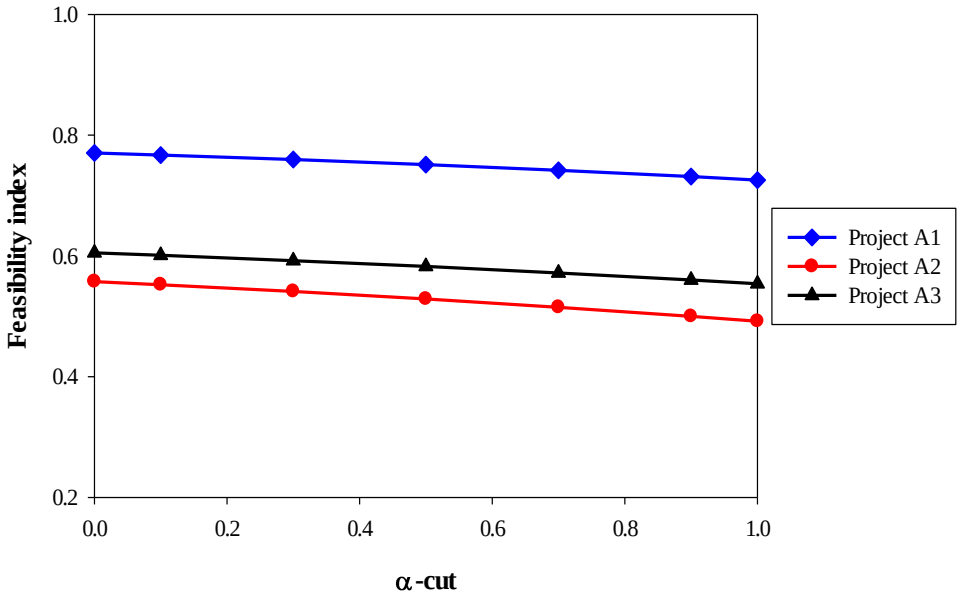



Figure 9-9 Feasibility index and ranking of potential projects for a moderate DM ($\lambda$=0.5)

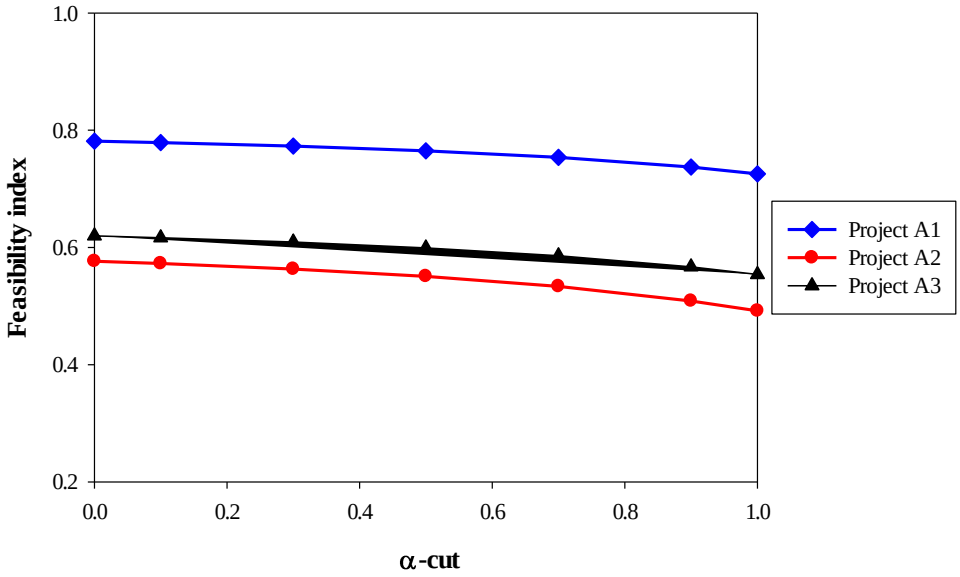



Figure 9-10 Feasibility index and ranking of potential projects for a optimistic DM ($\lambda$=1)

A comparison of the results of feasibility score by the three methods are shown in Table 9-30. Project A1 got the highest feasibility score, which means that this project is recommended by DMAT tool for private investors as it has he highest probability of feasibility.

Table 9-30 Comparison among three methods

| Projects | Method 1 | Method 2 | Method 3 |
|---|---|---|---|
| | BNP value | CCi | CCi (α=0.5, λ=0.5) |
| **A1** | 109.51<br>Fair < A1 ≅ Good | 0.431<br>Good < A1 < Very Good | 0.751<br>Good ≅ A1 < Very Good |
| **A2** | 82.46<br>A2 ≤ Fair | 0.352<br>A2 ≥ Fair | 0.529<br>A2 < Fair |
| **A3** | 95.77<br>Fair < A3 < Good | 0.391<br>Fair < A3 < Good | 0.583<br>Fair < A3 < Good |

## 9.5 Conclusion

The risky environment of the PPP transportation projects in Vietnam is extremely critical. After private investors analyze the overall situation of the investment climate and prepare responsive strategies to cope with these conditions, they must identify and

select the potential feasibility projects from the list of potential PPP projects. Private investors can select and submit proposals for their interested projects or initiate in the case of competitive tenders of specific PPP projects. In this research, we create a decision-making assistant tool (DMAT) to help private investors to calculate the feasibility indexes amongst some potential PPP projects by analyzing the performance score of 28 investment willingness criteria.

# CHAPTER 10
# CONCLUSIONS

The final chapter presents all research conclusions and recommendations for the future research for Public-Private Partnership (PPP) transportation projects in Vietnam. The first part displays the review of investigation objectives of PPP projects in Vietnam. The second part describes the major findings of this research, such as overall feature of PPP transportation projects, concern factors, risk factors, investment willingness criteria, and responsive strategies. The next section presents the limitations and future research directions. Finally, contributions of this research are demonstrated to provide knowledge for the public sector as well as private investors.

## 10.1 Review of research objectives

Vietnam is a Southeast Asian country with a great expansion of the construction industry in recent years. However, national infrastructure systems have been underdeveloped for many decades. The transnational road systems have been overloaded and degraded without appropriate maintenance due to the nation's financial inadequacy. Moreover, the current situation of infrastructure financing is worrisome. State monetary policies also threatened the financial market in Vietnam, so accessing to credit is more difficult. Because Vietnam has been excluded from underdeveloped countries list, ODA fund is limited. Attracting investment through government bonds was also ineffective due to a low rate of return and illiquidity. To address such challenge, the government has called for the participation of different economic sectors, especially private investors. Private capital (i.e., foreign direct and domestic capital investment) has been the main source for funding infrastructure development. Vietnam has been attempting to attract both domestic and overseas private investors to capitalize in infrastructure projects in a business form called public-private partnership (PPP).

Since 1993, there have been several PPP infrastructure projects developed in the form of Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), and Build-Transfer (BT) contracts. The current legislation regarding BOT, BTO, and BT projects was issued at the end of 2009 (Decree 108, 2009) and revised in early 2011. The government

issued the PPP pilot regulations (Decision 71, 2010) as a basis to implement a number of projects and has further improved mechanisms, policies, and regulations on investment in PPP projects. The newest regulations about PPP (combined BOT/BT/BTO and PPP pilot regulations) have just been issued in April 2015 and are not well comprehended by both the public and private sectors (Decree 15, 2015).

PPP form has been used as one of the main approaches to developing infrastructure systems worldwide. If it is well established and strictly managed, PPP can yield many benefits for the public sector such as increasing a financial capital of infrastructure projects, transferring risk from the public sector to the private sector, and increasing the value for money for infrastructure services by providing more efficient, inexpensive, and useful services. However, the Vietnamese government has limited experience on PPP. Many PPP projects must be hold on or canceled due to many reasons such as a wide expectation gap among the public and private sector, a lack of transparency of the commitments and policies of the government, the complexity of approvals and permits process, insufficient legal framework, poor risk management, and underdevelopment financial market. Currently, the investment atmosphere in Vietnam cannot appeal private investors to PPP transportation projects due to many challenges such as legal issues, problems related to government incentives, financial matters, pre-construction issues (e.g., feasibility studies, land acquisition, and land compensation), and macroeconomics. Thus, to attract the investment capitals from the private sector, it is necessary for the public sector to understand clearly their expectations and must also acknowledge concern factors of the private sector for investment market in Vietnam.

The main objectives of this research are (1) to identify and assess concern factors of private investors when investing in PPP transportation projects; (2) to identify and assess risk factors affecting the performance of the private sector throughout previous PPP transportation projects in Vietnam; (3) to establish a Risk-based Investment Willingness Assessment Model (RIWAM) that assists the private sector select responsive strategies in deciding to participate in PPP transportation projects in Vietnam; (4) to establish a Decision Making Assistant Tool (DMAT) that support private investors to make investment decision in the tendering process of PPP transportation projects in Vietnam; and (5) to investigate the strategies for the private

sector when investing in PPP transportation projects. Finally, the recommendations and lessons for the public and private sectors are analyzed and summarized.

Table 10-1 shows all of tools and methods that used to achieve the objectives of this research.

Table 10-1 Tools and methods used to achieve the research objectives

| | **Objectives** | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| **Tools and methods** | Identify and assess concern factors of private investors when investing in PPP transportation projects | Identify and assess risk factors affecting the performance of the private sector throughout previous PPP transportation projects in Vietnam. | Establish a RIWAM model that assists the private sector select responsive strategies in deciding to participate in PPP transportation projects in Vietnam | Establish a DMAT tool that support private investors to make investment decision in the tendering process of PPP transportation projects in Vietnam | Investigate the strategies for the private sector when investing in PPP transportation projects |
| **1. Data collection tools** | | | | | |
| Literature review | ✓ | ✓ | ✓ | ✓ | ✓ |
| Case study | | ✓ | | ✓ | |
| In-depth interview | ✓ | ✓ | ✓ | ✓ | ✓ |
| Questionnaire survey | ✓ | ✓ | ✓ | ✓ | ✓ |
| **2. Data analysis methods** | | | | | |
| Mean score techniques | ✓ | ✓ | ✓ | ✓ | ✓ |
| P-I method | | ✓ | | | |
| Spearman's rank correlation coefficient | ✓ | ✓ | | | |
| One-sample t-test | ✓ | | | | |
| Independent sample t-test | ✓ | ✓ | | | |
| Factor analysis (FA) | | ✓ | ✓ | | |
| Structural equation modelling (SEM) | | | ✓ | | |
| FAHP | | | | ✓ | |
| TOPSIS | | | | ✓ | |

## 10.2 Major findings

### 10.2.1 Overall of PPP transportation projects (the first pilot survey - Chapter 4)

Throughout the first pilot survey, a brief interview with six experienced professionals related to performance of PPP projects in Vietnam has conducted, including basic information about PPP in Vietnam (e.g., evolution, legal framework, structure of PPP, and incentive policies of government), remarkable features of PPP, and difficulties and challenges of PPP (e.g., legal issues, financial matters, as well as construction and operation issues).

### 10.2.2 Review of research objectives (the second pilot survey - Chapter 5)

Based on the results of the second pilot survey, in-depth interview with seven experienced professionals about some PPP case studies in Vietnam, concern factors of private investors, risk factors affecting the performance of private investors, investment willingness criteria of the private sector and responsive strategies of private investors are uncovered to cope with PPP projects in Vietnam.

In order to understanding clearly investment environment for PPP projects in Vietnam, the risk factors affecting the life cycle of ten previous PPP projects are also investigated. Firstly, the general information, as well as the structure of stakeholders of such projects, are conducted. Most of the risk factors occurred during the feasibility study, finance and operation phases of PPP projects such as incorrect estimating the project cost, scope changes, inadequate law and regulations, land acquisition and compensation, lack of supporting infrastructure, change policies of government, and termination concession by concession company.

Based on the literature review and in-depth interviews with the experienced professionals, a total of 22 concern factors of private investors are identified into two categories (i.e., company-specific and project-specific factors), and four sub-categories (i.e. company profile – 4 factors, finance - 6 factors, opportunities - 6 factors and risks of PPP projects - 6 factors).

Similarly, a total of 33 risk factors are collectively chosen by seven professionals. Risk factors affecting the performance of private investors consists of six main risk groups,

including political, legal, commercial, design and procurement, construction, and operation and performance risks groups.

Investment willingness criteria/attribute are also investigated throughout literature review and interviews. A list of 28 investment willingness criteria is divided into six main attributes, such as finance attribute (5 criteria), profitability attribute (4 criteria), legal framework attribute (5 criteria), partner selection attribute (4 criteria), risk sharing attribute (4 criteria), and macroeconomics attribute (6 criteria).

Besides, all respondents were asked to express their opinions about responsive strategies of private investors to cope with investment process in PPP projects in Vietnam. There are four strategies groups, including cooperation strategies (4 strategies), financing strategies (4 strategies), evaluation strategies (4 strategies), and suggestion strategies (6 strategies).

### 10.2.3 Concern factors, risk factors, investment willingness criteria of PPP transportation project (large-scale survey)

**1. Concern factors of private investors in PPP (Chapter 6)**

Regarding the critical level of concern factors, both the public and private sectors agreed about the ranking of all concern factors categories. “Capacity of company”, “finance” and “risks” of PPP are the most critical concern factors groups of private investors when they would like to promote investment in Vietnam, whereas opportunities of PPP projects factor is the least critical concern group (still critical due to its mean $\geq 3.5$). Interestingly, all of the respondents evaluated all concern factors that have a mean above the important average level of 3.

