DETERMINANTS OF PROJECT SUCCESS FOR INTERNATIONAL CONSTRUCTION JOINT VENTURES IN GHANA

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Determinants of Project Success for International Construction Joint Ventures in Ghana

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CERTIFICATE OF ORIGINALITY

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_____ _____ (Signed)

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DEDICATION

I dedicate this thesis to God, the Almighty, my family, especially my mother – Agnes Donkor and Wife-to-be – Miss. Monica Assem Kaki, and friends.

ABSTRACT

International construction joint ventures (ICJVs), a hybrid-oriented project-based collaborative arrangement, have evolved as an effective approach to sustainable development, given their myriad socio-economic and environmental benefits. Despite the benefits, performance/success in ICJV comes with great difficulty, and the failure of an ICJV can lead to fatal problems on the project. Many scholars have, therefore, emphasized that the need for effective coordination and management of ICJVs is paramount to their success. However, the successful implementation and management of ICJVs are challenging for especially in developing countries. To enable the successful operation and enhance the performance of ICJVs, it is, therefore, crucial to understand the dynamic issues influencing their performance. This study aims to develop an effective management framework for the successful management and performance of ICJVs in Ghana. Specifically, this research has six objectives: (1) to identify the key drivers for implementing ICJVs in Ghana; (2) to identify and evaluate critical barriers impeding ICJVs success in Ghana; (3) to define and establish practical measures for exercising MC in ICJVs; (4) to develop a complete performance assessment framework for ICJVs in Ghana; (5) to examine the relationship between MC mechanisms and the performance of ICJVs in Ghana; and (6) to develop an effective management framework for ICJVs, contingent on the study's results, to help in facilitating the successful management and performance of ICJVs in Ghana. Developing countries, for many valid reasons, e.g. lack of advanced technology, and various forms of resources, would prefer to undertake ICJV to mitigate risks and acquire technology transfer from the partnered firms, hence studying ICJV in developing countries is timely and important. Focusing on developing countries, such as Ghana, where construction investments via ICJV have been increasing is worthwhile.

In achieving the stated objectives, a comprehensive literature review and questionnaire surveys with ICJVs practitioners in Ghana were utilized in this study. Various quantitative analysis techniques were used to analyze the data. On the drivers for implementing ICJVs, the results confirmed that different rationales to establish ICJVs are held simultaneously by partnered firms. Factor analysis uncovered two underlying grouped drivers: operational success drivers, and organizational-driven drivers from 14 drivers as common/mutual drivers. More so, two non-overlapping factors including strategic positioning drivers, and market power drivers from 10 drivers were retained as separate drivers. On the barriers impeding ICJVs success, 22 barriers were found to be critical. Most of the critical barriers were attributed to culture, individual, and organizational issues. On the measures for exercising MC in ICJVs, 16 significant mechanisms were identified. The top significant mechanisms were more connected to personnel-driven mechanisms including staffing of corporate board members, staffing of senior executive positions, and key functional areas placement. On the performance assessment framework for ICJVs, confirmatory factor analysis confirmed the significance of five underlying grouped measures, including project-based performance, company/partner-based performance, performance of ICJV management, perceived satisfaction with the ICJV, and socio-environmental performance. On the relationship between MC mechanisms and the performance of ICJVs, PLS-SEM results indicated that personnel and policy MC mechanisms have a significant positive impact on project and socio-environmental performance of ICJVs when foreign partners are involved, while both MC mechanisms highly displayed a positive and significant impact on project performance for local partners. The study concluded that while there are no barrier-free ICJVs, the results highlight the need for partnering firms to align their motivations and strategically build management control structures to promote the achievement of ICJVs goals by weakening the performance impacts of critical barriers. More importantly, an effective management

framework for the successful management and performance of ICJVs is proposed based on the overall results. The management framework was further validated by ICJV practitioners in Ghana to confirm its reliability and credibility.

This study not only makes significant contributions to the ICJV body of knowledge, especially for developing countries but also helps ICJVs practitioners, policymakers, and stakeholders to manage ICJVs efficiently and effectively and improve their performance.

Keywords: Barriers; Drivers; Developing countries; Ghana; International construction joint venture; Management control; Performance measurement.

LIST OF RESEARCH PUBLICATIONS

Below is a list of research publications that the author of this thesis contributed during his Ph.D. study, and as shown within the text, some parts of the thesis have been fully or partially published, with due acknowledgement, in these publications.

A. Refereed Journal Papers (published/accepted) (2019-2021)

Those Directly Relevant to This Thesis

1. **Tetteh, M. O**., Chan, A. P., Darko, A., and Torku, A. (2021b). Critical Barriers to International Construction Joint Ventures Success: Multi-Experts Views and Contextual Disparities. *Journal of Construction Engineering and Management, DOI: 10.1061/(ASCE)CO.1943-7862.0002059.*

2. **Tetteh, M. O**., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. *Engineering, Construction and Architectural Management*. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

3. **Tetteh, M. O**., Chan, A. P., Darko, A., and Nani, G. (2020). Factors affecting international construction joint ventures: a systematic literature review. *International Journal of Construction Management*, 1-45.

4. Chan, A. P., **Tetteh, M. O**., and Nani, G. (2020). Drivers for international construction joint ventures adoption: a systematic literature review. *International Journal of Construction Management*, 1-13.

5. **Tetteh, M. O**., Chan, A. P., and Nani, G. (2019). Combining process analysis method and four-pronged approach to integrate corporate sustainability metrics for assessing international construction joint ventures performance. *Journal of Cleaner Production, 237*, 117781.

6. **Tetteh, M. O**., and Chan, A. P. (2019a). Review of concepts and trends in international construction joint ventures research. *Journal of Construction Engineering and Management, 145*(10), 04019057.

7. Twum-Ampofo, S., B., Nani, G., **Tetteh, M. O**., and Ababio, K. A. (2019). Factorial Analysis of International Construction Joint Venture Performance Measures: A Case of Ghana. *Journal of Architectural Environment and Structural Engineering, 2*(1), 14-22.

8. **Tetteh, M. O**., Chan, A. P., Darko, A., Yevu, S. K., Boateng, E. B., and Nwaogu, J. M. (2021c). Key drivers for implementing international construction joint ventures (ICJVs): global insights for sustainable growth. *Engineering, Construction and Architectural*

Management. Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/ECAM-07-2020-0512.

B. Refereed Journal Papers (Under review for the first to third time)

1. **Tetteh, M. O**., and Chan, A. P. (under review). Impacts of drivers, barriers, and management control mechanisms on the performance of international construction project joint ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-11174.

2. **Tetteh, M. O**., Chan, A. P., Oppong, G.D., Nani, G., and Darko, Amos (under review). Impacts of Management Control Mechanisms on the Performance of International Construction Project Joint Ventures, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4338.

3. **Tetteh, M. O.,** Chan, A. P., Darko, A., Ozorhon, B., and Adinyira, E. (under review) Multidimensional prototype of performance measures for international construction joint ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-10969.

4. **Tetteh, M. O**., Chan, A. P., Mohandes, S.R., and Agyemang, D.Y. (under review). Diagnosing Critical Barriers to International Construction Joint Ventures Success in a Developing Country Context: The Case of Ghana, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4263R1.

5. **Tetteh, M. O**., and Chan, A. P. (under review). Impact of Motivational Factors on the Performance Measurement of International Construction Project Joint Ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-10145.

6. **Tetteh, M. O**., and Chan, A. P. (under review). Modeling the performance implications of critical barriers to international construction joint ventures success: Implications for sustainability. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-10816.

C. Refereed Journal Papers (Others)

1. Nwaogu, J. M., Chan, A. P., and **Tetteh, M. O.** (2021). Staff resilience and coping behavior as protective factors for mental health among construction tradesmen. *Journal of Engineering, Design and Technology*, Vol. ahead-of-print No. ahead-of-print. DOI: 10.1108/JEDT-11-2020-0464.

2. Darko, A., Chan, A. P., Yang, Y., and **Tetteh, M. O.** (2020). Building information modeling (BIM)-based modular integrated construction risk management–Critical survey and future needs. *Computers in Industry*, *123*, 103327.

3. Yevu, S. K., Yu, A. T., **Tetteh, M. O.,** and Antwi-Afari, M. F. (2020). Analytical methods for information technology benefits in the built environment: towards an integration model. *International Journal of Construction Management*, 1-12.

4. Ohene, E., **Tetteh, M. O**., and Nani, G. (2019). Critical Barriers to Social Sustainability: the Quantity Surveyors' Perspective. *Journal of Architectural Environment and Structural Engineering Research, 2*(3), 22-33.

D. Conference Publications (Accepted or Presented)

1. **Tetteh, M. O.,** and Chan, A. P. (2019b). A review of international construction joint ventures research in construction journals. CIB World Building Congress: Constructing Smart Cities. 17-21 June 2019, *Hong Kong*.

2. **Tetteh, M. O.,** Chan, A. P., Darko, A., and Nani, G. (Accepted). Sustainable management practices of international construction joint ventures: a conceptual model for managing the barriers and risks. World Academy of Science, Engineering and Technology.

E. Book Chapters (Accepted)

1. Boateng, E. B., Twumasi, E. A., Darko, A., **Tetteh, M. O**., and Chan, A. P. (2021). Predicting Building-Related Carbon Emissions: A Test of Machine Learning Models. In *Enabling AI Applications in Data Science* (pp. 247-266). Springer, Cham.

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LIST OF ABBREVIATIONS

AEC	-	Architectural, Engineering, and Construction
BR	-	Barrier
CB-SEM	-	Covariance-Based Structural Equation Modeling
CFA	-	Confirmatory Factor Analysis
CI	-	Consistency Index
CJVs	-	Construction Joint Ventures
CLR	-	Comprehensive Literature Review
CM	-	Construction Management
CP	-	Company/Partner-Based Performance
CoC	-	Centre of Gravity
CR	-	Consistency Ratio
CS	-	Corporate Sustainability

DR	-	Driver
ER	-	Expert Review
FA	-	Factor Analysis
GIPC	-	Ghana Investment Promotion Centre
HTMT	-	Heterotrait-Monotrait
ICJVs	-	International Construction Joint Ventures
IJVs	-	International Joint Ventures
IRA	-	Interrater Agreement
JVs	-	Joint Ventures
KFOA	-	Key Functional and Operational Areas
MC	-	Management Control
MCM	-	Management Control Mechanisms
MS	-	Mean Score
MWU	-	Mann-Whitney U Test
MF	-	Membership Function
NJCC	-	National Joint Consultative Committee
PP	-	Project-Based Performance
PS	-	Pilot Study
PM	-	Performance of ICJV management
PS	-	Perceived Satisfaction with the ICJV
PLS-SEM	-	Partial Least Squares Structural Equation Modeling
PERM	-	Performance Measure
SPPP	-	Support in Policy and Planning Process
SD	-	Standard Deviation
SP	-	Socio-Environmental Performance

TMS	-	Top Management Staffing
TR	-	Transformation Rule
TLO	-	Training and Learning Opportunities
ZBWM	-	Z-based Best Worse Method
ZDM	-	Z-based Delphi Method

CHAPTER 1 INTRODUCTION[1]

1.1 BACKGROUND

Faced with complex construction project demands and fierce market competition, many construction firms adopt the project-based collaboration arrangement to improve project delivery efficiency (Kobayashi et al., 2009). This is particularly evident in developing countries as most local firms face difficulties in constructing more complex and large-scale infrastructure projects on their own (Lin and Ho, 2013; Hwang et al., 2017). A joint venture (JV) between construction firms from the developed countries and local construction firms has become among the most viable alternatives and has been used worldwide over the last three decades (Tetteh and Chan, 2019a). Specifically, this business model is referred to as an international construction joint venture (ICJV). ICJVs are critical to global infrastructure projects, whose host countries usually lack execution capacity or required managerial and

[1] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. *Engineering, Construction and Architectural Management*. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

Tetteh, M. O., Chan, A. P., Darko, A., Yevu, S. K., Boateng, E. B., and Nwaogu, J. M. (2021c). Key drivers for implementing international construction joint ventures (ICJVs): global insights for sustainable growth. *Engineering, Construction and Architectural Management*. Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/ECAM-07-2020-0512.

Tetteh, M. O., Chan, A. P., and Nani, G. (2019). Combining process analysis method and four-pronged approach to integrate corporate sustainability metrics for assessing international construction joint ventures performance. *Journal of Cleaner Production*, *237*, 117781.

Chan, A. P., Tetteh, M. O., and Nani, G. (2020). Drivers for international construction joint ventures adoption: a systematic literature review. *International Journal of Construction Management*, 1-13.

Tetteh, M. O., and Chan, A. P. (2019a). Review of concepts and trends in international construction joint ventures research. *Journal of Construction Engineering and Management*, *145*(10), 04019057.

Tetteh, M. O., and Chan, A. P. (2019b). A review of international construction joint ventures research in construction journals. CIB World Building Congress: Constructing Smart Cities. 17-21 June 2019, *Hong Kong*.

technological expertise (Brockmann and Brezinski, 2013). An ICJV simply refers to a temporary partnership between two or more legally distinct construction firms who invest and engage in executing Architectural, Engineering, and Construction (AEC) projects with at least one partner headquartered outside the venture operation country (Ozorhon et al., 2008a; Hong and Chan, 2014). Without ICJVs, numerous technically complex projects or large-scale infrastructure projects worldwide would not have been successful. Typical examples of more complex and large-scale infrastructure projects delivered through ICJVs around the world include the Hong Kong-Zhuhai-Macao Bridge in China, the Expressway System in Bangkok, the Three Gorges Dam in China, the High-Speed Railway in Taiwan, the Dawa Industrial Housing Project in Ghana, etc. (Girmscheid and Brockmann, 2010; Liang et al., 2019).

Construction firms form ICJVs for several reasons. Among the key reasons include that costs and risks of a project are spread, access to special expertise or new technologies, access to a new market, ensure the quality and timely execution of a project, pre-empting competition, and creation of stronger competitive units (McIntosh and McCabe, 2003; Panibratov, 2016). ICJVs are gaining space in the business world at an increasing rate, allowing corporate firms to achieve faster results more wisely and promote innovation and sustainability (Jin et al. 2020).

Despite the myriad benefits of ICJVs, they are not always successful in achieving the strategic, financial, or technological goals of the partnering firms (Flyvbjerg et al., 2003; Eissa et al., 2021). An ICJV introduces a high level of complexity in the management of a project in several ways. First, the large and highly diversified multinational companies whose objectives and motivations must be aligned in order for the project to be undertaken with success is increased. Second, aside from the concerns of the management of the project itself,

additional factors such as the management of the joint corporate entity come into play (Kobayashi et al., 2009). These issues pose greater challenges owing to the differences in partners' values, managerial systems and philosophies, factors of culture, government policy, and other cross-country issues (Ozorhon et al. 2008b; Girmscheid and Brockmann, 2010). Thus, success in ICJVs comes with great difficulty, and the failure of an ICJV can lead to fatal problems on the project. Many scholars have, therefore, emphasized that the need for effective coordination and management of ICJVs is paramount to their success (Luo, 2001; Ho et al., 2009; Han et al., 2019). That is to say that management control acts as a significant determinant of ICJVs success. However, the successful implementation and management of ICJVs are challenging for especially in developing countries. To enable the successful implementation and enhance the performance of ICJVs, it is, therefore, crucial to understand the issues influencing their performance.

1.2 SUMMARY OF RESEARCH GAPS

Focusing specifically on the defined scope of ICJVs, the review of existing literature presents five key research gaps that need to be addressed.

1.2.1 Research Gap 1

1.2.1.1 Key driving forces behind, and barriers affecting, ICJVs implementation

The driving forces behind ICJVs implementation are important to be considered for successful management strategies and mitigation action formulation (Brockmann and Girmscheid, 2009). However, empirical studies on the drivers for implementing ICJVs are limited and remain fuzzy in terms of the assessment from the perspectives of all partnered

firms of the same venture. While most of the existing related studies remain tied to JVs in the general business/management literature and opinion-based of researchers, few, if any, comprehensively examined the drivers for implementing ICJVs (McIntosh and McCabe, 2003). More so, despite the inconsistent adoption of ICJVs across various countries/jurisdictions, partnered firms have different interests engaging in ICJVs implementation (Klijn et al., 2014). This raises a fundamental question: what are the different drivers that partnering firms hold for implementing ICJVs? It is worth noting that reasons for venturing into ICJVs may vary locally, nationally, and among partnering firms. There exists some varying importance of factors driving ICJVs adoption as Chan et al. (2020) argued. For example, while technology transfer, learning managerial skills, attracting capital investment, and the opportunity to work on large and complex projects constitute a key set of strategic drivers for implementing ICJVs by local/host partnering firms, foreign partnering firms may enter ICJV for faster entry into local markets, facilitating international expansion, and conforming to the host/local government policy (Girmscheid and Brockmann, 2010). Previous studies have identified different drivers for implementing ICJVs, yet they shed little empirical investigation on the relative importance of these drivers between local/host and foreign partners and focused on very few driving factors.

Concerning the barriers affecting ICJVs success, while several studies have documented multiple risk factors jeopardizing ICJVs success (Hsueh et al., 2007; Zhao et al., 2013; Prasitsom and Likhitruangsilp, 2015; Hwang et al., 2017), studies that have fully investigated the potential problems, issues, challenges, or obstacles (hereafter only referred to as barriers) to ICJVs success are limited. Thus, it is rather difficult to find empirical studies specifically focusing on the barriers to the success of ICJVs. Critical barriers to ICJVs success need to be identified and analyzed in various levels of detail to facilitate the establishment of sustainable

action plans for the successful implementation and upscaling of ICJVs. The only existing study is by Lu et al. (2020), yet they did not focus specifically on ICJVs. Moreover, they did not analyze barriers from a specific-country perspective but rather from a cross-country perspective. That is to say that they conducted an industry-wide survey with both academicians and industry practitioners in several regions around the world. Meanwhile, they did not thoroughly review or empirically analyze the barriers in terms of their criticality. Aside from generalizability limitation given the specialty of ICJVs, different countries and regions may have different criticality levels of the barriers due to variations in cultures and traditions, socioeconomic, political, and environmental priorities (Tetteh et al., 2020). Thus, country-specific investigation of critical barriers to ICJVs success is crucial to driving penetrating solutions that match business requirements and/or opportunities to generate sustained, investment returns.

1.2.2 Research Gap 2

1.2.2.1 Management control (MC) in ICJVs

Geringer and Herbert (1989) defined MC as "*a process wherein one party influences the behaviour and performance of another party to varying degrees through power, bureaucracy, or informal mechanisms."* Of critical importance to the management of JVs are how control is acquired, how it is exercised, and how it influences JVs performance (Yan and Gray, 2001a). While studies, especially in the management field, have laid a rich foundation on how these three aspects are assessed, their applicability in ICJVs practice is challenging (Tetteh et al., 2021a). That is to say that they are specifically tailored with consideration of the manufacturing industry environment and strategies, in particular how MC is exercised, and are not suitable for ICJVs. Kamminga and Meer-Kooistra (2007) mentioned that the

conceptualization of MC is too theoretical because it does not consider the operational characteristics of organizations. Hence, there is a need to define and establish practical means of exercising MC in ICJVs with direct link to measurements that are precise and objective. More so, as central in any collaboration arrangement, MC develops distinctively in context and location, and the processes and its establishments differ as well (Girmscheid and Brockmann, 2010; Ho et al., 2009). Thus, a comprehensive understanding of the MC from a developing country's perspective is important for ICJV practitioners in making decisions about which ICJV activities to control, and the mechanisms to employ to efficiently and effectively manage ICJVs.

1.2.3 Research Gap 3

1.2.3.1 Holistic performance measurement of ICJVs

Performance assessment for ICJVs has become a central theme of research yet confused and debated aspect in extant literature. According to Tetteh and Chan (2019), there have been many seminal contributions to the discussion of international joint ventures (IJVs) performance assessment, however, diverse, discrete, and inadequate measures exist. Such a divide originates from the hybrid structures and transitory nature of this collaboration form (Tetteh and Chan, 2019). Assessing ICJVs performance have always been a challenging task for both practitioners and researchers. For example, while practitioners are challenged with the perspective from which ICJV performance should be measured (i.e. either from the partner perspective, project-based perspective, ICJV itself, or the overall satisfaction), researchers find it difficult to determine indicators for assessing performance (Ozorhon et al., 2007a). This could be the unevenness and incompatibility of performance determinants in

ICJV literature. Both practitioners and researchers often use different and non-equivalent indicators that they subjectively believe are most important (Mohamed, 2003; Larimo et al., 2016). Hence, virtually no unified measurement criteria exist (Almohsen and Ruwanpura, 2016). Consequently, scholars' ability to predict overall ICJV outcomes and managers ability to enact successful performance have been hampered (Ren et al., 2009). Several studies have benchmarked the performance measures for ICJVs (Mohamed, 2003; Ozorhon et al., 2010a; Almohsen and Ruwanpura, 2016; Tetteh et al., 2019), yet a full and mutually acceptable performance measures for assessing and monitoring the performance of ICJVs is lacking. For example, Mohamed (2003) partially assessed Australian and British contracting JVs performance using only three performance measures: value, profit, and satisfaction. Ozorhon et al. (2010a) considered only the views of host/local partners and conceptualized seventeen (17) performance measures into four dimensions; project-based performance, company/partner-based performance, performance of ICJV management, and overall/perceived satisfaction. Mohr (2006) argued that ICJVs performance is not only multidimensional but also has to be seen from all partners' perspective. Besides, key performance measures such as safety performance, dispute resolution, environmental performance, and effective communication were not included. According to Shah (2015), these performance indicators promote sustainability and competitive advantage. Following this call, Tetteh et al. (2019) launched a fifth dimension, socio-environmental performance, with thirty-five (35) performance measures; but it is only a literature review study that lacks empirical evidence. Therefore, there is a need to develop a more holistic performance assessment framework for ICJVs.