It is found that almost concern factors in "finance of PPP projects" group (i.e., demand issues, possibility of long-term income, availability of financing sources, return on equity investment, and project cash flows) are evaluated key worries of private investors when considering investment in PPP projects in Vietnam. Thus, if the public sector would like to enhance the participation of private investors, they must perform appropriate policies to increase the feasibility of PPP projects' demand, profitability, cash flow, and the availability of financing sources (e.g., government incentives, and supporting policies for financial institutions).

Moreover, in “company capacity” group, strong finance and good management capacity of their private investors are the most critical concern when they would like to invest in PPP projects in Vietnam. Therefore, it is very necessary to find reliable partners for their investment in PPP transportation projects.

Interestingly, “risks environment of PPP projects” group is also the most critical concern of private investors which they must discover clearly before they open their pockets to invest in PPP transportation projects. Particularly, risk factors related to legal, political, commercial, and design and procurement risks must be clearly recognized to enhance the investment environment for the performance of PPP transportation projects.

Especially, the concern factors related to opportunities for PPP projects in Vietnam currently are not highly appreciated by respondents. The main reason is the investment environment in Vietnam still not attractive enough for private investors to seek new markets, enhance their reputation and capacities.

From these results, several recommendations for the public sector to attract the participation of the private sector and some lessons for the private sector to improve the performance of PPP transportation projects in Vietnam are suggested.

**2. Risk factors affecting private sector in PPP transportation projects (Chapter 7)**

The combined risk levels (RL) are used to rank all of 33 risk factors. According to the assessment of risk factors, risk factors in this research are divided into three zones, namely, low-risk level (no risk), medium-risk level (10 risks), and high-risk level (23 risks). The two factors with least impact on PPP transportation projects are force majeure and environmental protection risk. Most of the ten critical risk factors are risks corresponding to feasibility studies or initial phases of PPP transportation projects, namely, (1) land acquisition and compensation; (2) delay in project approvals and permits; (3) inefficient feasibility study, (4) financial market risk; (5) subjective project evaluation method, (6) change in laws and regulations; (7) interest rate fluctuations; (8) corruption; (9) scope change of projects; and (10) supporting incentive of government risk. Then, a comparison of the results of five critical risk factors with previous research works are constructed to get an overview about risk factors affecting PPP projects among this study and six different selected previous studies. The results show that

inefficient feasibility study and subjective project evaluation method are two significant factors recognized in this study. These issues are not recognized critical in remaining research works. Besides, land acquisition and compensation issues must also be paid attention by the private sector in PPPP transportation projects in Vietnam.

To capture any multivariate interrelationships existing among the risk factors in terms of risk factor levels, factor analysis is applied. Twenty-three critical risk factors are then used for factor analysis. As the results, four groups retain represent 69.8 percent of the variance of the 12 risk factors. The groups and associated variables are explainable as group 1 concerns bidding process issues, group 2 concerns finance issues, group 3 is laws and regulations issues, and group 4 concerns project evaluation related issues.

Moreover, in order to clarify the different perceptions of stakeholders on critically of PPP project risks in Vietnam, public and private sectors' perceptions are compared through independent sample t-test to confirm any significant differences (at $\alpha$=5%). The survey findings reveal that eight critical risk factors shows significant differences in mean ratings as perceived by the respondents from the public sector and private consortium, namely, corruption (P3), scope change of projects (Co1), lack of transparency in the bidding (D2), inflation (C4), payment risk (O4), inefficient feasibility study (D8), inadequate allocation of responsibility and risk (D10), and interest rate fluctuations (C2). Therefore, the private sector must prepare to cope with these issues and share knowledge with the public sector to create the favorable investment policies and environment. Finally, risk management actions are also constructed in this research which will help private and public sectors to manage PPP projects better in the future.

**3. An RIWAM model of PPP transportation projects (Chapter 8)**

Addressing investment environment risk and specifying the investment willingness criteria for decision-making of the private sector are critical requirements for decision makers in PPP projects. Simultaneously, the appropriate responsive strategies are essentials determining the success of the private sector when deciding to invest in PPP projects. A risk-based investment willingness assessment model (RIWAM) is established to capture the interrelationships existing among risk perceptions, investment willingness and responsive strategies of private investors into PPP

transportation projects (Figure 10-1). Based on the results of RIWAM model, “finance”, “bidding process”, and “feasibility” groups directly influence “investment willingness” of the private sector. It can be interpreted as if the situation of financial matters, bidding process and feasibility issues is worse, the private sector will not be ready to invest in PPP projects. Besides, “finance”, “partners’ capacity”, and “investment willingness” situations of the private sector have optimistic influences on “responsive strategies”. It indicates that private investors currently concern about the financial situation and capable partners when they decide to invest and then perform responsive strategies to cope with PPP transportation projects in Vietnam. Finally, results of RIWAM model examine how to incorporate risk perceptions with investment willingness and responsive strategies of the private sector in PPP transportation projects which has rarely been made in previous research.

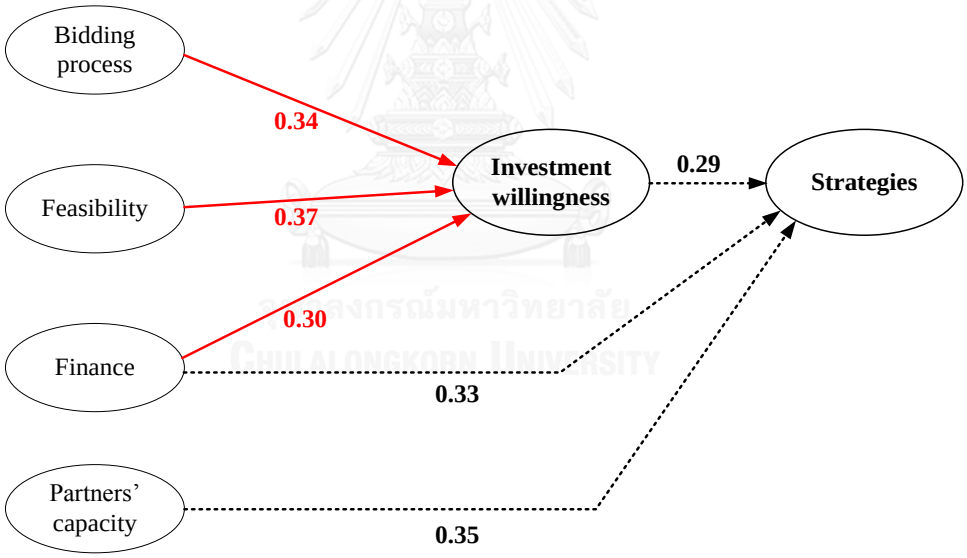



Figure 10-1 The results of RIWAM model

**4. DMAT tool for private investors of PPP transportation projects (Chapter 9)**

Based on the list of potential PPP projects, private investors can choose and propose proposals for their interesting projects or initiate in the case of competitive tenders for specific PPP projects. In this research, a decision-making assistant tool (DMAT) is established to help private investors to choose the feasibility projects amongst many

potential PPP projects. DMAT tool could help private investors assess the viability of a PPP project by analyzing the performance score of 28 investment willingness criteria.

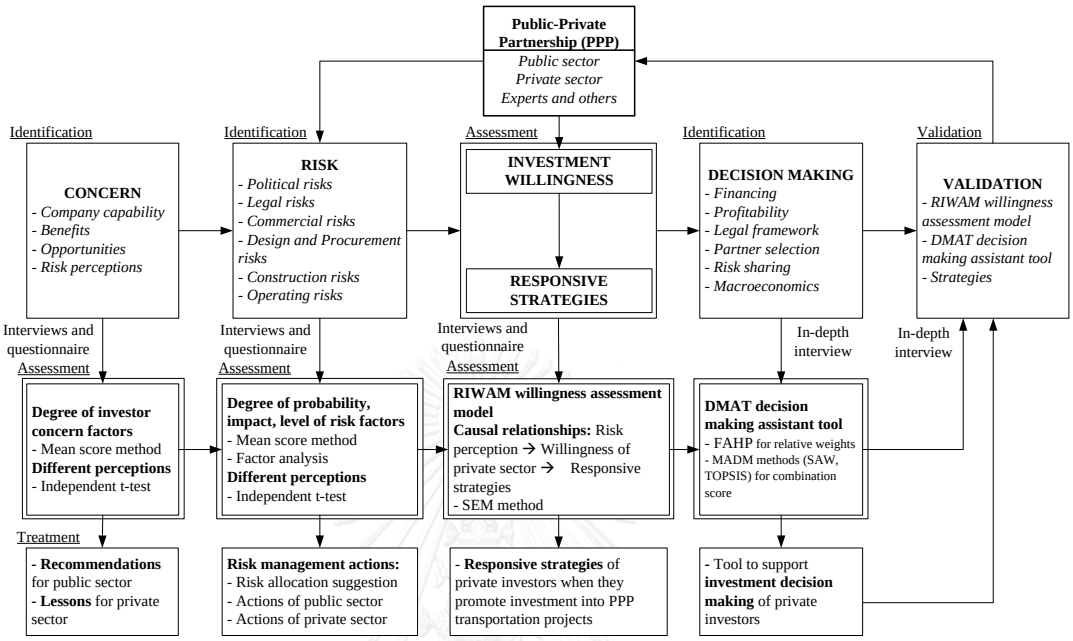



Figure 10-2 Summarized results of this research

## 10.3 Contributions

This research contributed to the performance of PPP transportation projects in the following ways by:

### 10.3.1 Contributions for the government

- Understanding the concern factors or expectation of private investors when they promote to invest in PPP transportation projects in Vietnam or key factors affecting the decision to get involve with the investment of PPP transportation projects.

- Proposing the RIWAM model to help the public sector understand risk factors that influence the investment willingness of private investors. Moreover, public sector can understand response strategies of investors. The government will then improve legal framework, laws, and regulations, procedures as well as incentives to attract private investors.

### 10.3.2 Contributions for private investors

- Identifying concerning factors of private investors in PPP transportation projects. Interested private investors can then understand the main expectation factors of PPP projects in Vietnam.

- Identifying, analyzing and responding risk factors affecting the performance of private investors in previous PPP transportation projects. Moreover, the private sector can recognize different perceptions of the public and private sectors about risk factors of PPP transportation projects. Consequently, private sector can realize weaknesses, strengths, opportunities and threats when investing in Vietnam PPP transportation projects.

- Identifying investment willingness attributes and criteria of private investors.
- Establishing a risk – based investment willingness assessment model (RIWAM) that best models for assessing the influencing among risk factors, investment willingness, and responsive strategies of private investors at the feasibility stage. This model will be helpful for both private and public sectors at the initial stage to perform PPP transportation projects.

- Establishing a decision-making assistant tool (DMAT) to support the private sector's decision-making in the tendering process. Besides, this research provides responsive strategies for private investors when they would like to invest into PPP transportation projects in Vietnam. Private investors can also recommend for the public sector to improve investment environment of PPP transportation projects in Vietnam.



## 10.4 Limitations and future research directions

The current results of this research establish a knowledge profile for supporting the performance of PPP projects in Vietnam for the private as well as public sector. The results of this research are based on the viewpoints of six experts in the first pilot survey, seven experts in the second pilot survey, 123 respondents in the large-scale survey, 17 respondents for FAHP model, and three experts for validation stage.

This research is very relevant for public sector in Vietnam; it will help the government understand the main critical concerns, the key risk factors affecting the investment

decisions of the private sector. Thus, the government or the public sector from central to local will issue the appropriate measures to improve investment environment, laws and regulations, approval and permit procedures, as well as supporting policies to investors. In addition, this study enables private investors to realize the major risk factor in transportation PPP projects in Vietnam. Moreover, this research also provides a semi-quantitative tool to support the process of investment decision-making of the private sector. It has great significance for all stakeholders corresponding in PPP transportation projects, but it does not supply a perfect quantitative decision-making tool for private investors to make the investment decision-making.

This study has some limitations, and it should be improved in future research. Here are some suggestions for future research works:

- Respondents: Experts sometimes are unwilling to share their experiences and causes of failure of the PPP transportation projects in Vietnam. Moreover, the foreign experts (lenders, financial institutions, and private investors) were less in this research. Therefore, more respondents must be increased to get all of the aspects related to PPP transportation projects

- Types of PPP projects: this research only focuses on transportation projects. Thus, future research may expand to other types of PPP projects (e.g., energy and infrastructure sector).

- This research is classified as qualitative and semi-quantitative research approach. The questionnaire survey and interview techniques were used to gather information from respondents. Therefore, a further quantitative research may be studied to strengthen the reliability of a decision-making assistant tool.

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# APPENDIX

# APPENDIX A: PILOT INTERVIEW

## RISK MANAGEMENT FOR PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS IN VIETNAM

*Dear Sir/Madam,*
*I am Sy Tien Do, a PhD Candidate at the Chulalongkorn University in Thailand. I am doing a research about "***Risk management for Public-Private Partnership transportation projects in Vietnam***". This survey is only for writing a thesis, the information within the survey will not be opened to the public. Your information will be very important for the accuracy of the research. Thank you so much indeed*
*Please spend you a little time to mark the following statements carefully.*
*I appreciate your contribution and co-operation!*
*Wish you well.*
*The survey includes two parts and begins.*


**Researcher Information**

| | |
|---|---|
| **Sy Tien Do** | PhD Candidate, Construction Engineering and Management, Chulalongkorn University, Thailand and Kyoto University, Japan |
| **Address:** | Division of Construction Engineering and Management, Faculty of Civil Engineering, HCMUT, 268 Ly Thuong Kiet Street, 14 Ward, District 10, HCMC |
| **Mobile:** | (+66)805.578.257 – (+84)932.011.085 |
| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |
|---|---|---|
| | | |

**SECTION 1: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years

☐ 5→10 years ☐ > 10 years

2) How many PPP transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects

☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

☐ Private Investors ☐ Government Agencies ☐ Consultants

☐ Contractors ☐ Financiers ☐ Other:

4) You are working at your company as a position:

☐ Directors ☐ Deputy Directors ☐ Project Managers

☐ Supervisors ☐ Engineers Other:

5) Where do your private sector in your project come from:

☐ Singapore ☐ America ☐ Korea ☐ France

☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

6) Average project size:

☐ <10 Billion VNĐ ☐ 100 - 500 Billion VNĐ

☐ 10 - 50 Billion VNĐ ☐ 500 - 1000 Billion VNĐ

☐ 50 - 100 Billion VNĐ ☐ > 1000 Billion VNĐ

7) Do you know about the risk management?