1.2.4 Research Gap 4

1.2.4.1 MC mechanisms and the performance of ICJV relationship

As mentioned earlier (i.e. research gap 2), the core understanding of how MC influences ICJVs performance is still lacking. For example, based on Yan and Gray's (1996) proposition of MC, Luo (2001) examined the MC mechanisms and performance relationships in ICJVs using the performance measures of profitability and government satisfaction. The limitation of Luo (2001)'s study, as pointed out by Ozorhon et al. (2010b) and Tetteh et al. (2019), was that many other performance measures were not considered. Lin and Ho (2013) also assessed the impact of MC mechanisms on the performance of ICJVs using client satisfaction, which has been criticized for being a minute performance goal of ICJVs. Thus, an integrated perspective of MC mechanisms impacting multiple performance goals of ICJVs has yet to be investigated. Moreover, existing studies have focused on the perspective of only one partner, typically the foreign partner, which is insufficient if one accepts that ICJVs performance depends on which partner is asked. ICJV partners differ in national and corporate culture as well as in their contributions to and expectations from the venture, and all of these could moderate the MC and performance relationship (Luo et al., 2001). A model that shows the relationships between MC mechanisms and performance of ICJVs from both perspectives is necessary to deepen the understanding of that relationship. Thus, a two-sided partner perspective of MC mechanisms and performance impacts in ICJVs is timely and important. This greater understanding can act as the foundation for improved ICJVs management heuristics, allowing the venture to modify its mechanisms and to develop alternatives for improving overall performance.

1.2.5 Research Gap 5

1.2.5.1 ICJV management framework

An effective management framework for the successful management of ICJVs has yet to be developed. Such a framework would be useful to provide guidelines and reference to practitioners on how best to manage ICJVs to enhance overall performance. Therefore, the call for this research study is introduced in response to the above-mentioned research gaps.

1.3 RESEARCH QUESTIONS

Based on the identified knowledge gaps, this research intends to take the initiatives to provide an effective management framework for the successful management of ICJVs hosted in the developing country of Ghana. The following research questions are to be addressed throughout the study.

1. What are the driving forces behind ICJV implementation in Ghana?
2. What are the barriers impeding ICJVs success in Ghana?
3. How should MC in ICJV be evaluated to give a direct link to measurements that are precise and objective?
4. What performance evaluation criteria reflect a more complete ICJV success?
5. What practical measures should be established for the successful management and performance of ICJVs in Ghana?

1.3.1 The Context of Ghana

Developing countries such as Ghana has since the mid-1960s engaged in joint participation programme through regulation and administration of investment codes with the objective to develop, finance, and contribute to national socio-economic development by building large and complex infrastructure projects (Boateng and Glaister, 2000). Notwithstanding, over the past decade, the commencement of some critical business policies such as the "One-District-One-Factory", "Planting for Food and Jobs", "Accra Marine Drive" project, and improved tax system has increased foreign direct investment through international joint ventures (IJVs) in Ghana (Ghana Investment Promotion Centre (GIPC, 2021). Ghana has increasingly become a ground for competitive investment and business destination for both developed and developing countries including the USA, the UK, China, Netherlands, India, Hong Kong, etc. While IJVs in sectors such as manufacturing, agriculture, services, etc. have been increasing, in construction, the rate of growth is slow. A report published by the GIPC shows an unstable growth of JV adoption. For example, there was a 6% reduction of JVs registered in the year 2017 as compared to the year 2016. However, in 2018 as compared to the previous year (i.e. 2017) there was a percentage growth of about 6.3% (GIPC, 2021). Oftentimes, as the government policy promotes ICJV adoption, the inflow may reduce with time due to the unstable government policies. Similarly, ICJV operations especially in developing countries are unstable and sometimes get dissolved with time, while others fail due to unsatisfactory performance (Bamford et al., 2004). Hence, the study that aimed at providing an effective management framework for ICJVs in Ghana is timely and important.

1.4 RESEARCH AIM AND OBJECTIVES

This study aims to develop an effective management framework for the successful management and performance of ICJVs in Ghana.

The specific objectives for achieving the aim of this research are as follows:

1. To identify the key drivers for implementing ICJVs in Ghana;
2. To identify and evaluate the critical barriers impeding ICJVs success in Ghana;
3. To define and establish practical means for exercising MC in ICJVs;
4. To develop a complete performance assessment framework for ICJVs in Ghana;
5. To examine the relationship between MC mechanisms and the performance of ICJVs in Ghana; and
6. To develop an effective management framework for ICJVs, contingent on the study results, to help in facilitating the successful management and performance of ICJVs in Ghana.

The overall study begins with an identification of the drivers for implementing ICJVs (objective 1) via a comprehensive literature review. An empirical assessment is performed on the drivers based on industry practitioners' perceptions to ascertain the key drivers for implementing ICJVs in Ghana. This whole process is repeated for Objectives 2, 3, and 4 to identify the critical barriers, the significant MC mechanisms for exerting control, and the key measures for assessing the performance of ICJVs. With Objective 5, the significant MC mechanisms and performance measures that will be obtained in objectives 3, and 5 will be modeled to ascertain the critical paths to provide suitable strategies for the final framework. Lastly, Objective 6 combines all the established key, critical, and significant factors that will

be ascertained in objectives 1, 2, 3, 4, and 5 to provide an effective management framework for the successful management and performance of ICJVs.

1.5 RESEARCH SCOPE

This study primarily focuses on ICJVs hosted in Ghana. An ICJV turns up to be a one-off project or typically a short-term agreement (Girmscheid and Brockmann, 2010), with the objectives of undertaking procurement works, engineering, consulting, and construction. JVs may be formed by consultants or contractors in a construction project (Kumaraswamy and Palaneeswarm, 2000). However, Hong (2014) emphasized that JVs formed between contractors are the mainstream in construction JVs as far as the JV partners are concerned. This is echoed in the industry-wide surveys in many previous studies addressing issues concerning ICJVs (e.g., Mohamed 2003; Ozorhon et al., 2008b; 2010a; Almohsen and Ruwanpura, 2016). This study, therefore, falls under the defined scope of ICJVs established for undertaking construction projects by architectural/engineering/construction (AEC) firms. ICJV front liners – those that operate at the top management level (e.g., project/construction managers, architects, etc.) in Ghana were selected as the target respondents for collecting data for analysis. The focused on these target respondents is that they are the top management decision-makers and have knowledge of the firm, familiarity with the environment of the firm, have access to strategic information and knowledge on the performance of the firm (Zhou et al., 2010).

1.6 RESEARCH METHODOLOGY IN BRIEF

An overview of the overall research methodology is provided in this section. A detailed explanation of the research methodology is provided in Chapter 2. This study was undertaken

in five main stages as depicted in Fig. 1.1. The initial phase of the study, Stage 1 involved the exploration of the research domain by reviewing literature and having discussions with the author's chief supervisor, academics, and some industrial practitioners who have acquired direct hands-on JVs with foreign construction firms in Ghana and Hong Kong. Through this process, the research gaps, aim, objectives and research method to use were formulated. Stage 2 involved a comprehensive literature review and synthesis of prior related studies addressing the phenomenon of interest (contingent on the objectives of the study). Related studies in the management discipline provided a strong theoretical underpinning for this study. Many information sources including journal and conference papers, books, industrial publications, internet data (e.g., Ph.D. theses, published reports/papers), etc. were useful for this study. Objectives 1, 2, 3, and 4 were partially achieved at this stage. Stage 3 covered primarily data collection through three types of structured questionnaire surveys, Delphi survey (i.e. two rounds of questionnaire survey), a general survey, and Z-numbers-based Best Worst Method (ZBWM) survey with ICJVs practitioners (i.e. both local and foreign partners of ICJVs). This survey was supplemented by follow-up interviews for generating insights. This further contributed to the partial attainment of objectives 1, 2, 3, 4, and 5. At stage 4, the data gathered were quantitatively analyzed, which helped to fully achieve objectives 1, 2, 3, 4, and 5. Contingent on the results, a complete model was developed and analyzed, which helped to partially achieve objective 6. as explained in Chapter 2, various statistical analysis method, including mean score ranking, factor analysis (both exploratory and confirmatory), ZBWM, and partial least squares-structural equation modeling (PLS-SEM) were used at this stage. In the final stage, Stage 5, the overall outcome was then triangulated to develop the management framework for the successful management of ICJVs and validation of the study, the objective 6 was fully achieved.

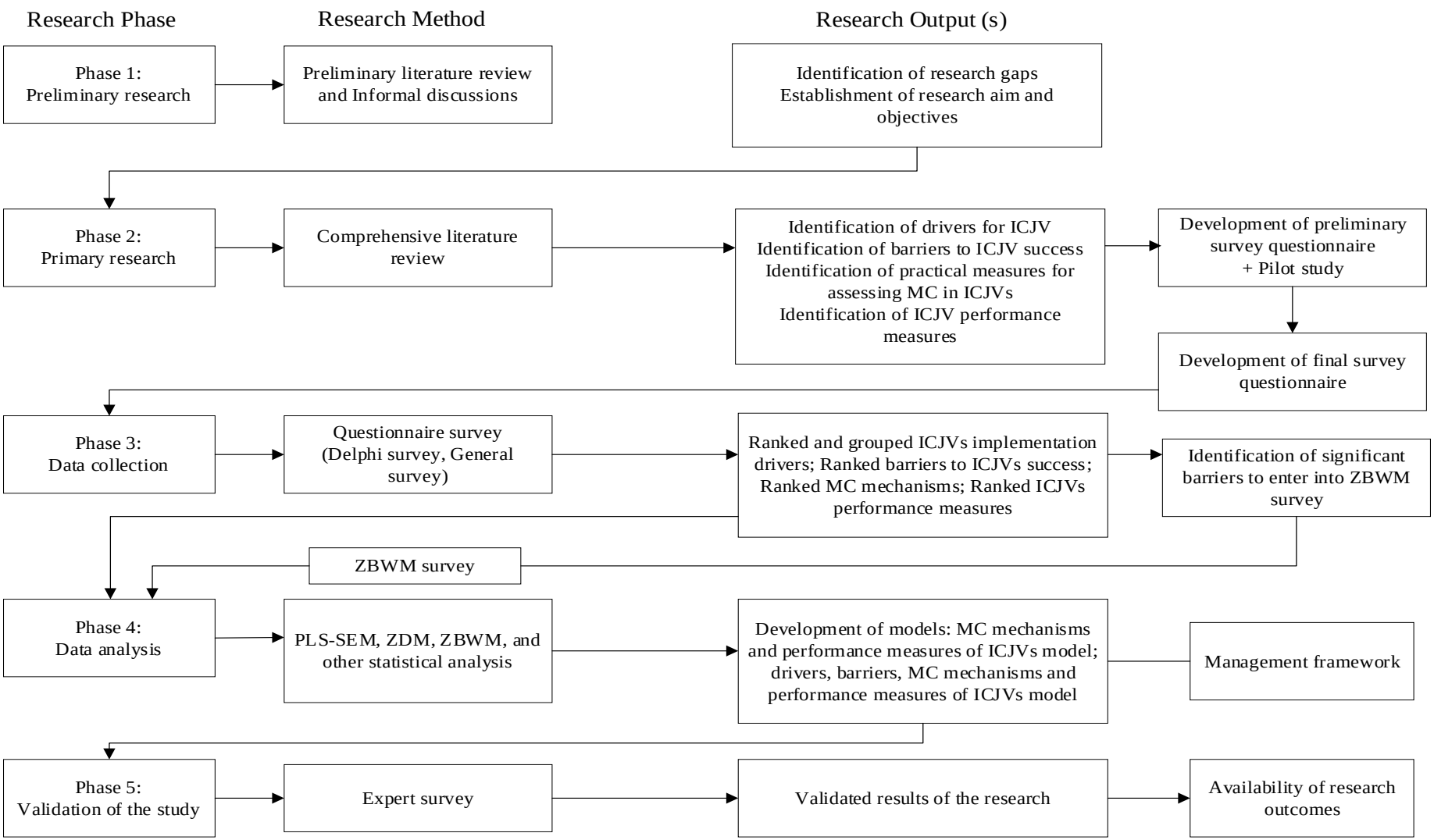

Fig. 1. 1 Flowchart of the entire study (Modified from Darko, 2019).

1.7 STRUCTURE OF THESIS

The entire study is structured into eleven chapters. Chapter 1 covers the background of the research, highlights the research gaps, and questions, outlines the research aim and objectives, defines the scope of the study, and briefly describes the research methodology. Chapter 2 presents the theoretical background of ICJVs adoption and practice. The Chapter also provides a comprehensive literature review on ICJV research interests and implications for future research studies. Chapter 3 discusses the research methodology and statistical analysis methods employed in more detail. Chapter 4 presents a comprehensive literature review of what drives the formation of ICJVs. It also reviews the literature to identify potential barriers impeding the ICJVs success. Chapter 5 comprehensively reviews the literature on prior studies addressing the conceptualization of MC in IJVs to define and establish practical measures for assessing MC in ICJVs. The chapter also presents a comprehensive review of the literature on ICJVs performance assessment by updating and aggregating the discrete ICJVs performance metrics and introducing a new dimension of performance assessment into ICJVs. Chapters 6, 7, 8, and 9 present analyses of the questionnaire survey data; the discussions of the results are also presented in these chapters. Chapter 6 presents statistical analyses, including factor analysis, of drivers for implementing ICJVs in Ghana. Chapter 7 presents and discusses the ZDM, ZBWM, factor analysis results of the barriers affecting ICJVs success in Ghana. Chapter 8 presents the statistical analysis of the MC mechanisms and performance measurement of ICJVs, wherein Mann-Whitney *U* test and confirmatory factor analysis were used to determine any divergence of ranking of the MC mechanisms by the respondents and validate the importance of the performance measures, respectively. Chapter 9 presents and discusses the PLS-SEM model results of the relationship between MC mechanisms and the performance of ICJVs. Chapter 10 presents and discusses the PLS-SEM model results that depict the various ICJVs implementation drivers, barriers,

MC mechanisms, and the performance of ICJVs. The PLS-SEM results supported the proposition of an effective management framework for the successful management of ICJVs in Ghana. Furthermore, it presents the validation of this study. Chapter 11 concludes the thesis and offers recommendations.

1.8 CHAPTER SUMMARY

This chapter presented the background of the research study, and covered (1) research gaps, (2) research questions, (3) research scope and geographical context, (4) research aim and objectives, (5) research methodology in brief, and (6) structure of the thesis. The following chapter, Chapter 2, comprehensively reviews the literature and presents the research gaps warranting future research studies.

CHAPTER 2 LITERATURE REVIEW – THEORETICAL BACKGROUND OF ICJVs ADOPTION AND PRACTICE, RESEARCH INTERESTS, AND IMPLICATIONS FOR FUTURE STUDIES[2]

2.1 INTRODUCTION

The previous chapter presented the introduction of this research, whereas the present chapter presents the background and theoretical foundations supporting the establishment of ICJVs. This Chapter also provides a comprehensive literature review on ICJV research interests and implications for future research studies. Understanding ICJV research concepts and trends provide invaluable insights for researchers and practitioners to appreciate ICJV research trends and developments and expand the knowledge in the field, and stimulate future research based on the identified gaps.

2.2 BACKGROUND OF JVs FORMATION

Among different strategic alliance models, JVs have expansively gained attention over some decades now (Xu et al., 2005). Ozorhon et al. (2008a) posited that JVs offer a distinctive opportunity for combining the characteristic competencies including the corresponding resources from partnering firms. JVs have been used as a commercial device to conduct

[2] This Chapter is largely based upon:
Tetteh, M. O., and Chan, A. P. (2019). Review of concepts and trends in international construction joint ventures research. *Journal of Construction Engineering and Management*, *145*(10), 04019057.
Tetteh, M. O., and Chan, A. P. (2019). A review of international construction joint ventures research in construction journals. CIB World Building Congress: Constructing Smart Cities. 17-21 June 2019, *Hong Kong*.
Tetteh, M. O., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. *Engineering, Construction and Architectural Management*. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

sizable commercial transactions since ancient times. What is new in the modern era, especially since the early 80s is the apparent expansion in the adoption of JV. The use of JVs within matured economies like the USA and the UK has proliferated due to the large technological and economic changes that accelerated free trade, globalization, and the call for product innovation (Harrigan, 2003). More than half of the JVs were in the manufacturing industry based on the statistics of the Federal Trade Commission (FTC) in the USA. Now, JV adoption has expanded in multiple industries including telecommunications, financial services, aerospace engineering, construction, etc.

As JVs have proliferated, so has research aimed at increasing knowledge on successful operation and management of its use. Surprisingly, many studies have presented different definitions of the term "JV", with similar features of JVs incorporated. Tomlinson (1970) defined JV as *"an agreement between at least two legally separate entities who combine resources for their mutual benefits for a long period"*. The definition of Geringer (1988) somehow differs to some extent from Tomlinson's definition as he said, *"JV is an integration of at least two legally distinct organizations that contribute equity and resources to a semiautonomous legal separate entity while preserving their separate identity/autonomy"*. The two types of definitions represent the general taxonomy of JVs: equity JVs and non-equity JVs. While equity JVs engage in pursuing certain objectives and has time to develop and grow, non-equity JVs normally engage in a wide array of contractual arrangements for a limited period (Hennart, 1988). Sillars and Kangari (2004) also considered a JV as a new entity formed temporarily as an association between one firm and its partner(s) to undertake a project.

2.2.1 Theories Behind JVs Formation Motives

Prior existing studies have provided many theoretical perspectives on which JVs are created, ranging from economic theories to organization theories and game theory. All the available theories focus on the achievement of strategic objectives and are viewed as complementary instead of competing. Most prominent theories on the formation incentives of JVs include transaction cost theory on cost minimization, strategic behavior theory on profit maximization, and inter-organizational interdependence and resource dependency theory on mutual needs for maintaining and managing an existing interfirm linkage and mutual reliance for complementary resources, respectively.

2.2.1.1 Transaction cost theory

In business transactions, there exist three types of contract laws with different modes of governance structures, as highlighted by Williamson (1991). They include: 1) the classical contract law for markets; 2) the forbearance contract law for hierarchies, and 3) the neoclassical contract law for hybrid governance. Overall, cost minimization happens to be the prime determinant of selecting any of these contract laws, according to Williamson (1991). The costs are related to negotiating, writing, monitoring, and enforcement to allow an exchange between two parties to exist. The difficulties encountered during the exchange process are the source of these costs (Williamson, 1975). A study by Jones and Hill (1988) summarizes six main factors creating transaction difficulties in interfirm transactions. Under the contract laws, the market has to do with the economic situations where completely independent parties engage in the exchange of resources. Hierarchies constitute organizations that place transactions under unified ownerships and hybrids are lifelong contractual relations preserving the independence of each party (Knoke, 2001). The hybrid governance structures have been considered superior among alternative structures for interfirm transactions, including equity and non-equity JVs, in previous research in the transaction costs tradition.

Examining the three generic governance structures, Williamson (1991) argues that hybrid collaboration forms, such as JVs, are more elastic than market transactions yet more legalistic than self-contained organizational hierarchies.

Palenzuela and Bobillo (1999) argued that applying the principle of transaction costs theory to international entry decisions, JVs represent an entry mode that renders considerable control to multinational firms. Drawing on Jones and Hill's (1988) factors producing transaction difficulties, Knoke (2001) argued that whenever both exchange partners' asset specificity rise, the call for adaptive cooperation increases to avert opportunism by one of the exchange partners. Likewise, transaction cost explanation for JVs lies in the uncertainties associated with a transactional relationship. A JV helps address the issue of uncertainty by creating an effective monitoring mechanism and alignment of incentives among the partners to reveal information, learn from each other, make joint decisions, and achieve performance. In JVs, unforeseen difficulties to both parties are dealt with collectively and both partners are motivated to commit to the venture's future development. In the construction industry, for example, JVs reduces transaction costs arising from the uncertainties of projects, this is evident in large-scale projects with planning difficulty and technical complexity.

2.2.1.2 Interorganizational interdependence and resource dependency theory

The theoretical position captured by the inter-organizational dependence perspective is that JVs are established to manage the interdependence between the partnering firms. The inter-organizational relations perspective explains that modern business enterprises are ingrained in inter-organizational networks and strive for autonomy and independence of others (Burt, 1982). Again, the increasing business environment problems largely hold down the firm's latitude for individualistic strategic actions (Bresser and Harl, 1986). Thus, collective efforts

across organizational boundaries become important. JVs emerge as a desirable form for coping with the paradoxical situation. Corporate firms can commit to and pursue strategic goals at the collective level, while each remains an autonomous entity at the corporate level (Yan and Luo, 2016). Pfeffer and Nowak (1976) argue that JVs are formed to manage two types of organizational interdependence: competitive interdependence and symbiotic interdependence. While competitive interdependence exists at the cooperate or organizational level, symbiotic interdependence exists among corporate firms vertically related in the production process. Drawing on experience from industry-wide practice, they mention that JVs are created either to reduce the level of competitive interdependence or to maintain and strengthen symbiotic interdependence.

Resource dependency theory is based on the notion that no single organization is self-reliant, each must be engaged in a number of relationships with other organizations for critical resources to survive and remain competitive (Pfeffer and Salancik, 2003). Therefore, JV partners establish an alliance to benefit from a synergistic effect to be derived from the combined use of their complementary resources. The lack of strategic resources is the prime cause of inter-organizational relations and the means for reducing uncertainty (Özgen, 2007). This theory explains why JVs are formed in the construction industry. According to Geringer (1991), the need for partners' resources and complementary skills (e.g., market access, market knowledge, local identity, and marketing channel) is the prime motivation for the formation of JV. Equipment, technical skills, and expertise are the major resources that enhance the collaboration of JV in the construction industry.

2.2.1.3 Strategic behavior theory

This theory argues that JVs are formed for strategic reasons, that is, to enhance their competitive positioning in the market (Kogut, 1988). In this view, the ultimate goal for a firm is to maximize profits through improving its competitive position toward its rivals. Through the formation of JVs, firms can change the industry structures for the disadvantage of competitors. When there is an international competition, organizations choose JVs as the most effective entry mode, a mode, that maximizes profits rather than minimizes costs, as transaction costs theory posits. Many strategic factors for forming JVs have been summarized by Harrigan (1988). JVs are a form of defensive investment by which multinationals dodge against strategic uncertainty, critically in industries where there is moderate concentration and collision is quite difficult to obtain regardless of the benefits of coordinating the interdependence among firms.