☐ Unknown ☐ Known

☐ Heard of it ☐ Know very well

8) Risk management is necessary in PPP transportation projects or not?

☐ Unnecessary ☐ Necessary ☐ Very necessary

Explanation:

9) How is the risk management system of your organization/ company?

**Contact Information**
**Name:**
**Email:**
**Mobile:**
**Name of projects you are working:**

## SECTION 2: RISK AFFECTING THE IMPLEMENTATION OF PPP TRANSPORTATION PROJECTS IN VIETNAM

### I. EXPLANATION:

#### 1. PPP

**Public–private partnership (PPP)** means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts. (Decision No. 71/2010/QD-TTg)

Or **PPP** present a framework that – while engaging the private sector – acknowledge and structure the role for government in ensuring that social obligations are met and successful sector reforms and public investment achieved. (*ADB*)

**Build-operate-transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State. (Decree No. 108/2009/ND-CP)

**Build-transfer-operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits.

**Build-transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract.

#### 2. RISK

Risk is commonly used as a synonym for "hazard", "danger" or "threat" – an undesirable event. Therefore, we focus on studying risk factors of PPP transportation projects in Vietnam.

Risk factors affected the ***success or failure of the project***, based on the probability and impact on cost, time, and quality of PPP transportation projects. This survey aims to investigate risk management of PPP from the information provided by Vietnamese government agencies and private sector who worked in the past or have been working in PPP transportation projects.

Here are some examples of risks affecting the performance of PPP transportation projects

| **Risks** | **Probability of risks** | **Impact of risks** |
|---|---|---|
| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**II. INTERVIEW QUESTIONS**

1. How about the revised legal framework for BOT and PPP projects in Vietnam? Can you tell any related-issues with the revised/new framework?

2. Difficulties and Challenges of PPP models in Vietnam?

3. Problems and Issues about finance of PPP transportation projects in Vietnam?

4. How about the policies (incentive policies) of government for PPP transportation projects?

5. What is the typical structure of PPP transportation contract?

6. How about the process of PPP interim framework in Vietnam?



7. Please list some of PPP transportation projects (Finished, Ongoing, Future plan)?

8. Issues/problems during the implementation of PPP projects in Vietnam?

# APPENDIX B: THE SECOND PILOT INTERVIEW

## A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS – A CASE STUDY IN VIETNAM

*Dear Sir/Madam,*
*I am Sy Tien Do, a PhD Candidate at the Chulalongkorn University in Thailand. I am doing a research about "***A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS– A CASE STUDY IN VIETNAM***". This survey is only for writing a thesis, the information within the survey will not be opened to the public. Your information will be very important for the accuracy of the research. Thank you so much indeed*
*Please spend you a little time to mark the following statements carefully.*
*I appreciate your contribution and co-operation!*
*Wish you well.*
*The survey includes two parts and begins.*


**Researcher Information**

| | |
|---|---|
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| **Address:** | Division of Construction Engineering and Management, Faculty of Civil Engineering, HCMUT, 268 Ly Thuong Kiet Street, 14 Ward, District 10, HCMC |
| **Mobile:** | (+66)805.578.257 – (+84)932.011.085 |
| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |
|---|---|---|
| | | |

## SECTION 1: GENERAL INFORMATION

### I. EXPLANATION:

### 1. PPP definitions

**Public–private partnership (PPP)** means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts. (Decision No. 71/2010/QD-TTg)

**Build-operate-transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State. (Decree No. 108/2009/ND-CP)

**Build-transfer-operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits. (Decree No. 108/2009/ND-CP)

**Build-transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract. (Decree No. 108/2009/ND-CP)

### 2. RISK

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Here are some examples of risks affecting the performance of PPP transportation projects

| **Risks** | **Probability of risks** | **Impact of risks** |
|---|---|---|
| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**SECTION 2: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years

☐ 5→10 years ☐ > 10 years

2) How many PPP transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects

☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

☐ Private Investors ☐ Government Agencies ☐ Consultants

☐ Contractors ☐ Financiers ☐ Other:

4) You are working at your company as a position:

☐ Directors ☐ Deputy Directors ☐ Project Managers

☐ Supervisors ☐ Engineers Other:

5) Where do your private sector in your project come from:

☐ Singapore ☐ America ☐ Korea ☐ France

☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

6) Average project size:

☐ <10 Billion VNĐ ☐ 100 - 500 Billion VNĐ

☐ 10 - 50 Billion VNĐ ☐ 500 - 1000 Billion VNĐ

☐ 50 - 100 Billion VNĐ ☐ > 1000 Billion VNĐ

7) Do you know about the risk management?

☐ Unknown ☐ Known

☐ Heard of it ☐ Know very well

8) Risk management is necessary in PPP transportation projects or not?

☐ Unnecessary ☐ Necessary ☐ Very necessary

9) How is the risk management system of your organization/ company? Description

10) How important of investment project evaluation tool?

☐ Not important ☐ Not sure whether important or not

☐ Important ☐ Very important

11) How to make investment decisions in your organization/ company? Description

**Contact Information**

**Name:**

**Email:**

**Mobile:**

**Name of projects you are working:**

**SECTION 3: FACTORS CONTRIBUTING TO THE DECISION TO PURSUE THE INVESTMENT INTO PPP TRANSPORTATION PROJECTS**

Please check on the checklist box ☒ based on your own experience and opinion

**1. How are the important of factors contributing to the decision to pursue the investment of private sector?**

| Very Unimportant | Unimportant | Neutral | Important | Very Important |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| No. | Factors that influence the decision of private sector to get involve in a PPP projects | Important level | | | | |
|---|---|---|---|---|---|---|
| | | Very unimportant ---------- -> Very important | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| **I** | **COMPANY PROFILE** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Management capacity of the company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Financial viability of the company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | The company's resources about labor, machinery, engineering | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | The company's experience with same project before | ☐ | ☐ | ☐ | ☐ | ☐ |
| **II** | **FINANCE OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Return on equity investment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Possibility of long-term income | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Project cash flows | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Availability of financing sources | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Tax/tariff issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Demand issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| **III** | **OPPORTUNITIES OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Assess/seek to new markets | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Enhancing relationship with lenders | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Enhancing relationship with contractors, project management, or operator companies | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Enhancement of company's strength in its industry | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Value of image to other investors | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Need for work | ☐ | ☐ | ☐ | ☐ | ☐ |
| **IV** | **RISK OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Political risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Legal risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Commercial risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Design and procurement risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Construction risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Operating risks | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 4: RISK FACTORS AFFECTING THE INVESTMENT WILLINGNESS OF PRIVATE SECTOR OF PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**2. What are the PROBABILITY and IMPACT of risk factors affecting to the performance of PPP projects?**

**a. PROBABILITY of risk**

| **Not expected** to happen | **Small likelihood** but could well happen | **Quite often** occurs | **More than** even chance | **Very frequent** occurrence |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**b. IMPACT of risk**

| **Not** impact | **Not significantly** impact | **Average** impact | **Significant** impact | **Very significant** impact |
|---|---|---|---|---|
| A | B | C | D | E |

| **No** | **ID** | **Risk factors** | **PROBABILITY of risk** | | | | | **IMPACT of risk** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Not expected** to happen ---> **Very frequent** occurrence | | | | | **Not** impact --------> **Very significant** impact | | | | |
| | | | **1** | **2** | **3** | **4** | **5** | **A** | **B** | **C** | **D** | **E** |
| 1 | Political | Government's intervention | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | | Delay in project approvals and permits | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | | Corruption | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Legal | Inadequate law and supervision system | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | | Change in laws and regulations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | | Change in tax regulation (Tariff change) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | Commercial | Financial market risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | | Interest rate fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | | Foreign exchange fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | | Inflation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | Design and | Poor public decision-making process | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | | Lack of transparency in the bidding | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13 | | Subjective project evaluation method | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| No | ID | Risk factors | PROBABILITY of risk | | | | | IMPACT of risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Not expected** to happen ---> **Very frequent** occurrence | | | | | **Not** impact --------> **Very significant** impact | | | | |
| | | | **1** | **2** | **3** | **4** | **5** | **A** | **B** | **C** | **D** | **E** |
| 14 | | Supporting incentive of government risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15 | | Unclear about state participant portion | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16 | | Conflicting or imperfect contract | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17 | | Breach of contract by government | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18 | | Inefficiency feasibility study | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19 | | Unfair process of selection of the private sector | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20 | | Inadequate allocation of responsibility and risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21 | | Low capacity of concession company | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 22 | Construction | Scope change of projects | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 23 | | Land acquisition and compensation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24 | | Problems due to partner's different practice | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 25 | | Lack of supporting infrastructure | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 26 | | Environmental protection risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27 | | Force majeure risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 28 | Operating | Completion risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 29 | | Early termination of concession by concession company | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 | | Toll fee issues | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 31 | | Payment risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 32 | | Demand risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 33 | | Operator inability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 5: PRIVATE SECTOR'S ASSESSMENT ABOUT WILLINGNESS CRITERIA/ATTRIBUTES IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**3. How do private sector RATE the application of such criteria/attributes?**

| **APPLICATION** capacity | |
|---|---|
| Yes | No |

**4. Please indicate the level of AGREEMENT with the following statements**

| **Strongly disagree** | **Disagree** | **Normal** | **Agree** | **Totally agree** |
|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** |

| **No.** | **Attributes** | **APPLICATION capacity** | | **AGREEMENT level** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | **Strongly disagree ----> Totally agree** | | | | |
| | | **Yes** | **No** | **1** | **2** | **3** | **4** | **5** |
| **I.** | **Finance criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Ability to supply capital for the project | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Credibility to call loan for the project | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Ability to fund initial project costs | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Efficiency of domestic capital market | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Suitability of equity/debt ratio | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **II.** | **Profitability criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Revenues from operating the vicinity of PPP projects | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Revenues from the services of project | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Stability of project's cash flow | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Ability of new markets' seeking and penetration | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **III.** | **Legal framework criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Transparency and adequacy of legal framework | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Advantage of legal framework for investment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Efficiency of State's incentive policies for investment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Clarity of State participant portion | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| No. | Attributes | APPLICATION capacity | | AGREEMENT level | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Strongly disagree ----> Totally agree | | | | |
| | | Yes | No | 1 | 2 | 3 | 4 | 5 |
| 5 | Facilitation for procedures of land acquisition and compensation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **IV.** | **Partner Selection criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Accessibility to reliable partners | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Capacity of partners | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Favorable investment environment for seeking partners | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Competitiveness and transparency of bidding process | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **V.** | **Risk sharing criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Less risky in project | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Efficient legal framework about project risk sharing | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Clear risk allocation among parties | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Clear supporting condition about risk sharing by the State | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **VI.** | **Macroeconomics criteria** | | | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Changes of macroeconomics policies | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Favorable conditions by the State for investment operation of the private sector | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Attractiveness of investment environment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Efficiency of the monetary policy of the state | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Stability of economic indicators (e.g., GDP, CPI, Inflation...) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Effectiveness of environmental impact assessment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 6: RESPONSE STRATEGIES OF PRIVATE SECTOR WHEN INVESTING IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**5. How are the level of AGREEMENT on the response strategies of private sector after they are ready to invest in PPP transportation projects?**

| Strong disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| No. | Response strategies | Level of AGREEMENT | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| **A. Cooperation strategies** | | | | | | |
| 1 | Select capable partners (technical capacity and financial resources) | | | | | |
| 2 | Maintain long-term relationships with industrial partners | | | | | |
| 3 | Maintain good relationship with local government and higher officials | | | | | |
| 4 | Improve capacity of professionals involved | | | | | |
| **B. Financing strategies** | | | | | | |
| 5 | Establish detailed plan for loan capitals and long-term financing | | | | | |
| 6 | Evaluate carefully the incentive policies and the state participation portion | | | | | |
| 7 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | | | | | |
| 8 | Seek government support and guarantees | | | | | |
| **C. Evaluation strategies** | | | | | | |
| 9 | Develop a project evaluation tool | | | | | |
| 10 | Hire experienced consultants to assess the feasibility of the project | | | | | |
| 11 | Analyze appropriate allocation of responsibility and risk | | | | | |
| 12 | Evaluate concession period for projects | | | | | |
| **D. Suggestion (FOR Government)** | | | | | | |
| 13 | Acquire proposals from the private sector | | | | | |
| 14 | Suggest to build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | | | | | |
| 15 | Establish Adequate Legal/Regulatory Framework | | | | | |
| 16 | Establish an inter-sector working team | | | | | |
| 17 | Develop a database for historical PPP projects | | | | | |
| 18 | Adjust the appropriate risk allocation between private and public sector | | | | | |

**Thank you for your support**

# APPENDIX C: QUESTIONNARIRE SURVEY

## A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS – A CASE STUDY IN VIETNAM

*Dear Sir/Madam,*
*I am Sy Tien Do, a PhD Candidate at the Chulalongkorn University in Thailand. I am doing a research about "***A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS– A CASE STUDY IN VIETNAM***". This survey is only for writing a thesis, the information within the survey will not be opened to the public. Your information will be very important for the accuracy of the research. Thank you so much indeed*
*Please spend you a little time to mark the following statements carefully.*
*I appreciate your contribution and co-operation!*
*Wish you well.*
*The survey include five parts and begins.*


**Researcher Information**

| | |
|---|---|
| **Sy Tien Do** | PhD Candidate, Construction Engineering and Management, Chulalongkorn University, Thailand and Kyoto University, Japan<br>Lecturer, Division of Construction Engineering and Management, Faculty of Civil Engineering, HCMUT |
| **Address:** | 268 Ly Thuong Kiet Street, 14 Ward, District 10, HCMC |
| **Mobile:** | (+66)805.578.257 – (+84)932.011.085 |
| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |
|---|---|---|
| | | |

## SECTION 1A: GENERAL INFORMATION

### I. EXPLANATION:

### 1. PPP definitions

**Public–private partnership (PPP)** means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts. (Decision No. 71/2010/QD-TTg)

**Build-operate-transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State. (Decree No. 108/2009/ND-CP)

**Build-transfer-operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits. (Decree No. 108/2009/ND-CP)

**Build-transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract. (Decree No. 108/2009/ND-CP)

### 2. RISK

**Risk** is commonly used as a synonym for "hazard", "danger" or "threat" – an undesirable event. Therefore, we focus on studying risk factors of PPP transportation projects in Vietnam.