Recently, organizational learning has gained much attention in the strategic behavior thesis. This perspective views JVs as a means by which firms learn from their partnering firms to develop strategic capabilities (Kogut, 1988). Therefore, JV is a channel through which tacit knowledge is transferred. This is encouraging under two conditions: either of the partners to the JV may desire to acquire the other organization knowhow, or specifically preserve the capability of the organization whiles benefiting from cost advantage and existing knowledge (Hong, 2014).

2.2.2 ICJV Definition: A Global Perspective

According to Garbs (1988), in construction, JVs are temporarily formed to provide procurement works, engineering, consulting, construction, and construction management

services through the combination of complementary resources. In addition, parties to the venture have joint and several liabilities for their contractual commitments to the client (National Joint Consultative Committee (NJCC) (1985). Thus, there is a contractual relationship between the client and the joint venture system (Kreitl et al., 2002). In view of this, Badger et al. (1993) mentioned that a construction joint venture (CJV) turns up to be one project or typically a short-term agreement. Kreitl et al. (2002) argued that CJV can also be formed either with a limited objective or without a time limit. Hong and Chan (2014) defined CJVs as a temporarily marriage between at least two firms who combine strength for the purpose of providing AEC projects. It becomes "international" where the headquarters of at least one partner is situated outside the venture operation country (Geringer and Hebert, 1989). In addition, Girmscheid and Brockmann (2010) added that once partners are dispersedly located and when the employer or client becomes part of the JV system through a construction contract, then we talk about an international joint venture (IJV). Due to the confusion that researchers face in distinguishing between IJVs and ICJVs whenever they are simultaneously mentioned in a single study, Girmscheid and Brockmann (2010) proposed a framework to distinguished IJVs and ICJVs. The noticeable characteristic between the two per their definition is that IJVs particularly takes the form of equity joint ventures, and ICJVs are contractual joint ventures.

As equity joint ventures are regulated by a corporate and a joint venture contract with an unlimited period to develop and grow, contractual joint ventures are defined by two different contract arrangements (i.e. regulated by both the JV contract and construction contract signed with the client/employer). Fig 3.1 depicts the differences between IJVs and ICJVs. This study falls under the defined scope of ICJVs established by Girmscheid and Brockmann (2010) and Hong and Chan (2014) to determine the research trend and gaps for further studies.

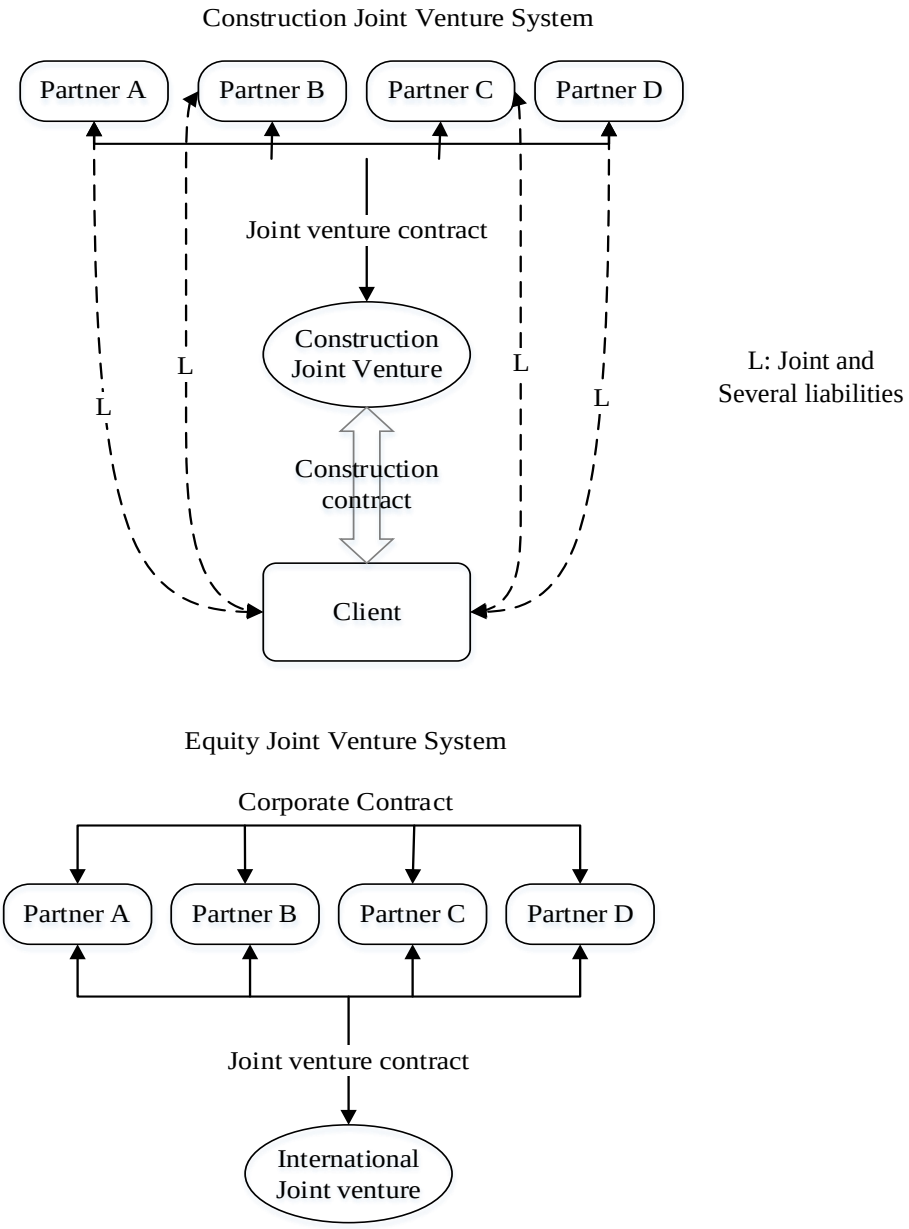

Fig. 2. 1 CPJV and equity joint venture

Source: Adapted from Girmscheid and Brockmann (2010); Tetteh and Chan (2019)

2.3 REVIEW OF CONCEPTS AND TRENDS IN ICJVs RESEARCH

Several ICJV studies have focused on different research interests (Gale and Luo, 2004; and Razzaq et al., 2018). For instance, Mohamed (2003) summarized ICJV research interests as motivations behind ICJV formation; related benefits and disadvantages; critical success factors (CSFs); and risk analysis and management. Likewise, Ozorhon et al. (2008a) identified a similar clustered focus from a small group of studies on ICJVs as risk management; factors affecting the performance of ICJVs; and management-related issues.

The existing literature is concealed with highly diversified topics that hinder the recognition of research efforts in the area. Therefore, a systematic and comprehensive examination of the existing literature on ICJV studies is needed to enhance the understanding of the ICJV concept and pave the way for future researchers to undertake more efficient and intensive research. Research papers published in top-tier leading academic journals in the field of construction engineering and management from 1990 to 2018 were comprehensively reviewed.

2.3.1 Identification of Relevant Papers for the Study

ICJV-related literature published in selected CM journals from 1990 to 2018 were gathered and systematically examined to provide awareness of the current ICJVs research interests, as well as identify key areas for future research. The entire search rule: TITLE-ABS-KEY ("International Construction Joint Venture" OR "International Joint Ventures" OR "Construction Joint Ventures" OR "Joint Collaboration Ventures" OR "ICJVs" OR "International Construction" AND "Construction Industry" OR "Building Industry") AND DOCTYPE (ar OR re) AND PUBYEAR > 1990 AND PUBYEAR < 2018 AND (LIMIT-TO (SUBJAREA , "ENGI") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "DECI") OR LIMIT-TO (SUBJAREA, "ECON") AND (LIMIT-TO

(LANGUAGE, "English")) (Search results: 374 documents (searched on August 28, 2018). After a thorough filtering process, a total of 53 papers formed the basis of the review. The 53 identified papers highly stand in a better position to provide an in-depth understanding of the current status and present knowledge gap for further studies as it relates positively with past similar collaboration reviews presented in CM literature (e.g., Osei-Kyei and Chan, 2015; Yu et al., 2018).

2.3.2 Key Research Areas and Sub-Focus Captured in ICJV Research

Following Hong and Chan's (2014) classification, this study classified the research interest into seven: (1) entry modes, formation decision strategies, and operation (e.g. Ling et al., 2005; Chen, 2008; Ling et al., 2008; Chen and Messner, 2009); (2) risk assessment and management practices (e.g. Bing and Tiong, 1999; Bing et al., 1999; Hsueh et al., 2007; Zhang and Zou, 2007; Zhao et al., 2013; Al-Sabah et al., 2014; Hwang et al., 2017; Razzaq et al., 2018). (3) performance evaluation elements (e.g. Mohamed, 2003; Ozorhon et al., 2010a; 2010b); (4) dispute resolution mechanisms (e.g. Chan and Suen, 2005a; and Maemura et al., 2018); (5) management issues in ICJVs (e.g. Luo, 2001; Ho et al., 2009; and Girmscheid and Brockmann, 2010); (6) influential factors for ICJV practice (e.g. Kreitl et al., 2002; Gale and Luo, 2004; and Ozorhon et al., 2008b); and (7) technology transfer (e.g. Carrillo, 1996; Ganesan and Kelsey, 2006; and Zhang et al., 2010). Table 3.1 summarized the seven broad research topics and their sub-topics. The succeeding sections discuss into detail the various research topic, to better project what has been done from what needs to be done so that the research gap can be identified to stimulate future research.

Table 2. 1 Research areas and sub-focus in ICJV publications (see Tetteh and Chan, 2019a; 2019b)

S/N	Research area	Sub-focus
1	Entry modes, formation decision strategies, and	Culture characteristics to entry decision; Entry strategies; Collaboration and competition; Entry mode classification; Influential factors for entry mode

	operation	choices; Model for entry location and entry timing; and Host country-related factors on entry mode selection
2	Risk assessment and management practices	Model for managing risk; Risk identification and its impact on the project; Political risk management; Risk mitigation by resource level and capabilities; Exchange rate risk management; culture and performance; Host country risk and performance; Critical external risk; and Risk assessment and allocation preference
3	Performance evaluation criteria	Modeling perspective of performance; Multidimensional performance measures; comparative performance study
4	Dispute resolution mechanisms	Sources of disputes and resolution strategies
5	Management issues in ICJVs	Coordination and control; Trust; Management and operating performance; Governance structure strategies: Model for organizational governance choices; and Safety management challenges
6	Influential factors for ICJV practice	Key factors influencing the success of ICJVs at the formations stage; Market concentration and ICJV formation; Partner fit and performance; Corporate growth strategies; and Practical aspect of ICJV implementation
7	Technology transfer	Knowledge transfer mechanisms; and learning effectiveness

2.3.2.1 Entry modes, formation decision strategies, and operation

The adoption of JVs by AEC firms for strategic purposes in the global construction market is widely acknowledged in literature (Fisher and Ranasinghe, 2001; Ling et al., 2008). The easiest way for foreign contractors to have access to a domestic market is through joint ventures with local construction firms (Fisher and Ranasinghe, 2001; Xu et al., 2005). Several ICJV-related studies have reported on the entry mode and formation decision strategies (Chen, 2008), factors that affect entry mode decision (Chen, 2008; Jia et al., 2016), and model for entry location and timing (Isa et al., 2014).

2.3.2.2 Risk assessment and management practices

The most explored area within the study period is risk assessment and management. This is understandable due to the high failure rate of ICJVs around the world (Bing and Tiong, 1999; Ho et al., 2009). Studies focusing on risk in ICJV have looked at risk identification (Hwang et al., 2016 and Razzaq et al., 2018) to risk assessment (Zhang and Zou, 2007; Hwang et al., 2017), to prioritization of risk (Zhao et al., 2013; Hwang et al., 2017; Razzaq et al., 2018), to

risk management/treatment (Bing et al., 1999; Odediran and Windapo, 2016), through to risk allocation preference (Hwang et al., 2016; 2017). To some extent, risk implications on the performance of ICJVs have also been studied (Ozorhon et al., 2008b; Al-Sabah et al., 2014). Consequently, models have been developed to manage and transfer risk in ICJV operations (Bing and Tiong, 1999 and Hwang et al., 2017). Although studies that have comprehensively focused on risk are many, there still exist limited studies in risk-related areas which have been addressed in the subsequent section for further studies.

2.3.2.3 Performance evaluation criteria

Performance assessment of ICJVs have always been a difficult task for both practitioners and researchers. While practitioners are challenged with the perspective from which performance should be measured (i.e. either from the partner perspective, project-based perspective, ICJV itself, or the overall satisfaction), researchers find it difficult to determine variables relating to ICJV performance (Ozorhon et al., 2010b). While it is difficult to find a complete performance assessment framework in the management field (Geringer and Herbert, 1991), the case is worsened in the construction field because of duration precision coupled with complex structures and dynamic environmental conditions. Objective and subjective measures have been used in assessing IJVs' performance in the management literature. The objective measures focus on financial determinants (e.g., profitability measures, growth, and cost position, longevity, and survival). The subjective measures focus on the overall satisfaction as perceived by partner firms of JV (Geringer and Herbert, 1991). Ozorhon et al. (2007b) modeled the determinants of ICJV success in their study and came out with three distinct performance criteria: inter-partner relationship, the structure of the ICPJV, and inter-partner fit. With the increasing complexity of the ICJV structure, Ozorhon et al. (2007a) extended the performance measurement concept by modeling a two-dimensional construct

(i.e. "overall satisfaction" and "project performance") to reflect multiple dimensions of ICJV performance. To broadly capture and extend the performance measurement model, Ozorhon et al. (2008b) proposed a three-dimensional construct as project performance, partner performance, and the performance of the ICJV itself. Nonetheless, overall satisfaction as a final dimension was raised by Ozorhon et al. (2010a; 2010b). These performance assessment criteria reflect both the objective and subjective indicators as Ozorhon et al. (2007a) postulated. From the process-based perspectives, Mohamed, (2003) modeled key processes in the stagewise progression of ICJV growth and performance, where the performance of ICJV was measured by value, profit, and satisfaction. Also, in assessing management control and performance of Sino-foreign CJVs, Luo (2001) employed profit and management control measures to measure performance. Overall, an adequate combination of the performance measures may reflect ICJV success.

2.3.2.4 Dispute resolution mechanisms

In ICJVs, the increase in the number of partners with a different cultural and organizational background in the construction value chain means more business interactions and arguments, irrespective of the contractual or social relationship, hence leading to increasing in construction disputes (Kumaraswamy and Yogeswaran, 1998). By studying the sources of disputes and disputes resolution strategies in Sino-foreign joint ventures in China, Chan and Suen (2005a) classified the sources of disputes into three categories: contractual, cultural, and legal matters and the common dispute resolution methods used are mediation and arbitration. Maemura et al. (2018) also reported on the root causes of contractual conflicts in international construction projects by multinationals and identified nineteen (19) causal factors of contractual conflicts encapsulating under six (6) categories. A critical review of ICJV literature has shown that dispute resolution methods have always focused on the

contractual relations between partnering firms whilst neglecting the contract signed with the client. However, there is still limited work in this subject area.

2.3.2.5 Management issues in ICJVs

MC remains key for efficiently utilizing resources and effectively implementing strategies (Girmscheid and Brockmann, 2009). Different concepts and measures have been used empirically when examining MC therefore resulting in inconclusive findings. For instance, Luo (2001) investigated the relationship between MC and performance in Sino-foreign CJVs in China by using dominant and shared control as a MC mechanism. Neves and Bugalho (2008) analyzed the control and coordination process in multinational firms using bureaucratic, cultural, and social control. Likewise, Girmscheid and Brockmann (2009) conceptualized MC mechanism by using formal and informal control. Comparatively, with the aim of providing an effective organizational governance structure mechanism, Ho et al. (2009) proposed a model for choosing the best governance structure for CJVs. They proposed two different taxonomy of governance structure which is: jointly managed JVs (JMJs) and separately managed JVs (SMJs). Building upon Ho et al.'s (2009) study, Lin and Ho (2012) investigated the performance impact s of the two-governance structure taxonomy by holding the same level of governance structure fit and found a significant positive relationship between the two.

2.3.2.6 Influential factors for ICJV practice

This theme mainly focused on the relational and practical aspects in implementing ICJVs operations, and the perceptual factors that results to the ICJVs success as indicated by previous researchers (Luo et al. 2001 and Gale and Luo, 2004). They include but not limited

to commitment, co-operation, partner selection, cultural fit, inter-partner relations, strategic and organizational fit, etc. (Morledge and Adnan, 2006). Further, models have been developed to test the relationships between some of these influential factors on the operational success of ICJVs. Example, the effect of partner fit, host country (Ozorhon et al. 2007a; 2008a) etc.

2.3.2.7 Technology transfer

Joint ventures serve as a tool for transferring knowledge in the construction industry (Carrillo, 1996 and Ofori et al. 2001). However, it is surprising to notice that research attention given to it is low. Zhang et al. (2010) noted that it is due to the lack of set practical processes, mechanisms or systematic guidelines, and the extent of realization of the need etc. as postulated by. Thus, it worth it conducting studies in this area. Nonetheless, regardless of the numerous advantages obtained as a result of technology transfer to local partners, ICJVs also presents some constraints as an effective transfer and learning mechanisms, as highlighted by previous researchers (Ofori et al. 2001 and Ganesan and Kelsey, 2006). Drawing from literature under the sub-themes; knowledge transfer mechanisms and learning effectiveness, Zhang et al. (2010) emphasized that the technology transfer process that is knowledge-based driven requires adequate absorptive capacity from the recipient industry. Thus, acquiring this human capital facilitates the transfer, absorption, and adaptation of new technologies (Ganesan and Kelsey, 2006).

2.4 KNOWLEDGE GAPS

The framework below (Fig. 2.2) highlights both the status and future research directions of ICJV studies. Within the larger frame of the framework denotes the contract signed between

the partnering firms (ICJV contract), and the various issues addressed in the literature (i.e., the seven identified broad topics from literature). With the intention of each research interest influencing the operational success of ICJV (performance), there is a direct link of each research interest to increase the overall performance. Further, the interlinked research interests indicate that achieving the right balance of studies in each area drives industrial innovation which leads to higher performance. More so, the overall performance located at the center highlights five key performance criteria (project level, company/partner level, ICJV itself, overall satisfaction, and corporate sustainability) and with a stagewise progression of the ICJV life cycle (Pre-inception stage, formation, and organizing stage, operation and adjustment stage, and completion and evaluation stage). On the other hand, the construction contract that binds ICJV partners and the client/employer is indicated. Future research directions worth to be noted and emphasized are performance evaluation; management issues in ICJVs; influential factors for ICJV practice; and technology transfer.

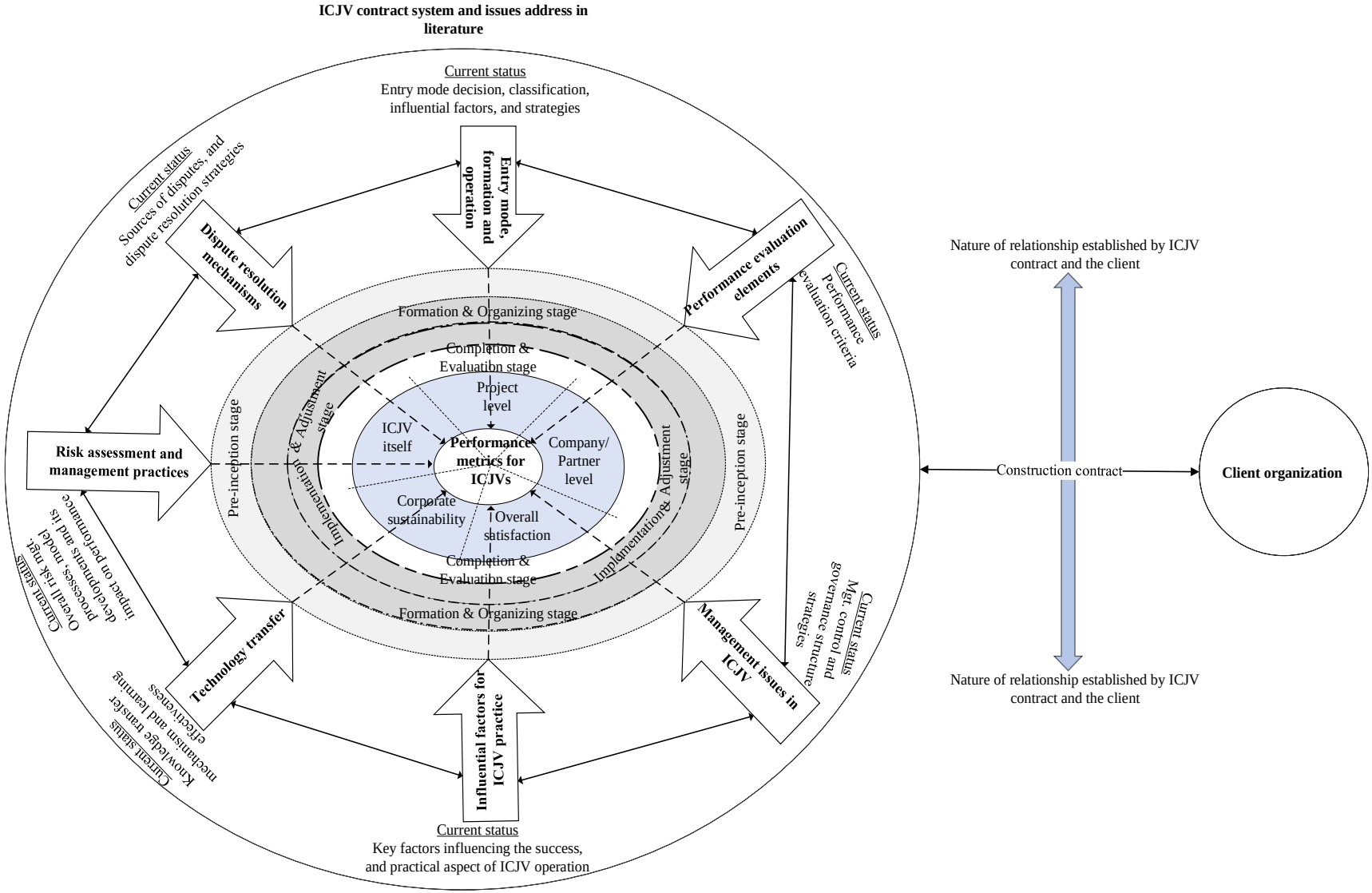

Fig. 2. 2 Research gap framework and future direction in ICJV discipline (see Tetteh and Chan, 2019).