**Risk factors** affected the ***success or failure of the project***, based on the probability and impact on cost, time, and quality of PPP transportation projects. This survey aims to investigate risk management of PPP from the information provided by The Vietnamese government agencies and private sector who worked in the past or have been working in PPP transportation projects.

Here are some examples of risks affecting the performance of PPP transportation projects

| **Risks** | **Probability of risks** | **Impact of risks** |
|---|---|---|
| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**Contact Information**

**Name:**

**Email:**

**Mobile:**

**Name of projects you are working:**

**SECTION 1B: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years

☐ 5→10 years ☐ > 10 years

2) How many PPP (BOT/BT/BTO) transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects

☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

☐ Private Investors ☐ Government Agencies ☐ Consultants

☐ Contractors ☐ Financiers ☐ Other:

4) You are working at your company as a position:

☐ Directors ☐ Deputy Directors ☐ Project Managers

☐ Supervisors ☐ Engineers Other:

5) Where do your private sector in your project come from:

☐ Singapore ☐ America ☐ Korea ☐ France

☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

6) Average project size:

☐ <10 Billion VNĐ ☐ 100 - 500 Billion VNĐ

☐ 10 - 50 Billion VNĐ ☐ 500 - 1000 Billion VNĐ

☐ 50 - 100 Billion VNĐ ☐ > 1000 Billion VNĐ

7) Do you know about the risk management?

☐ Unknown ☐ Known

☐ Heard of it ☐ Know very well

8) Risk management is necessary in PPP transportation projects or not?

☐ Unnecessary ☐ Necessary ☐ Very necessary

9) How is the risk management system of your organization/ company? Description

10) How important of investment project evaluation tool?

☐ Not important ☐ Not sure whether important or not

☐ Important ☐ Very important

11) How to make investment decisions in your organization/ company? Description

**SECTION 2: FACTORS CONTRIBUTING TO THE DECISION TO PURSUE THE INVESTMENT INTO PPP TRANSPORTATION PROJECTS**

Please check on the checklist box ☒ based on your own experience and opinion

**1. How do you think about these factors influence reluctant investment (not ready to invest) of private sector in PPP projects?**

| Very unimportant | Unimportant | Neutral | Important | Very important |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| No. | Factors that influence the decision of private sector to get involve in a PPP projects | Important level<br>Very unimportant ------> Very important | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| **I** | **COMPANY PROFILE** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Management capacity of the company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Financial viability of the company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | The company's resources about labor, machinery, engineering | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | The company's experience with same project before | ☐ | ☐ | ☐ | ☐ | ☐ |
| **II** | **FINANCE OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Return on equity investment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Possibility of long-term income | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Project cash flows | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Availability of financing sources | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Tax/tariff issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Demand issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| **III** | **OPPORTUNITIES OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Assess/seek to new markets | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Enhancing relationship with lenders | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Enhancing relationship with contractors, project management, or operator companies | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Enhancement of company's strength in its industry | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Value of image to other investors | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Need for work | ☐ | ☐ | ☐ | ☐ | ☐ |
| **IV** | **RISK OF PPP PROJECTS** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Political risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Legal risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Commercial risks | ☐ | ☐ | ☐ | ☐ | ☐ |

| No. | Factors that influence the decision of private sector to get involve in a PPP projects | Important level | | | | |
|---|---|---|---|---|---|---|
| | | Very unimportant ------> Very important | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| 4 | Design and procurement risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Construction risks | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Operating risks | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 3: RISK FACTORS AFFECTING THE PERFORMANCE OF PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**2. What are the PROBABILITY and IMPACT of risk factors affecting to the performance of PPP projects?**

**a. PROBABILITY of risk**

| **Not expected** to happen | **Small likelihood** but could well happen | **Quite often** occurs | **More than** even chance | **Very frequent** occurrence |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**b. IMPACT of risk**

| **Not** impact | **Not significantly** impact | **Average** impact | **Significant** impact | **Very significant** impact |
|---|---|---|---|---|
| A | B | C | D | E |

| **No** | **ID** | **Risk factors** | **PROBABILITY of risk** | | | | | **IMPACT of risk** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Not expected** to happen ---> **Very frequent** occurrence | | | | | **Not** impact --------> **Very significant** impact | | | | |
| | | | **1** | **2** | **3** | **4** | **5** | **A** | **B** | **C** | **D** | **E** |
| 1 | **Political** | Government's intervention | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | | Delay in project approvals and permits | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | | Corruption | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | **Legal** | Inadequate law and supervision system | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | | Change in laws and regulations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | | Change in tax regulation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | **Commercial** | Financial market risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | | Interest rate fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | | Foreign exchange fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | | Inflation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | **Design and Procurement** | Poor public decision-making process | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | | Lack of transparency in the bidding | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13 | | Subjective project evaluation method | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14 | | Supporting incentive of government risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15 | | Unclear about state participant portion | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16 | | Conflicting or imperfect contract | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| No | ID | Risk factors | PROBABILITY of risk | | | | | IMPACT of risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Not expected** to happen ---> **Very frequent** occurrence | | | | | **Not** impact --------> **Very significant** impact | | | | |
| | | | **1** | **2** | **3** | **4** | **5** | **A** | **B** | **C** | **D** | **E** |
| 17 | | Breach of contract by government | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18 | | Inefficiency feasibility study | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19 | | Unfair process of selection of the private sector | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20 | | Inadequate allocation of responsibility and risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21 | | Low capacity of concession company | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 22 | **Construction** | Scope change of projects | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 23 | | Land acquisition and compensation | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24 | | Problems due to partner's different practice | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 25 | | Lack of supporting infrastructure | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 26 | | Environmental protection risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27 | | Force majeure risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 28 | **Operating** | Completion risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 29 | | Early termination of concession by concession company | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 | | Toll fee issues | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 31 | | Payment risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 32 | | Demand risk | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 33 | | Operator inability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 4A: RISK FACTORS AFFECTING THE INVESTMENT WILLINGNESS OF PRIVATE SECTOR OF PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**3. How do risk factors can INFLUENCE on PPP transportation projects?**

| Strongly disagree | Disagree | Neutral | Agree | Totally agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| No | ID | Do you think these factors can influence on PPP transportation projects? | Agreement level | | | | |
|---|---|---|---|---|---|---|---|
| | | | Strongly disagree -----> Totally agree | | | | |
| | | | 1 | 2 | 3 | 4 | 5 |
| 1 | Political | Government's intervention *can influence PPP projects* | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | | Delay in project approvals and permits *can influence PPP projects* | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | | Corruption | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Legal | Inadequate law and supervision system | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | | Change in laws and regulations | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | | Change in tax regulation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | Commercial | Financial market risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | | Interest rate fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | | Foreign exchange fluctuations | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | | Inflation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | Design and Procurement | Poor public decision-making process | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | | Lack of transparency in the bidding | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13 | | Subjective project evaluation method | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14 | | Supporting incentive of government risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15 | | Unclear about state participant portion | ☐ | ☐ | ☐ | ☐ | ☐ |

| No | ID | Do you think these factors can influence on PPP transportation projects? | Agreement level | | | | |
|---|---|---|---|---|---|---|---|
| | | | Strongly disagree -----> Totally agree | | | | |
| | | | 1 | 2 | 3 | 4 | 5 |
| 16 | | Conflicting or imperfect contract | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17 | | Breach of contract by government | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18 | | Inefficiency feasibility study | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19 | | Unfair process of selection of the private sector | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20 | | Inadequate allocation of responsibility and risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 21 | | Low capacity of concession company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 22 | Construction | Scope change of projects | ☐ | ☐ | ☐ | ☐ | ☐ |
| 23 | | Land acquisition and compensation | ☐ | ☐ | ☐ | ☐ | ☐ |
| 24 | | Problems due to partner's different practice | ☐ | ☐ | ☐ | ☐ | ☐ |
| 25 | | Lack of supporting infrastructure | ☐ | ☐ | ☐ | ☐ | ☐ |
| 26 | | Environmental protection risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 27 | | Force majeure risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 28 | Operating | Completion risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 29 | | Early termination of concession by concession company | ☐ | ☐ | ☐ | ☐ | ☐ |
| 30 | | Toll fee issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| 31 | | Payment risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 32 | | Demand risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 33 | | Operator inability | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 4B: PRIVATE SECTOR'S ASSESSMENT ABOUT WILLINGNESS CRITERIA/ATTRIBUTES IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**4. Please indicate the level of AGREEMENT for attributes and criteria reflecting investment willingness of private sector in PPP transporation projects**

| Strongly disagree | Disagree | Normal | Agree | Totally agree |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| No. | Attributes | AGREEMENT level | | | | |
|---|---|---|---|---|---|---|
| | | Strongly disagree ----> Totally agree | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| **I.** | **Finance criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Ability to supply capital for the project *affect the investment willingness of private sector* | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Credibility to call loan for the project *affect the investment willingness of private sector* | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Ability to fund initial project costs | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Efficiency of domestic capital market | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Suitability of equity/debt ratio | ☐ | ☐ | ☐ | ☐ | ☐ |
| **II.** | **Profitability criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Revenues from operating the vicinity of PPP projects | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Revenues from the services of project | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Stability of project's cash flow | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Ability of new markets' seeking and penetration | ☐ | ☐ | ☐ | ☐ | ☐ |
| **III.** | **Legal framework criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Transparency and adequacy of legal framework | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Advantage of legal framework for investment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Efficiency of State's incentive policies for investment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Clarity of State participant portion | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Facilitation for procedures of land acquisition and compensation | ☐ | ☐ | ☐ | ☐ | ☐ |

| No. | Attributes | AGREEMENT level | | | | |
|---|---|---|---|---|---|---|
| | | Strongly disagree ----> Totally agree | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| **IV.** | **Partner Selection criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Accessibility to reliable partners | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Capacity of partners | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Favorable investment environment for seeking partners | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Competitiveness and transparency of bidding process | ☐ | ☐ | ☐ | ☐ | ☐ |
| **V.** | **Risk sharing criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Less risky in project | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Efficient legal framework about project risk sharing | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Clear risk allocation among parties | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Clear supporting condition about risk sharing by the State | ☐ | ☐ | ☐ | ☐ | ☐ |
| **VI.** | **Macroeconomics criteria** | ☐ | ☐ | ☐ | ☐ | ☐ |
| 1 | Changes of macroeconomics policies | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Favorable conditions by the State for investment operation of the private sector | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Attractiveness of investment environment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Efficiency of the monetary policy of the state | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | Stability of macroeconomic indicators (e.g., Inflation, interest rate, currency exchange rates, GDP, CPI, Inflation...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Effectiveness of environmental impact assessment | ☐ | ☐ | ☐ | ☐ | ☐ |

**SECTION 4C: RESPONSE STRATEGIES OF PRIVATE SECTOR WHEN INVESTING IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**5. How are the level of AGREEMENT on the response strategies of private sector after they are ready to invest in PPP transportation projects?**

| Degree of agreement with response strategies of private sector | | | | |
|---|---|---|---|---|
| **Strong disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly agree** |
| 1 | 2 | 3 | 4 | 5 |

| **No.** | **Response strategies** | **Level of AGREEMENT** | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| **A. Cooperation strategies** | | | | | | |
| 1 | Select capable partners (technical capacity and financial resources) | | | | | |
| 2 | Maintain long-term relationships with industrial partners | | | | | |
| 3 | Maintain good relationship with local government and higher officials | | | | | |
| 4 | Improve capacity of professionals involved | | | | | |
| **B. Financing strategies** | | | | | | |
| 5 | Establish detailed plan for loan capitals and long-term financing | | | | | |
| 6 | Evaluate carefully the incentive policies and the state participation portion | | | | | |
| 7 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | | | | | |
| 8 | Seek government support and guarantees | | | | | |
| **C. Evaluation strategies** | | | | | | |
| 9 | Develop a project evaluation tool | | | | | |
| 10 | Hire experienced consultants to assess the feasibility of the project | | | | | |
| 11 | Analyze appropriate allocation of responsibility and risk | | | | | |
| 12 | Evaluate concession period for projects | | | | | |
| **D. Suggestion (FOR Government)** | | | | | | |
| 13 | Acquire proposals from the private sector | | | | | |
| 14 | Suggest to build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | | | | | |
| 15 | Establish adequate legal and regulatory framework | | | | | |
| 16 | Establish an inter-sector working team | | | | | |
| 17 | Develop a database for historical PPP projects | | | | | |
| 18 | Adjust the appropriate risk allocation between private and public sector | | | | | |

**Thank you for your support**

# APPENDIX D: QUESTIONNARIRE SURVEY-FAHP

## A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS – A CASE STUDY IN VIETNAM

*Dear Sir/Madam,*
*I am Sy Tien Do, a PhD Candidate at the Chulalongkorn University in Thailand. I am doing a research about "***A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS– A CASE STUDY IN VIETNAM***". This survey is only for writing a thesis, the information within the survey will not be opened to the public. Your information will be very important for the accuracy of the research. Thank you so much indeed*
*Please spend you a little time to mark the following statements carefully.*
*I appreciate your contribution and co-operation!*
*Wish you well.*
*The survey include five parts and begins.*


| **Researcher Information** | |
|---|---|
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| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |
|---|---|---|

## SECTION 1: GENERAL INFORMATION

### I. EXPLANATION:

### 1. PPP definitions

**Public–private partnership (PPP)** means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts. (Decision No. 71/2010/QD-TTg)

**Build-operate-transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State. (Decree No. 108/2009/ND-CP)

**Build-transfer-operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits. (Decree No. 108/2009/ND-CP)

**Build-transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract. (Decree No. 108/2009/ND-CP)

### 2. RISK

**Risk** is commonly used as a synonym for "hazard", "danger" or "threat" – an undesirable event. Therefore, we focus on studying risk factors of PPP transportation projects in Vietnam.

**Risk factors** affected the ***success or failure of the project***, based on the probability and impact on cost, time, and quality of PPP transportation projects. This survey aims to investigate risk management of PPP from the information provided by The Vietnamese government agencies and private sector who worked in the past or have been working in PPP transportation projects.

Here are some examples of risks affecting the performance of PPP transportation projects

| Risks | Probability of risks | Impact of risks |
|---|---|---|
| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**Contact Information**

**Name:**

**Email:**

**Mobile:**

**Name of projects you are working:**

**SECTION 2: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years
☐ 5→10 years ☐ > 10 years

2) How many PPP (BOT/BT/BTO) transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects
☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

☐ Private Investors ☐ Government Agencies ☐ Consultants
☐ Contractors ☐ Financiers ☐ Other:

4) You are working at your company as a position:

☐ Directors ☐ Deputy Directors ☐ Project Managers
☐ Supervisors ☐ Engineers Other:

5) Where do your private sector in your project come from:

☐ Singapore ☐ America ☐ Korea ☐ France
☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

6) Average project size:

☐ <10 Billion VNĐ ☐ 100 - 500 Billion VNĐ
☐ 10 - 50 Billion VNĐ ☐ 500 - 1000 Billion VNĐ
☐ 50 - 100 Billion VNĐ ☐ > 1000 Billion VNĐ

7) Do you know about the risk management?

☐ Unknown ☐ Known
☐ Heard of it ☐ Know very well

8) Risk management is necessary in PPP transportation projects or not?

☐ Unnecessary ☐ Necessary ☐ Very necessary

9) How is the risk management system of your organization/ company? Description

10) How important of investment project evaluation tool?

☐ Not important ☐ Not sure whether important or not
☐ Important ☐ Very important

11) How to make investment decisions in your organization/ company? Description

**SECTION 3: PRIVATE SECTOR'S ASSESSMENT ABOUT WILLINGNESS CRITERIA/ATTRIBUTES IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion
**How are the important of willingness criteria/attributes of private sector?**

The pairwise comparison of linguistic variables using fuzzy numbers

| Intensity of Fuzzy Scale | Definition of linguistic variables | Fuzzy number | User-defined |
|---|---|---|---|
| $1^{\sim}$ | Similar importance (SI) | (L,M,U) | (1,1,1) |
| $3^{\sim}$ | Moderate importance (MI) | (L,M,U) | (2,3,4) |
| $5^{\sim}$ | Intense importance (II) | (L,M,U) | (4,5,6) |
| $7^{\sim}$ | Demonstrated importance (DI) | (L,M,U) | (6,7,8) |
| $9^{\sim}$ | Extreme importance (EI) | (L,M,U) | (8,9,9) |
| $2^{\sim}, 4^{\sim}, 6^{\sim}, 8^{\sim}$ | Intermediate values | (L,M,U) | (_,_,_) |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
| | ***I. Criteria - Criteria*** | | | | | | | | | | | | | | | | | | Wil2. Profitability criteria |
| 1 | Wil1. Financing criteria | | | | | | | | | | | | | | | | | | Wil3. Legal framework criteria |
| 2 | Wil1. Financing criteria | | | | | | | | | | | | | | | | | | Wil4. Partner selection criteria |
| 3 | Wil1. Financing criteria | | | | | | | | | | | | | | | | | | Wil5. Risk sharing criteria |
| 4 | Wil1. Financing criteria | | | | | | | | | | | | | | | | | | Wil6. Macroeconomics criteria |
| 5 | Wil1. Financing criteria | | | | | | | | | | | | | | | | | | Wil3. Legal framework criteria |
| 6 | Wil2. Profitability criteria | | | | | | | | | | | | | | | | | | Wil4. Partner selection criteria |
| 7 | Wil2. Profitability criteria | | | | | | | | | | | | | | | | | | Wil5. Risk sharing criteria |
| 8 | Wil2. Profitability criteria | | | | | | | | | | | | | | | | | | Wil6. Macroeconomics criteria |
| 9 | Wil2. Profitability criteria | | | | | | | | | | | | | | | | | | Wil4. Partner selection criteria |
| 10 | Wil3. Legal framework criteria | | | | | | | | | | | | | | | | | | Wil5. Risk sharing criteria |
| 11 | Wil3. Legal framework criteria | | | | | | | | | | | | | | | | | | Wil6. Macroeconomics criteria |
| 12 | Wil3. Legal framework criteria | | | | | | | | | | | | | | | | | | Wil5. Risk sharing criteria |
| 13 | Wil4. Partner selection criteria | | | | | | | | | | | | | | | | | | Wil6. Macroeconomics criteria |
| 14 | Wil4. Partner selection criteria | | | | | | | | | | | | | | | | | | Wil5. Risk sharing criteria |
| 15 | Wil5. Risk sharing criteria | | | | | | | | | | | | | | | | | | Wil6. Macroeconomics criteria |

| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **II. Attributes - Attributes** | | | | | | | | | | | | | | | | | | |
| | *Attributes of financing criteria (Wil1)* | | | | | | | | | | | | | | | | | | |
| 1 | Ability to supply capital for the project | | | | | | | | | | | | | | | | | | Credibility to call loan for the project |
| 2 | Ability to supply capital for the project | | | | | | | | | | | | | | | | | | Ability to fund initial project costs |
| 3 | Ability to supply capital for the project | | | | | | | | | | | | | | | | | | Efficiency of domestic capital market |
| 4 | Ability to supply capital for the project | | | | | | | | | | | | | | | | | | Suitability of equity/debt ratio |
| 5 | Credibility to call loan for the project | | | | | | | | | | | | | | | | | | Ability to fund initial project costs |
| 6 | Credibility to call loan for the project | | | | | | | | | | | | | | | | | | Efficiency of domestic capital market |
| 7 | Credibility to call loan for the project | | | | | | | | | | | | | | | | | | Suitability of equity/debt ratio |
| 8 | Ability to fund initial project costs | | | | | | | | | | | | | | | | | | Efficiency of domestic capital market |
| 9 | Ability to fund initial project costs | | | | | | | | | | | | | | | | | | Suitability of equity/debt ratio |
| 10 | Efficiency of domestic capital market | | | | | | | | | | | | | | | | | | Suitability of equity/debt ratio |

| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Attributes of profitability criteria (Wil2)* | | | | | | | | | | | | | | | | | | |
| 1 | Revenues from operating the vicinity of project | | | | | | | | | | | | | | | | | | Revenues from the services of project |
| 2 | Revenues from operating the vicinity of project | | | | | | | | | | | | | | | | | | Stability of project's cash flow |
| 3 | Revenues from operating the vicinity of project | | | | | | | | | | | | | | | | | | Ability of new markets' seeking and penetration |
| 4 | Revenues from the services of project | | | | | | | | | | | | | | | | | | Stability of project's cash flow |
| 5 | Revenues from the services of project | | | | | | | | | | | | | | | | | | Ability of new markets' seeking and penetration |
| 6 | Stability of project's cash flow | | | | | | | | | | | | | | | | | | Ability of new markets' seeking and penetration |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Attributes of legal framework criteria (Wil3)* | | | | | | | | | | | | | | | | | | |
| 1 | Transparency and adequacy of legal framework | | | | | | | | | | | | | | | | | | Advantage of legal framework for investment |
| 2 | Transparency and adequacy of legal framework | | | | | | | | | | | | | | | | | | Efficiency of State's incentive policies for investment |
| 3 | Transparency and adequacy of legal framework | | | | | | | | | | | | | | | | | | Clarity of State participant portion |
| 4 | Transparency and adequacy of legal framework | | | | | | | | | | | | | | | | | | Facilitation for procedures of land acquisition and compensation |
| 5 | Advantage of legal framework for investment | | | | | | | | | | | | | | | | | | Efficiency of State's incentive policies for investment |
| 6 | Advantage of legal framework for investment | | | | | | | | | | | | | | | | | | Clarity of State participant portion |
| 7 | Advantage of legal framework for investment | | | | | | | | | | | | | | | | | | Facilitation for procedures of land acquisition and compensation |
| 8 | Efficiency of State's incentive policies for investment | | | | | | | | | | | | | | | | | | Clarity of State participant portion |
| 9 | Efficiency of State's incentive policies for investment | | | | | | | | | | | | | | | | | | Facilitation for procedures of land acquisition and compensation |
| 10 | Clarity of State participant portion | | | | | | | | | | | | | | | | | | Facilitation for procedures of land acquisition and compensation |

| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Attributes of partner selection criteria (Wil4)* | | | | | | | | | | | | | | | | | | |
| 1 | Accessibility to reliable partners | | | | | | | | | | | | | | | | | | Capacity of partners |
| 2 | Accessibility to reliable partners | | | | | | | | | | | | | | | | | | Favorable investment environment for seeking partners |
| 3 | Accessibility to reliable partners | | | | | | | | | | | | | | | | | | Competitiveness and transparency of bidding process |
| 4 | Capacity of partners | | | | | | | | | | | | | | | | | | Favorable investment environment for seeking partners |
| 5 | Capacity of partners | | | | | | | | | | | | | | | | | | Competitiveness and transparency of bidding process |
| 6 | Favorable investment environment for seeking partners | | | | | | | | | | | | | | | | | | Competitiveness and transparency of bidding process |

| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Attributes of risk sharing criteria (Wil5)* | | | | | | | | | | | | | | | | | | |
| 1 | Less risky in project | | | | | | | | | | | | | | | | | | Efficient legal framework about project risk sharing |
| 2 | Less risky in project | | | | | | | | | | | | | | | | | | Clear risk allocation among parties |
| 3 | Less risky in project | | | | | | | | | | | | | | | | | | Clear supporting condition about risk sharing by the State |
| 4 | Efficient legal framework about project risk sharing | | | | | | | | | | | | | | | | | | Clear risk allocation among parties |
| 5 | Efficient legal framework about project risk sharing | | | | | | | | | | | | | | | | | | Clear supporting condition about risk sharing by the State |
| 6 | Clear risk allocation among parties | | | | | | | | | | | | | | | | | | Clear supporting condition about risk sharing by the State |

| | | Extremely important | | Demonstrated importance | | Intense importance | | Moderate importance | | Similar importance | | Moderate importance | | Intense importance | | Demonstrated importance | | Extremely important | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Attributes of macroeconomics criteria (Wil6)* | | | | | | | | | | | | | | | | | | |
| 1 | Macroeconomics policies | | | | | | | | | | | | | | | | | | Favorable conditions by the State for investment operation of the private sector |
| 2 | Macroeconomics policies | | | | | | | | | | | | | | | | | | Attractiveness of investment environment |
| 3 | Macroeconomics policies | | | | | | | | | | | | | | | | | | Efficiency of the monetary policy of the state |
| 4 | Macroeconomics policies | | | | | | | | | | | | | | | | | | Stability of economic indicators (e.g. GDP, CPI, Inflation...) |
| 5 | Macroeconomics policies | | | | | | | | | | | | | | | | | | Effectiveness of environmental impact assessment |
| 6 | Favorable conditions by the State for investment operation of the private sector | | | | | | | | | | | | | | | | | | Attractiveness of investment environment |
| 7 | Favorable conditions by the State for investment operation of the private sector | | | | | | | | | | | | | | | | | | Efficiency of the monetary policy of the state |
| 8 | Favorable conditions by the State for investment operation of the private sector | | | | | | | | | | | | | | | | | | Stability of economic indicators (e.g. GDP, CPI, Inflation...) |
| 9 | Favorable conditions by the State for investment operation of the private sector | | | | | | | | | | | | | | | | | | Effectiveness of environmental impact assessment |
| 10 | Attractiveness of investment environment | | | | | | | | | | | | | | | | | | Efficiency of the monetary policy of the state |
| 11 | Attractiveness of investment environment | | | | | | | | | | | | | | | | | | Stability of economic indicators (e.g. GDP, CPI, Inflation...) |
| 12 | Attractiveness of investment environment | | | | | | | | | | | | | | | | | | Effectiveness of environmental impact assessment |
| 13 | Efficiency of the monetary policy of the state | | | | | | | | | | | | | | | | | | Stability of economic indicators (e.g. GDP, CPI, Inflation...) |
| 14 | Efficiency of the monetary policy of the state | | | | | | | | | | | | | | | | | | Effectiveness of environmental impact assessment |
| 15 | Stability of economic indicators (e.g. GDP, CPI, Inflation...) | | | | | | | | | | | | | | | | | | Effectiveness of environmental impact assessment |