2.4.1 Performance Evaluation Criteria

For the past few decades, ICJVs performance measurement has received significant attention. The increase in ICJV adoption has resulted in a parallel growth of corporate bodies' awareness to benchmark the operational success of ICJV operations. However, the perspective from which performance should be measured and the determinants/variables related to the performance remains difficult both at the industry level and in academic studies. Significant efforts have been made by previous researchers (Mohamed, 2003; Ozorhon et al., 2007a; 2008b; 2010a), however, there still remain key indicators to be included as a result of the dynamic global circumstances. The existing literature have focused on the performance of ICJVs at the project level, company level, ICJV management, and overall satisfaction, and have focused less attention on the corporate sustainability performance of the ICJV operational initiatives. Presently, there is an increasing pressure on corporate firms to expand their performance goals to include social justice and environmental performance as well as economic efficiency is an important agenda and must form part of the company's strategic decision making (Pagell and Gobeli, 2009; and Sev, 2009). Hence, there is a need to establish a more holistic performance constructs covering economic, social, and environmental perspectives of corporate sustainability with key underlying indicators/measures, for evaluating the effectiveness of ICJVs operations.

In addition, ICJVs performance assessment has been too static and therefore failed to consider the evolutional stages of the ICJV life cycle development. As mentioned earlier, ICJVs undergo a growth cycle, and with a limited time (Gale and Luo, 2004; Prasitsom and Likhitruangsilp, 2015). Previous studies have placed more emphasis on the whole ICJVs life cycle when measuring ICJV performance rather than categorizing various performance

measures in stages (Fig. 3.2). Hence, future studies should address these two key research questions: What performance criteria should be adopted by a newly formed ICJVs from inception to completion? Do newly formed ICJVs share the same objectives as existing ICJV organizations?

2.4.2 Management Issues in ICJVs

MC mechanisms used in ICJVs have greater implications on performance as emphasized in the literature. However, only a few studies with different conceptualizations and practices exist. More so, most of the studies are focused on the developed countries and a few on developing countries. Many ICJVs have failed due to the lack of coordination and MC difficulties (Yan and Gray, 2001). Also, the relationships between MC and the performance of ICJV have received very little attention. Thus, there are several inadequacies and inconsistencies associated with the existing studies on measures used for evaluating MC in ICJVs. Hence, future studies should define and establish practical measures for assessing MC in ICJVs. More so, MC develops distinctively in contexts and locations and its processes and establishments differ as well (Luo, 2001). Thus, MC is likely to vary across multiple perspective situations. It is, therefore, in the remit of future studies to investigate the performance implications of MC mechanisms in developing countries.

2.4.3 Technology Transfer

Several factors including the lack of set practical processes, mechanisms, or systematic guidelines, the extent of realization of the need, and the readiness of the recipient industry (absorptive capacity), affect the transfer of knowledge and technology in ICJVs as highlighted earlier. Thus, future studies should be carried out to develop ways to match the

ideals for transferring knowledge by both ICJV partners to ensure efficient and effective transfer. Further studies should investigate the interrelationships between the transfer, absorption, and specific influential factors. In addition, further studies should be conducted on the barriers of transferring technology mostly in developing countries since most research work has been directed to the developed countries. Researchers should develop innovative mechanisms or approaches that have the capability for sustained application for transferring technology in ICJVs.

2.4.4 Influential Factors for ICJV Practice

The very few studies on this research topic present a promising gap which future researchers should be more concerned with. Future studies can explore practical industrial application factors for improving ICJV operations.

Overall, with reference to the identified research gaps presented above, there is a wide research gap in the literature that demands critical attention to ensure successful ICJV operations.

2.5 CHAPTER SUMMARY

This chapter presented the background of JVs by providing a brief history behind their emergence and the major practical and theoretical reasons for JV formation in the construction industry. Three major theoretical standpoints, including transaction cost, strategic behavior, and inter-organizational interdependence, and resource dependency were supported and justified. More so, the chapter comprehensively reviewed ICJV definition, scope, research trends, and development in globally renowned construction management

(CM) journals from 1990 to 2019. The trends of ICJV research in terms of research interests and implications for future research studies have also been analyzed. Key research topics covered within the study period included: 1) entry modes, formation decision strategies, and operation; 2) risk assessment and management practices; 3) performance evaluation; 4) dispute resolution mechanisms; 5) management issues in ICJVs; 6) influential factors for ICJV practice, and 7) technology transfer. Further research directions are proposed based on the analysis of the current status of ICJV research topics. The following chapter, Chapter 3, comprehensively discusses the research methodology adopted for this study.

CHAPTER 3 RESEARCH METHODOLOGY[3]

3.1 INTRODUCTION

Chapter 2 reviewed the literature and presented the research gaps warranting future research studies. This chapter describes the research methodology and methods used to achieve the aim and objectives of this study. This chapter covers the data collection procedure, tools for analyzing collected data, and background information of the respondents. According to Fellow and Liu (2015), a logical and coherent research methodology is essential for conducting research. Thus, to efficiently and accurately realize the research aim and objectives as well as contribute significantly to theory and practice, the most suitable research methodology was adopted. In the field of construction management (CM) research, Abowitz and Toole (2010) and Walker (1997) emphasized that to obtain more solid and reliable results, it is important to draw on the knowledge and experience of professionals in the industry. This study, therefore, involved industry practitioners who had knowledge and experience in investigating the issues under study.

In ICJVs studies, some of the common research methods adopted include expert interviews, questionnaire survey, literature review and case studies (Zhang and Zou, 2007; Ozorhon et

[3] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Darko, A., and Torku, A. (2021b). Critical Barriers to International Construction Joint Ventures Success: Multi-Experts Views and Contextual Disparities. *Journal of Construction Engineering and Management, DOI: 10.1061/(ASCE)CO.1943-7862.0002059.*

Tetteh, M. O., and Chan, A. P. (under review). Impacts of drivers, barriers, and management control mechanisms on the performance of international construction project joint ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-11174.

Tetteh, M. O., Chan, A. P., Oppong, G.D., Nani, G., and Darko, Amos (under review). Impacts of Management Control Mechanisms on the Performance of International Construction Project Joint Ventures, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4338.

Tetteh, M. O., Chan, A. P., Mohandes, S.R., and Agyemang, D.Y. (under review). Diagnosing Critical Barriers to International Construction Joint Ventures Success in a Developing Country Context: The Case of Ghana, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4263R1.

Tetteh, M. O., Chan, A. P., Darko, A., Yevu, S. K., Nwaogu, J. M., and Boateng, E. B. (under review). Key drivers for implementing international construction joint ventures (ICJVs): Global insights for sustainable growth. *Engineering, Construction and Architectural Management*.

al., 2007a; 2010a; Hwang et al., 2017; Han et al., 2019; Liang et al., 2019). Among these research methods, questionnaire survey happens to the most commonly used method, hence, the present study adopted questionnaire survey as the main source of data collection. The development of the survey questionnaire was achieved through a comprehensive literature review and expert interviews. Details of the questionnaire development and survey are discussed later in section 2.2.1.2. The collected data were analyzed using Statistical Package for Social Sciences (SPSS 26.0), SmartPLS 3.3.1 software, and Expert Choice software. Largely, the results are descriptively expressed in mean values, standard deviation (SD), and factor analysis was used to cluster relevant factors having similar underlying effects into factor components. PLS-SEM was used in this study to investigate the relationship between MC mechanisms and the performance of ICJVs, and model the impacts of different forms of drivers, barriers, and MC mechanisms on the performance of ICJVs. The Z-numbers-based Delphi Method (ZDM) was adopted in three steps to refining the identified barriers to ICJVs success. And finally, the ZBWM method was employed to rank the critical barriers based upon their computed final weights. The reasons for the adoption and application of these techniques are explained in the subsequent sections.

3.2 RESEARCH DESIGN AND METHODS FOR THE STUDY

There is neither best research methods nor fast rules for selecting research methods, but then using any research method depends largely on the research objectives, and questions (Yin, 1994; Fellow and Liu, 2015). So, therefore, careful consideration should be given to the kind of data required and the goal of the research objectives (Akadiri, 2011). Saunders et al. (2012) defined a research design as the overall process or method used in providing solutions to the research questions, gathering the required data, and the modes and techniques of

analyzing and validating the data. Thus, it explains the overall plan of the research. As the research design provides the overall framework for realizing the targeted goals, the respective research methods are proposed to achieve the processes established in the design.

The most commonly used research methods include qualitative, quantitative, or triangulation/mixed methods. Qualitative research methods are primarily grounded in practical investigation and evidence. They are framed as case studies, interviews, focus groups, participant observation, etc. (Creswell, 2009). Quantitative research methods gather information that can be examined numerically, and the results are generally presented by descriptive statistics, tables, and graphs. In most cases, quantitative research methods are more structured and require rigorous statistical analyses (Saunders et al., 2012). An approach or inquiry combining or associating both qualitative and quantitative methods is the triangulation/mixed method. Many studies have highlighted that the triangulation/mixed method is more powerful and advantageous than using a single research method (Moffatt et al., 2006; Creswell, 2014). The literature clarifies that researchers may adopt the qualitative method to develop constructive theories and use the quantitative method to test the developed theories or vice versa. In this study, a purely quantitative research method was adopted and supplemented by follow-up interviews for generating insights. The overall research design process with the respective methods to realize each objective for this study is summarized in Table 2.1 and explained in detail in the subsequent sections. The methods used for collecting data include comprehensive literature review, questionnaire survey, and expert interviews, whereas the data analysis methods include mean score ranking, standard deviation, factor analysis, confirmatory factor analysis, ZDM, ZBWM, and PLS-SEM.

Table 3. 1 Research process

Research objectives	Research design										
	Data collection methods			Data analysis methods							
	CLR	QS	ER/PS	MS	SD	FA/CFA	SEM	IRA	MWU	ZDM	ZBWM
1. To identify the key drivers for implementing ICJVs in Ghana	√	√	√	√	√	√		√	√		
2. To identify and evaluate the critical barriers impeding ICJVs success in Ghana	√	√	√			√				√	√
3. To define and develop a complete assessment framework for MC mechanisms and performance in ICJVs, respectively	√	√	√	√	√		√				
4. To examine the relationship between MC mechanisms and the performance of ICJVs in Ghana				√	√		√				
5. To develop an effective management framework for ICJVs in Ghana							√				

Note: CLR – Comprehensive literature review; ER – Expert review; PS – Pilot study; MS – Mean score; SD – Standard deviation; FA/CFA – Factor analysis/Confirmatory factor analysis; SEM – Structural equation modeling; IRA – Interrater agreement; MWU – Mann-Whitney U Test; ZDM - Z-numbers-based Delphi Method; ZBWM – Z-numbers-based Best Worst Method
Also note that other statistical test, such as Kendall's coefficient of concordance was conducted in this study

3.2.1 Data collection Methods

3.2.1.1 Comprehensive literature review

A literature review distils the existing literature within a particular domain of a subject and provides a thorough theoretical understanding of the subject area, thereby improving the quality and usefulness of subsequent research (Mertens, 2010). Through a comprehensive literature review, researchers can synthesize and consolidate highly diversified research focus and uncover areas where research is needed. More so, relevant, and new variables could only be identified from the findings of previous studies (Koebel et al., 2015; Darko, 2019). To identify the relevant variables to include, this study commenced with comprehensive literature reviews. The literature review conducted in this study draws on a range of different types of sources including academic (peer-reviewed) journals, conference papers, textbooks, internet data, and doctoral thesis, with more focus on peer-reviewed journals. The literature review allowed for the general understanding of the current research interest and research methods adopted in ICJV studies as well as the various issues affecting its implementation and success. These comprehensive reviews were a key part of the foundations for realizing the research aim and objectives and hence addressing the research problems of this study.