# APPENDIX E: QUESTIONNAIRE SURVEY – PERFORMANCE SCORE

## A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS – A CASE STUDY IN VIETNAM

*Dear Sir/Madam,*
*I am Sy Tien Do, a PhD Candidate at the Chulalongkorn University in Thailand. I am doing a research about "***A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS– A CASE STUDY IN VIETNAM***". This survey is only for writing a thesis, the information within the survey will not be opened to the public. Your information will be very important for the accuracy of the research. Thank you so much indeed*
*Please spend you a little time to mark the following statements carefully.*
*I appreciate your contribution and co-operation!*
*Wish you well.*
*The survey include five parts and begins.*


**Researcher Information**

| | |
|---|---|
| **Sy Tien Do** | PhD Candidate, Construction Engineering and Management, Chulalongkorn University, Thailand and Kyoto University, Japan<br>Lecturer, Division of Construction Engineering and Management, Faculty of Civil Engineering, HCMUT |
| **Address:** | 268 Ly Thuong Kiet Street, 14 Ward, District 10, HCMC |
| **Mobile:** | (+66)805.578.257 – (+84)932.011.085 |
| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| | | |
|---|---|---|
| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |

## SECTION 1: GENERAL INFORMATION

### I. EXPLANATION:

### 1. PPP definitions

**Public–private partnership (PPP)** means that the State and investor jointly implement projects on development of infrastructure or provision of public services on the basis of project contracts. (Decision No. 71/2010/QD-TTg)

**Build-operate-transfer (BOT)** contract means a contract signed between a competent state agency and an investor to build and operate an infrastructure facility in a specified duration. Upon the expiration of this duration, the investor shall transfer without compensation such facility to the Vietnamese State. (Decree No. 108/2009/ND-CP)

**Build-transfer-operate (BTO)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will grant the investor the right to operate that facility for a specified duration to recover investment capital and earn profits. (Decree No. 108/2009/ND-CP)

**Build-transfer (BT)** contract means a contract signed between a competent state agency and an investor to build an infrastructure facility. After completely building this infrastructure facility, the investor shall transfer it to the Vietnamese State. The Government will create conditions for the investor to implement other projects for recovering investment capital and earning profits or shall make payments to the investor as agreed in the BT contract. (Decree No. 108/2009/ND-CP)

### 2. RISK

**Risk** is commonly used as a synonym for "hazard", "danger" or "threat" – an undesirable event. Therefore, we focus on studying risk factors of PPP transportation projects in Vietnam.

**Risk factors** affected the ***success or failure of the project***, based on the probability and impact on cost, time, and quality of PPP transportation projects. This survey aims to investigate risk management of PPP from the information provided by The Vietnamese government agencies and private sector who worked in the past or have been working in PPP transportation projects.

Here are some examples of risks affecting the performance of PPP transportation projects

| Risks | Probability of risks | Impact of risks |
|---|---|---|
| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**Contact Information**

**Name:**

**Email:**

**Mobile:**

**Name of projects you are working:**

**SECTION 2: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years
☐ 5→10 years ☐ > 10 years

2) How many PPP (BOT/BT/BTO) transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects
☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

☐ Private Investors ☐ Government Agencies ☐ Consultants
☐ Contractors ☐ Financiers ☐ Other:

4) You are working at your company as a position:

☐ Directors ☐ Deputy Directors ☐ Project Managers
☐ Supervisors ☐ Engineers Other:

5) Where do your private sector in your project come from:

☐ Singapore ☐ America ☐ Korea ☐ France
☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

6) Average project size:

☐ <10 Billion VNĐ ☐ 100 - 500 Billion VNĐ
☐ 10 - 50 Billion VNĐ ☐ 500 - 1000 Billion VNĐ
☐ 50 - 100 Billion VNĐ ☐ > 1000 Billion VNĐ

7) Do you know about the risk management?

☐ Unknown ☐ Known
☐ Heard of it ☐ Know very well

8) Risk management is necessary in PPP transportation projects or not?

☐ Unnecessary ☐ Necessary ☐ Very necessary

9) How is the risk management system of your organization/ company? Description

10) How important of investment project evaluation tool?

☐ Not important ☐ Not sure whether important or not
☐ Important ☐ Very important

11) How to make investment decisions in your organization/ company? Description

**SECTION 3: PRIVATE SECTOR'S ASSESSMENT ABOUT WILLINGNESS CRITERIA/ATTRIBUTES IN PPP TRANSPORTATION PROJECTS IN VIETNAM**

Please check on the checklist box ☒ based on your own experience and opinion

**How are the feasibility score of willingness criteria/attributes in each potential projects?**

Measurement scale for investment willingness criteria

| Linguistic Scales | Code | Scale of Fuzzy number | | |
|---|---|---|---|---|
| Very Poor (VP) | VP | 0 | 0 | 20 |
| Poor (P) | P | 10 | 25 | 40 |
| Fair (F) | F | 30 | 50 | 70 |
| Good (G) | G | 60 | 75 | 90 |
| Very Good (VG) | VG | 80 | 100 | 100 |

| Attributes | Code | Investment willingness criteria | Project PM | | | | | Project A | | | | | Project B | | | | | Project C | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | VP | P | F | G | VG | VP | P | F | G | VG | VP | P | F | G | VG | VP | P | F | G | VG |
| **Wil1. Financing attribute** | WF1 | Ability to supply capital for the project | | | | | | | | | | | | | | | | | | | | |
| | WF2 | Credibility to call loan for the project | | | | | | | | | | | | | | | | | | | | |
| | WF3 | Ability to fund initial project costs | | | | | | | | | | | | | | | | | | | | |
| | WF4 | Efficiency of domestic capital market | | | | | | | | | | | | | | | | | | | | |
| | WF5 | Suitability of equity/debt ratio | | | | | | | | | | | | | | | | | | | | |
| **Wil2. Profitability attribute** | WP1 | Revenues from operating the vicinity of project | | | | | | | | | | | | | | | | | | | | |
| | WP2 | Revenues from the services of project | | | | | | | | | | | | | | | | | | | | |
| | WP3 | Stability of project's cash flow | | | | | | | | | | | | | | | | | | | | |
| | WP4 | Ability of new markets' seeking and penetration | | | | | | | | | | | | | | | | | | | | |
| **Wil3. Legal framework attribute** | WL1 | Transparency and adequacy of legal framework | | | | | | | | | | | | | | | | | | | | |
| | WL2 | Advantage of legal framework for investment | | | | | | | | | | | | | | | | | | | | |
| | WL3 | Efficiency of State's incentive policies for investment | | | | | | | | | | | | | | | | | | | | |
| | WL4 | Clarity of State participant portion | | | | | | | | | | | | | | | | | | | | |
| | WL5 | Facilitation for procedures of land acquisition and compensation | | | | | | | | | | | | | | | | | | | | |
| **Wil4. Partner selection attribute** | WS1 | Accessibility to reliable partners | | | | | | | | | | | | | | | | | | | | |
| | WS2 | Capacity of partners | | | | | | | | | | | | | | | | | | | | |
| | WS3 | Favorable investment environment for seeking partners | | | | | | | | | | | | | | | | | | | | |
| | WS4 | Competitiveness and transparency of bidding process | | | | | | | | | | | | | | | | | | | | |
| **Wil5. Risk sharing attribute** | WR1 | Less risky in project | | | | | | | | | | | | | | | | | | | | |
| | WR2 | Efficient legal framework about project risk sharing | | | | | | | | | | | | | | | | | | | | |
| | WR3 | Clear risk allocation among parties | | | | | | | | | | | | | | | | | | | | |
| | WR4 | Clear supporting condition about risk sharing by the State | | | | | | | | | | | | | | | | | | | | |
| **Wil6. Macroeconomics attribute** | WM1 | Changes of macroeconomics policies | | | | | | | | | | | | | | | | | | | | |
| | WM2 | Favorable conditions by the State for investment operation of the private sector | | | | | | | | | | | | | | | | | | | | |
| | WM3 | Attractiveness of investment environment | | | | | | | | | | | | | | | | | | | | |
| | WM4 | Efficiency of the monetary policy of the state | | | | | | | | | | | | | | | | | | | | |
| | WM5 | Stability of economic indicators (e.g. GDP, CPI, Inflation...) | | | | | | | | | | | | | | | | | | | | |
| | WM6 | Effectiveness of environmental impact assessment | | | | | | | | | | | | | | | | | | | | |

# APPENDIX F: VALIDATION

## A WILLINGNESS ASSESSMENT MODEL FOR PRIVATE SECTOR INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP TRANSPORTATION PROJECTS BASED ON RISK ANALYSIS – A CASE STUDY IN VIETNAM

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| | |
|---|---|
| **Sy Tien Do** | PhD Candidate, Construction Engineering and Management, Chulalongkorn University, Thailand and Kyoto University, Japan<br>Lecturer, Division of Construction Engineering and Management, Faculty of Civil Engineering, HCMUT |
| **Address:** | 268 Ly Thuong Kiet Street, 14 Ward, District 10, HCMC |
| **Mobile:** | (+66)805.578.257 – (+84)932.011.085 |
| **Email:** | sy.dotien@yahoo.com |


*Please kindly answer the questions; the research would not be fulfilled without your cooperation. Thank you for your support.*

| *Faculty of Civil Engineering* | *Division of Construction Engineering & Management* | *Researcher* |
|---|---|---|
| | | |

## SECTION 1A: GENERAL INFORMATION

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| **Risks** | **Probability of risks** | **Impact of risks** |
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| Government's intervention | Quite often occurs | Time, cost of projects |
| Foreign exchange fluctuation | More than even chance (3 times/years) | Cost of projects |
| Delay in project approvals and permits | Quite often occurs | Time, Cost, and Scope of projects |

**Contact Information**

**Name:**

**Email:**

**Mobile:**

**Name of projects you are working:**

**SECTION 1B: PERSONAL INFORMATION**

1) How long have you worked in construction industry?

☐ < 3 years ☐ 3→5 years

☐ 5→10 years ☐ > 10 years

2) How many PPP (BOT/BT/BTO) transportation projects have you ever participated in:

☐ Nothing ☐ 2 projects

☐ 1 project ☐ > 2 projects

3) You are working at your company as a role:

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☐ Contractors ☐ Financiers ☐ Other:

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☐ Supervisors ☐ Engineers Other:

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☐ China/Hong Kong ☐ Japan ☐ Vietnam Other:

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9) How is the risk management system of your organization/ company? Description

10) How important of investment project evaluation tool?

☐ Not important ☐ Not sure whether important or not

☐ Important ☐ Very important

11) How to make investment decisions in your organization/ company? Description

## SECTION 2: FACTORS CONTRIBUTING TO THE DECISION TO PURSUE THE INVESTMENT INTO PPP TRANSPORTATION PROJECTS

Please check on the checklist box ☒ based on your own experience and opinion

**1. How do you think about these critical factors influence reluctant investment of private sectors in PPP projects?**

| No. | Concern factors | Agree | Disagree | Comments |
|---|---|---|---|---|
| 1 | Financial viability of the company | ☐ | ☐ | |
| 2 | Management capacity of the company | ☐ | ☐ | |
| 3 | Demand | ☐ | ☐ | |
| 4 | Legal risks | ☐ | ☐ | |
| 5 | Possibility of long-term income | ☐ | ☐ | |
| 6 | Availability of financing sources | ☐ | ☐ | |
| 7 | Return on equity investment | ☐ | ☐ | |
| 8 | Project cash flows | ☐ | ☐ | |
| 9 | Political risks | ☐ | ☐ | |
| 10 | Commercial risks | ☐ | ☐ | |

**2. The comparisons opinions between the public and private sectors**

| No. | Concern factors | Ranking | | | Agree | Disagree | Comments |
|---|---|---|---|---|---|---|---|
| | | Private | | Public | | | |
| 1 | Financial viability of the company | 1 | → | 1 Financial viability of the company | | | |
| 2 | Management capacity of the company | 2 | → | 2 Demand issues | | | |
| 3 | Legal risks | 3 | → | 3 Possibility of long-term income | | | |
| 4 | Return on equity investment | 4 | → | 4 Legal risks | | | |
| 5 | Project cash flows | 5 | → | 5 Availability of financing sources | | | |
| 6 | Possibility of long-term income | 6 | → | 6 Management capacity of the company | | | |
| 7 | Demand issues | 7 | → | 7 Project cash flows | | | |
| 8 | Political risks | 8 | → | 8 Return on equity investment | | | |
| 9 | Availability of financing sources | 9 | → | 9 Commercial risks | | | |
| 10 | Commercial risks | 10 | → | 10 Design and procurement risks | | | |
| 11 | Design and procurement risks | 11 | → | | | | |
| | | | | 19 Political risks | | | |

## 3. Different perceptions between the public and private sectors

| No. | Different perceptions between the public and private sectors | Different perceptions | | Comments |
|---|---|---|---|---|
| | | Private | Public | |
| 1 | Financial viability of the company | √ | | |
| 2 | Demand | √ | | |
| 3 | Enhancement of company's strength in its industry | | √ | |
| 4 | Political risks | | √ | |
| 5 | Construction risks | | √ | |

## 4. Recommendations and lessons for the public and private sectors

| No. | Different perceptions between the public and private sectors | Different perceptions | | Comments |
|---|---|---|---|---|
| | | Private | Public | |
| 1 | Corruption | √ | - | |
| 2 | Interest rate fluctuations | √ | - | |
| 3 | Inflation | √ | - | |
| 4 | Lack of transparency in the bidding | √ | - | |
| 5 | Inefficient feasibility study | √ | - | |
| 6 | Inadequate allocation of responsibility and risk | √ | - | |
| 7 | Scope change of projects | √ | - | |
| 8 | Payment risk | √ | – | |

## SECTION 3: RISK FACTORS AFFECTING THE PERFORMANCE OF PPP (BOT/BT/BTO) TRANSPORTATION PROJECTS IN VIETNAM

Please check on the checklist box ☒ based on your own experience and opinion

**1. How do you think about these critical risk factors influence the perfomance of PPP projects?**

| No. | Risk factors | Agree | Disagree | Comments |
|---|---|---|---|---|
| 1 | Land acquisition and compensation | ☐ | ☐ | |
| 2 | Delay in project approvals and permits | ☐ | ☐ | |
| 3 | Inefficient feasibility study | ☐ | ☐ | |
| 4 | Financial market risk | ☐ | ☐ | |
| 5 | Subjective project evaluation method | ☐ | ☐ | |
| 6 | Change in laws and regulations | ☐ | ☐ | |
| 7 | Interest rate fluctuations | ☐ | ☐ | |
| 8 | Corruption | ☐ | ☐ | |
| 9 | Scope change of projects | ☐ | ☐ | |
| 10 | Supporting incentive of government risk | ☐ | ☐ | |

## 2. The comparisons opinions between the public and private sectors

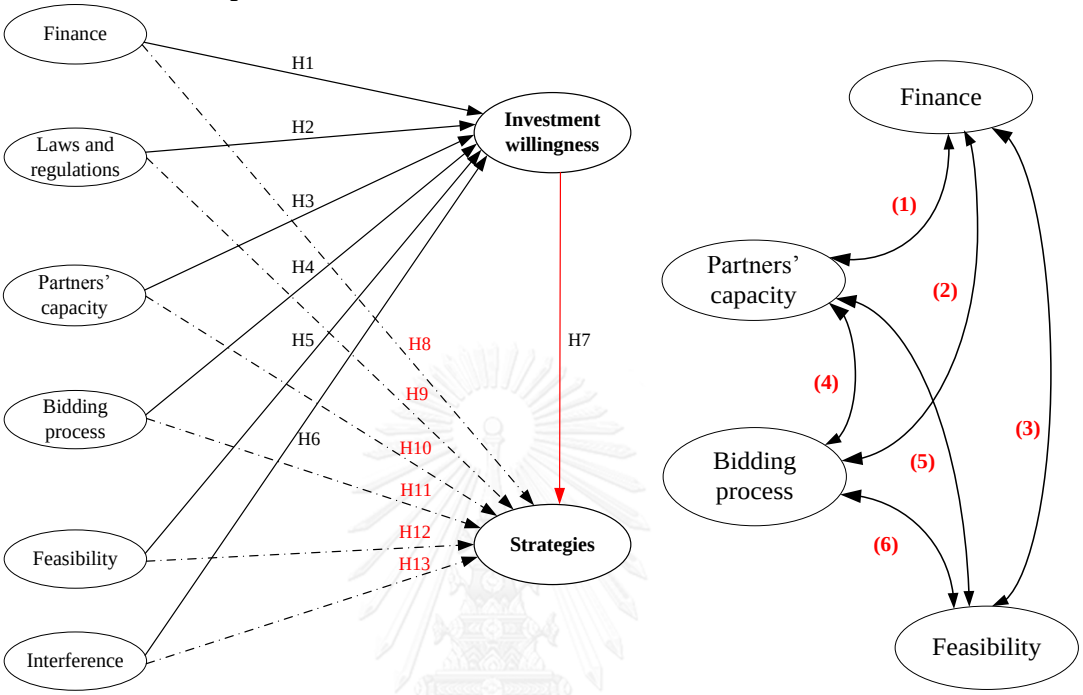
| No. | Risk factors | Ranking | | | | Agree | Disagree | Comments |
|---|---|---|---|---|---|---|---|---|
| | | Private | | Public | | | | |
| 1 | Land acquisition and compensation | 1 | → | 1 | Land acquisition and compensation | | | |
| 2 | Delay in project approvals and permits | 2 | → | 2 | Delay in project approvals and permits | | | |
| 3 | Inefficient feasibility study | 3 | → | 3 | Subjective project evaluation method | | | |
| 4 | Corruption | 4 | → | 4 | Change in laws and regulations | | | |
| 5 | Scope change of projects | 5 | → | 5 | Financial market risk | | | |
| 6 | Financial market risk | 6 | → | 6 | Low capacity of SPV | | | |
| 7 | Subjective project evaluation method | 7 | → | 7 | Inefficient feasibility study | | | |
| 8 | Change in laws and regulations | 8 | → | 8 | Demand risk | | | |
| 9 | Interest rate fluctuations | 9 | → | 9 | Supporting incentive of government risk | | | |
| 10 | Inadequate allocation of responsibility and risk | 10 | → | 10 | Poor public decision-making process | | | |
| 11 | Supporting incentive of government risk | 11 | → | 11 | Interest rate fluctuations | | | |
| 12 | Poor public decision-making process | 12 | → | | | | | |
| .. | | | | 13 | Inadequate allocation of responsibility and risk | | | |
| 17 | Demand risk | 17 | → | 22 | Scope change of projects | | | |
| .. | | | | .. | | | | |
| 24 | Low capacity of SPV | 24 | → | 27 | Corruption | | | |

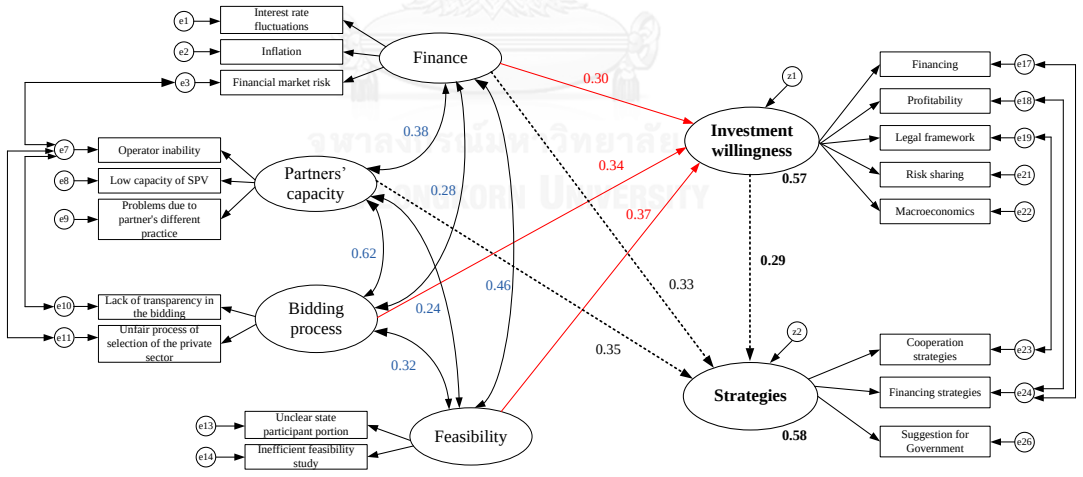
**3. Different perceptions about critical risk factors among the public and private sectors**

| No. | Different perceptions between the public and private sectors | Different perceptions | | | Comments |
|---|---|---|---|---|---|
| | | Private | | Public | |
| 1 | Corruption | √ | | - | |
| 2 | Interest rate fluctuations | √ | | - | |
| 3 | Inflation | √ | | - | |
| 4 | Lack of transparency in the bidding | √ | | - | |
| 5 | Inefficient feasibility study | √ | | - | |
| 6 | Inadequate allocation of responsibility and risk | √ | | - | |
| 7 | Scope change of projects | √ | | - | |
| 8 | Payment risk | √ | | – | |

## SECTION 4: RISK-BASED INVESTMENT WILLINGNESS ASSESSMENT MODEL

Please check on the checklist box ☒ based on your own experience and opinion
Kết quả mô hình đánh giá mối liên hệ giữa rủi ro, sự sẵn sàng đầu tư của tư nhân, và các chiến lược đối phó của tư nhân



| No. | Causal relationship | | | Standardized regression weights | Agree | Disagree | Comments |
|---|---|---|---|---|---|---|---|
| **H1** | Finance | --> | Investment willingness | **0.3** | ☐ | ☐ | |
| **H4** | Bidding process | --> | Investment willingness | **0.34** | ☐ | ☐ | |
| **H5** | Feasibility | --> | Investment willingness | **0.37** | ☐ | ☐ | |
| | | | | | ☐ | ☐ | |
| **H7** | Investment willingness | --> | Responsive strategies | **0.29** | ☐ | ☐ | |
| | | | | | ☐ | ☐ | |
| **H8** | Finance | --> | Responsive strategies | **0.417** | ☐ | ☐ | |
| **H10** | Partners' capacity | --> | Responsive strategies | **0.35** | ☐ | ☐ | |
| | | | | | ☐ | ☐ | |
| **H2** | Laws and regulations | --> | Investment willingness | - | ☐ | ☐ | |
| **H3** | Partners' capacity | --> | Investment willingness | - | ☐ | ☐ | |
| **H6** | Interference | --> | Investment willingness | - | ☐ | ☐ | |
| | | | | | ☐ | ☐ | |
| **H9** | Laws and regulations | --> | Responsive strategies | - | ☐ | ☐ | |
| **H11** | Bidding process | --> | Responsive strategies | - | ☐ | ☐ | |
| **H12** | Feasibility | --> | Responsive strategies | - | ☐ | ☐ | |
| **H13** | Interference | --> | Responsive strategies | - | ☐ | ☐ | |

| No. | Correlation | | | Correlation coefficients | Agree | Disagree | Comments |
|---|---|---|---|---|---|---|---|
| **1** | Finance | <--> | Partners' capacity | **0.377** | ☐ | ☐ | |
| **2** | Finance | <--> | Bidding process | 0.281 | ☐ | ☐ | |
| **3** | Finance | <--> | Feasibility | **0.463** | ☐ | ☐ | |
| **4** | Partners' capacity | <--> | Bidding process | **0.622** | ☐ | ☐ | |
| **5** | Partners' capacity | <--> | Feasibility | 0.244 | ☐ | ☐ | |
| **6** | Bidding process | <--> | Feasibility | 0.325 | ☐ | ☐ | |

## SECTION 5: RESPONSE STRATEGIES OF PRIVATE SECTOR WHEN INVESTING IN PPP TRANSPORTATION PROJECTS IN VIETNAM

Please check on the checklist box ☒ based on your own experience and opinion

**How are the level of AGREEMENT on the response strategies of private sectors after they are ready to invest in PPP transportation projects?**

| Degree of agreement with response strategies of private sectors | | | | |
|---|---|---|---|---|
| **Strong disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly agree** |
| 1 | 2 | 3 | 4 | 5 |

| No. | Response strategies | Level of AGREEMENT | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| **A. Cooperation strategies** | | | | | | |
| 1 | Select capable partners (technical capacity and financial resources) | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | Maintain long-term relationships with industrial partners | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | Maintain good relationship with local government and higher officials | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | Improve capacity of professionals involved | ☐ | ☐ | ☐ | ☐ | ☐ |
| **B. Financing strategies** | | | | | | |
| 5 | Establish detailed plan for loan capitals and long-term financing | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | Evaluate carefully the incentive policies and the state participation portion | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | Comprehensive assess the effects of inflation, interest rate, foreign exchange issues | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | Seek government support and guarantees | ☐ | ☐ | ☐ | ☐ | ☐ |
| **C. Evaluation strategies** | | | | | | |
| 9 | Develop a project evaluation tool | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | Hire experienced consultants to assess the feasibility of the project | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | Analyze appropriate allocation of responsibility and risk | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | Evaluate concession period for projects | ☐ | ☐ | ☐ | ☐ | ☐ |
| **D. Suggestion (FOR Government)** | | | | | | |
| 13 | Acquire proposals from the private sector | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14 | Suggest to build permanent contract during the concession period of the contract, the contract could be adjusted to fit economic, political, and social changes | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15 | Establish Adequate Legal/Regulatory Framework | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16 | Establish a Coordinating and Supportive Authority | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17 | Develop a database for historical PPP projects | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18 | Adjust the appropriate risk allocation between private and public sector | ☐ | ☐ | ☐ | ☐ | ☐ |

**Thank you for your support**

# APPENDIX G: RISK STRATEGIES OF PRIVATE INVESTORS

| Categories | No. | Code | Risk factors | Allocation | | | | Strategies | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pu | Pr | S | Ne | Private sector (Investors/Lenders) | Public sector |
| **Politics** | 1 | P1 | Government's intervention | v | | | | - Maintain close relationships with government officers<br>- Share knowledge with the public sector | - Establish an inter-sector working team<br>- Implement training for government staff |
| | 2 | P2 | Delay in project approvals and permits | | | | v | - Maintain close relationships with government officers<br>- Minimize the bureaucracy and the procedures for approvals by government<br>- Select reputable partners<br>- Add contingency funds for delay of late approvals | - Perform transparent and streamline the approvals and permits process<br>- Restrict corruption in the process of approvals and permits for projects<br>- Establish transparent process for approvals and permits |
| | 3 | P3 | Corruption | v | | | | - Avoid compromise with corruption<br>- Select prestigious partners (state-owned companies)<br>- Prepare all procedures, and complete dossiers as required, to minimize corruption and bribery of local officials<br>- Maintain good relationships with local officials, and government agencies<br>- Sign the contract with organizations that have good relationships with local officials to undertake the approval procedures | - Establish transparent procurement process<br>- Adhere strictly the anti-corruption legal framework<br>- Raise salaries for government officials |
| **Law** | 4 | L1 | Inadequate law and supervision system | v | | | | - Increase the understanding of law and supervision system<br>- Add contingency funds or special conditions in the contract | - Establish adequate legal and regulatory framework |
| | 5 | L2 | Change in laws and regulations | v | | | | - Increase the understanding of law and supervision system<br>- Provide appropriate measures/strategies to decrease change impact of laws and regulations<br>- Add contingency funds or special conditions in the contract | - Promulgate quickly and clearly circulars to enhance the performance of PPP laws |
| | 6 | L3 | Change in tax regulation (Tariff change) | v | | | | - Provide appropriate measures/strategies to decrease impact changes of tariff regulations | - Establish stable tax policies and regulations |

| Categories | No. | Code | Risk factors | Allocation | | | | Strategies | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pu | Pr | S | Ne | Private sector (Investors/Lenders) | Public sector |
| **Commerce** | 7 | C1 | Financial market risk | | v | | | - Establish detailed plan for loan capitals and long-term finance<br>- Attempt early involvement with financial institutions | - Promulgate specific policies to stabilize financial market<br>- Establish loan guarantee policies to support investors<br>- Conduct a combination of concessional resources and appropriate support policies |
| | 8 | C2 | Interest rate fluctuations | | | | v | - Assess comprehensive the effects of interest rate issue<br>- Sign pre-defined prices with the public sector<br>- Secure standby cash flow in advance<br>- Specify escalation clauses for interest rate in contract<br>- Specify reimbursement clauses in contract to mitigate loss from interest rate changes<br>- Sign the fixed price with the subcontractors/suppliers<br>- Obtain payment bonds and performance bonds from banks/financial institutions<br>- Establish alternatives for payment in contract (i.e. land development, and resource swap rights) | - Tighten monetary policies to stem interest rate |
| | 9 | C3 | Foreign exchange fluctuations | | | v | | - Request payments in hard currency in countries with unstable economic conditions<br>- Use dual-currency contracts with certain portion to be paid in local currency and others in foreign currency<br>- Obtain local government guarantees of exchange rate and convertibility (i.e. fixed rate for long period or less fluctuation)<br>- Specify compensation clauses for exchange rate<br>- Obtain payment bonds and performance bonds from banks/financial institutions<br>- Establish alternatives for payment in contract (i.e. land development, and resource swap rights)<br>- Specify extension or compensation clauses in contract for payment | - Tighten monetary policies to stem foreign exchange rate |
| | 10 | C4 | Inflation | | | v | | - Assess comprehensive the effects of inflation issue<br>- Sign pre-defined prices with subcontractors/suppliers<br>- Use local product and labor to reduce the impact of inflation<br>- Establish alternatives for payment in contract | - Sign pre-defined prices with concessionaire company<br>- Tighten monetary policies to stem inflation |

| Categories | No. | Code | Risk factors | Allocation | | | | Strategies | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pu | Pr | S | Ne | Private sector (Investors/Lenders) | Public sector |
| **Design and procurement** | 11 | D1 | Poor public decision-making process | v | | | | - Share knowledge with the public sector | - Establish a database for historical PPP projects<br>- Establish an inter-sector working team<br>- Develop a project evaluation tool |
| | 12 | D2 | Lack of transparency in the bidding | v | | | | - Suggest some methods to enhance transparency of the bidding process<br>- Establish two-way communication channel with the public sector | - Establish transparent procurement process<br>- Restrict direct contracting (direct procurement)<br>- Standard bidding documents and contracts corresponding with type of infrastructure sectors<br>- Organize regular meetings with investors to share information |
| | 13 | D3 | Subjective project evaluation method | | | v | | - Develop a project evaluation tool<br>- Produce comprehensive project evaluation method | - Produce a comprehensive project evaluation<br>- Establish two-way communication channels with the private sector |
| | 14 | D4 | Supporting incentive of government risk | v | | | | - Suggest support and guarantee policies<br>- Evaluate carefully the incentive policies and the state participation portion | - Establish two-way communication channels with the private sector<br>- Organize regular meetings with investors to share information about potential projects and incentive policies |
| | 15 | D5 | Unclear about state participant portion | | | | v | - Evaluate carefully the incentive policies and the state participation portion | - Establish two-way communication channels with the private sector<br>- Organize regular meetings with investors to share information about potential projects and state participant portion |
| | 16 | D6 | Conflicting or imperfect contract | | | v | | - Conduct detailed feasibility studies for the project (Proposed projects by the private sector)<br>- Build permanent contract during the concession period of the contract (the contract could be adjusted to fit economic, political, and social changes)<br>- Establish mechanisms for the management of concession contract (dispute resolution) | - Conduct detailed feasibility studies for the project (Proposed projects by the public sector)<br>- Build permanent contract during the concession period of the contract (the contract could be adjusted to fit economic, political, and social changes)<br>- Establish mechanisms for concession contract management (dispute resolution) |
| | 17 | D7 | Breach of contract by government | v | | | | - Specify clearly the regulations about material, immaterial breach of contracts in contract agreement<br>- Specify comprehensive terms of material and immaterial default in contract<br>- Renegotiate the contract to solve disputes | - Supply notice for breach of contracts on time<br>- Renegotiate the contract to solve disputes |
| | 18 | D8 | Inefficient feasibility study | | | v | | - Conduct detailed feasibility studies for the projects (Proposed projects by the private sector)<br>- Improve capacity of professionals involved<br>- Hire experienced consultants (third-party) to assess the feasibility of the project<br>- Notice to government any problem of planning and budgeting as soon as possible<br>- Specify additional cost and extension time clauses in contract | - Conduct detailed feasibility studies for the projects (Proposed projects by the public sector)<br>- Hire experienced consultants (third-party) to assess the feasibility of the project<br>- Acquire proposals from the private sector<br>- Implement synchronous contractual commitments<br>- Improve capacity of professionals involved |
| | 19 | D9 | Unfair process of selection of the private sector | v | | | | | - Establish transparent procurement process<br>- Restrict direct contracting (direct procurement)<br>- Standard bidding documents and contracts corresponding with type of infrastructure sectors |
| | 20 | D10 | Inadequate allocation of responsibility and risk | | | v | | - Analyze appropriate allocation of responsibility and risk<br>- Establish two-way communication channels with the public sector<br>- Allocate work to partners corresponding with their ability | - Analyze appropriate allocation of responsibility and risk<br>- Establish two-way communication channels with the private sector<br>- Establish a database for historical PPP projects |
| | 21 | D11 | Low capacity of concession company | | | v | | - Distribute works in accordance with the capabilities of each partners<br>- Select partners with strong capability | - Restrict corruption in private investors selection<br>- Establish transparent procurement process<br>- Improve capacity of professionals involved |

| Categories | No. | Code | Risk factors | Allocation | | | | Strategies | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pu | Pr | S | Ne | Private sector (Investors/Lenders) | Public sector |
| **Construction** | 22 | Co1 | Scope change of projects | | | v | | - Define clearly scope of work of such partners in contract<br>- Specify extension or additional payment clauses in contract for scope changes<br>- Try to fully understand all the public's needs<br>- Share knowledge with the public sector to reduce any change of scope<br>- Develop the contingency plans for scope change | - Specify extension or additional payment clauses in contract for scope changes<br>- Define clearly scope of work of such partners in contract<br>- Establish two-way communication channels with the private sector |
| | 23 | Co2 | Land acquisition and compensation | v | | | | | - Perform appropriate planning (i.e. budget accordingly) for land acquisition and compensation<br>- Restrict corruption for land acquisition and compensation tasks<br>- Divide the specific tasks for all levels from national government to local provinces |
| | 24 | Co3 | Problems due to partner's different practice | | v | | | - Hire subcontractors/ suppliers more experience and previous relationship<br>- Train staff for enhancing project management skills<br>- Select a reasonable partners (e.g. contractors, sub-contractors, suppliers …)<br>- Maintain long-term relationships with industrial partners<br>- Be careful in accepting the nominated subcontractors/suppliers<br>- Notice to failure of subcontractors/suppliers<br>- Require the performance bonds supplied by subcontractors.<br>- Specify flow-down clauses in subcontract | - Select reasonable investors<br>- Implement suitable policies to enhance transparent of procurement process and contract documentation |
| | 25 | Co4 | Lack of supporting infrastructure | | | | v | - Include disclaimer clauses (i.e. compensation, termination clauses) for lack of supporting infrastructure of Government<br>- Specify the extension of time clause in contract | - Implement synchronous contractual commitments about the support infrastructure |
| | 26 | Co5 | Environmental protection risk | | v | | | - Sign a subcontract with specialist companies to control pollution<br>- Comply with laws, regulations of international and local environment<br>- Establish measures/strategies to strictly control pollution of construction site<br>- Include disclaimer clauses for present pollution problems in contract<br>- Develop the contingency plan to support environmental protection (the schedule for raining, flood, …) | - Restrict corruption in the process of approvals and permits for projects<br>- Conduct a more detailed environment impact assessment for projects |
| | 27 | Co6 | Force majeure risk | | | v | | - Develop clearly policies in contract to limit the impact of risks in the implementation of projects<br>- Sign a contract between clients and contractors with specified terms and particular conditions to share force majeure risks<br>- Get insurance from insurance companies<br>- Specify the extension of time clause in contract<br>- Prepare appropriate construction measures/strategies to adverse weather such as heavy rain, strong wind, flood, storms and earthquakes | - Establish an inter-sector working team<br>- Implement training for government staff<br>- Define step-in and step-out clauses in contract |

| Categories | No. | Code | Risk factors | Allocation | | | | Strategies | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pu | Pr | S | Ne | Private sector (Investors/Lenders) | Public sector |
| **Operation** | 28 | O1 | Completion risk | | v | | | - Obtain payment bonds and performance bonds from banks/financial institutions<br>- Specify extension or compensation clauses in contract for payment | - Obtain payment bonds and performance bonds from banks/financial institutions<br>- Specify extension or compensation clauses in contract for payment |
| | 29 | O2 | Early termination of concession by concession company | | | v | | - Define termination clauses in contract<br>- Define compensation for termination clauses in contract<br>- Renegotiate the contract to resolve disputes | - Define step-in, step-out, and termination clauses in contract<br>- Renegotiate the contract to resolve disputes |
| | 30 | O3 | Toll fee issues | | | v | | - Provide strategies and appropriate measures/strategies to decrease impact of toll fee issues (e.g. change of toll fee)<br>- Conduct detailed feasibility studies for the project<br>- Add contingency funds or special conditions for toll fee issues | - Conduct detailed feasibility studies for the PPP projects |
| | 31 | O4 | Payment risk | v | | v | | - Prepare strong own financial instrument<br>- Require the minimum revenue guarantees from the public sector to cope with unrealistic forecast on future demand | - Support private investors with minimum revenue guarantees in PPP contract<br>- Perform support policies related to operating process |
| | 32 | O5 | Demand risk | | | v | | - Perform researches for actual demand of project<br>- Require the minimum revenue guarantees from the public sector to cope with unrealistic forecast on future demand | - Perform adequate researches about demand issues in feasibility studies (e.g. traffic projection, competing projects, and future social-economic development)<br>- Support private investors with minimum revenue guarantees in PPP contract |
| | 33 | O6 | Operator inability | | v | | | - Select reputable partners for operation phase<br>- Train staff for enhancing project management skills | - Strengthen inspection and monitoring of government staff<br>- Implement training to enhance abilities for government staff |

# VITA

Do Tien Sy was born on Oct 01, 1985 in Ha Tay, a large province in Vietnam. He finished his elementary education in Le Hong Phong High school in Hochiminh. Then he continued to study Civil Engineering in Hochiminh City University of Technology (HCMUT), Hochiminh, Vietnam. His undergraduate research focused on Structural Engineering, in the area of high-rise building design. In April 2008, he finished his bachelor's degree and was accepted to become an assistant lecturer in HCMUT. Then, he got a scholarship from AUN/Seed-net/JICA to continue his study in the Master of Engineering program in Department of Civil Engineering, Falculty of Engineering, Chulalongkorn, Bangkok, Thailand. After that, he received the Master's degree in Division of Civil Engineering and Management from Chulalongkorn University in 2012. Furthermore, he also got a scholarship from AUN/Seed-net for PhD Sandwich program at Chulalongkorn University and Kyoto University.

During his study at Chulalongkorn and Kyoto University, he has the experiences in special research projects in the field of the construction risk management, the construction contract, the construction law, and the building information modeling (BIM).