Specifically, the literature was conducted to 1) establish the theoretical foundation for understanding the research intent as well as to help position the study within a well-defined scope (reported in Tetteh and Chan, 2019); 2) identify the related practical issues of ICJV application, such the drivers for implementing ICJVs and the barriers affecting ICJVs success across different countries/jurisdictions (reported in Chan et al., 2020 and Tetteh et al., 2020, respectively); 3) define and establish practical measures for assessing MC in ICJVs (reported

in Tetteh et al., 2021a); 4) develop a complete performance assessment framework for ICJVs (reported in Tetteh et al., 2019); and 5) identify suitable research methods and help in the development of the questionnaire and field survey. This study conducted five comprehensive reviews that are summarized, analyzed, and reported in four chapters of this thesis. Chapter 3 reviews the current research interest, research methods adopted, and implications for future research studies. Chapter 4 reviews the drivers for implementing ICJVs and barriers impeding the ICJVs success. Chapter 5 reviews the existing key performance measures for measuring the performance of ICJVs. Chapter 6 presents a conceptual model of MC in ICJVs, how it is acquired, how it is exercised, and a model for studying its impact on the performance of ICJVs. These reviews supported the development of the questionnaire design that solicits the industrial practitioners' views towards these practical aspects. Understanding of all these issues provided the grounds for developing an effective management framework for promoting the successful implementation and performance of ICJVs in Ghana.

3.2.1.2 Questionnaire survey

A questionnaire survey is a structured process commonly used in the social sciences and management spheres for collecting qualitative data from a large sample size (Fellows and Liu, 2015). In ICJV studies, questionnaire survey has commonly been used to solicits the industrial practitioners' views (e.g., Ozorhon et al., 2010b; Almohsen and Ruwanpura, 2016; Han et al., 2019; Lu et al., 2020; Eissa et al., 2021). According to Hoxley (2008), questionnaire survey provides reliable and valid information within a manageable or relatively shorter time frame at a reasonable cost. Besides, it ensures respondents' anonymity, especially on sensitive matters within the management of construction and engineering projects (Owusu, 2020). It further helped to provide quantitative descriptions of the

perceptions and attitudes of the entire study population via studying a sample of the population (Creswell, 2014). Regardless of the issues surrounding the use of questionnaire survey, including the risk of bias and distortions and low response rate, which is common, notably for postal/email questionnaire, yet researchers can investigate a large number of factors if the sample is sufficient to yield enough reliable data for inference to be drawn from the population at a required and specified level of confidence (Fellows and Liu, 2015). As mentioned earlier, questionnaire survey was adopted as the main data collection method. However, where necessary, follow-up interviews were used to supplement the process for generating insights. It is worth mentioning that the questionnaire was developed after conducting the review on the various constructs of ICJVs (i.e., drivers, barriers, MC mechanisms, and the performance measurement of ICJVs). The study adopted three types of questionnaire surveys: a general survey, Delphi survey, and ZBWM survey, as explicated in detail in later sections.

Questionnaire development

Structure of questionnaire

The questionnaire for the general survey was structured into six sections. The first section (A) introduced the survey with a cover letter that captured the research aim and objectives and contact details. The second section (B) was designed to gather the demographics of respondents, including their organizational type, specialties, working experience, and number of ICJV projects involved in. However, relevant instructions on how to respond to the survey were provided right before this section. The third section (C) solicited the respondents' view on the agreement level of drivers for implementing ICJVs. In the fourth section (D), the

respondents were asked to assess the criticalities of the barriers impeding ICJVs success and their confidence/reliability level base on the decision made. This was relevant for the ZDM analysis, wherein the barriers were refined for further analysis. In the fifth section (E), the respondents were asked to assess the importance of the mechanisms used in exercising MC in ICJVs. Lastly, in the sixth section (F), the respondents were asked to assess both the importance and realization of the measures for assessing the performance of ICJVs. The definitions of key performance constructs were provided to support the respondents' assessment of respective underlying performance variables. To have a better understanding of the general survey, a sample of the questionnaire is provided in Appendix A. The Delphi survey questionnaire consisted of two sections. The first section presented a cover letter that entails the research intent and contact details. In the following section, the respondents were asked to assess the agreement level of drivers for implementing ICJVs. This survey aimed to distinguish between common/mutual drivers – advantage to both parties, and separate drivers – advantage/disadvantage to one partner via building consensus between local partners and their foreign partners of ICJVs. Understanding of the common and separate drivers shaped the basis for the development of the management framework for ICJVs in Ghana. A sample of the Delphi survey is provided in Appendix B. The ZBWM questionnaire survey also consisted of two sections. The first section presented relevant instructions on how to respond to survey questions. Within the second section, the respondents were asked to assess the importance and reliability of the refined barriers based on the ZDM analysis. To have a better understanding of the ZBWM survey, a sample of the questionnaire is provided in Appendix C.

Rating scales

Rating scales such as five-point, seven-point, nine-point, and eleven-point have been widely used for gathering professional opinions in CM research. In this study, the seven-point grading system was adopted for assessing the various items in the survey questionnaire. Past studies, including Ling et al. (2006), Lin and Ho (2013), Tetteh et al. (2021b), etc., have adopted this rating system. The scale has the merits of providing respondents a broader explanation to each item in terms of evaluation, making the dataset suitable for different statistical analysis and reducing central tendency and leniency concerns in ordinal scales (Chan and Tam, 2000, p. 429; Ameyaw and Chan, 2015, p. 194). Table 2.2 shows the scale definitions used in this study.

Table 3. 2 Rating scores definitions

Assessment scores	Linguistic terms			
1	Strongly disagree[a]	Very low[b]	Not important[c]	Not realized[d]
2	Disagree[a]	Low	Least important[c]	Least realized[d]
3	Disagree somewhat[a]	Medium low	Fairly important[c]	Fairly realized[d]
4	Neither agree nor disagree[a]	Medium[b]	Moderate[c]	Moderate[d]
5	Agree somewhat[a]	Medium high[b]	Important[c]	Realized[d]
6	Agree[a]	High[b]	Very important[c]	Highly realized[d]
7	Strongly agree[a]	Very high[b]	Most important[c]	Most realized[d]

Note: [a]The seven-point scale used within the third section of the questionnaire; [b]The seven-point scale used within the fourth section of the questionnaire; [c]The seven-point scale used within the fifth and sixth section of the questionnaire; [d]The seven-point scale used with the sixth section of the questionnaire.

Pilot study

Pre-testing or piloting a questionnaire is important as it demonstrates the methodological rigor of the research (Hong, 2014). After the initial draft of the questionnaire, a pilot study was conducted to examine the comprehensiveness, practicality, and suitability before the development of the final survey questionnaire. Expert interviews with a panel of three professors, a senior lecturer, three postdoctoral fellows, and five ICJV practitioners (two from Hong Kong and three from Ghana) were convened to assess the questionnaire with regards to structure/wording – technical language/term, answerability, and whether any factor can be

added to, or removed from the survey. According to Cabaniss (2002), an expert is someone qualified to hold a position or someone having exclusive expertise or skills that is indisputable by that person's leadership in a professional organization or someone with publications in a recognized journal. These experts had knowledge and/or experience in ICJV implementation. While those from the academic domain had at least two publications in the area, those from the industry had 10 years of experience in ICJV implementation and had been involved in at least two ICJV implementation projects. The experts provided valuable feedback. For example, with the barriers factors, they advised that some barriers factors should be embedded in the other barriers factors as they were thought to be repetitive. For example, "inconsistent project objectives among partners" was evaluated as part of "competing objectives". Similarly, "improper project planning and budgeting", and "improper project feasibility studies" were recorded as "lack of proper project planning and budgeting". Based upon the feedback, the questionnaire was modified to enhance its quality and appropriateness, making it suitable for an industry-wide survey.

General survey

Focusing on ICJVs established in the developing country of Ghana, a list of targeted respondents was drawn from the records maintained by the Ghana Investment Promotion Centre (GIPC, 2021). The list comprised 416 international joint venture (IJV) projects completed/ongoing by Ghanaian firms and their foreign counterparts from 2006 to date. To establish the sample frame for this study, the sample was limited to IJVs that met the following two criteria: (1) IJVs operating in the construction/infrastructure sector were considered; and (2) IJVs established within the last 10 years were considered. Following these two criteria resulted in a sample frame of 134 ICJVs. The second criterion was

established to obtain accurate and reliable information from the respondents. Given the "finish and dissolve" nature of ICJVs (Tetteh et al., 2020), collecting reliable data from ICJVs that have been dissolved for more than a decade was very unlikely as respondents usually have hazy memories about past events (Ali et al., 2021). A total sample frame of 134 ICJVs was obtained. The list provided contact information details of the ICJV organizations, which provided a proxy for the study population. To respect the anonymity of these companies, their contact addresses are not given.

A random sampling technique was adopted to ensure an unbiased representation. The following equations (eqns.) from Khoshnava et al. (2020) were applied to ensure a suitable sample size (SS) for this study.

$$SS = \frac{Z^2\ P(1\text{-}P)}{C^2} \tag{3.1}$$

Where *z* represents the z-value (e.g., 1.96 for 95% of confidence level), *p* represents the percentage of the choice that will be selected, expressed in decimal (0.5 was used), and *c* denotes the confidence interval (±10% was assumed). These assumptions yielded a SS of 10. The calculated SS was then modified for a finite population using the eqn. 3.1.

$$Revised\ SS = \frac{SS}{1+\left(\frac{SS-1}{PoP}\right)} \tag{3.2}$$

PoP represents the population. Afterward, the *Revised SS* was adjusted for the response rate (*rr*) following Al-Tmeemy et al. (2012) recommendation. Thus, a *rr* of 10% was assumed using eqn. 3.3.

$$Revised\ SS \text{ for } rr = \frac{Revised\ SS}{rr} \tag{3.3}$$

Based on eqn. 3.3, a total of 90 ICJV organizations were targeted for the survey. For every respective ICJV organization, data was collected from both local and foreign partner representatives. Thus, overall, 180 questionnaires were distributed. Collecting data from

multiple partners within the same ICJV organization represents a reasonable approach for this study (Ozorhon et al., 2010a). ICJV front liners – those that operate at the top management level (e.g., project/construction managers, architects, etc.) were deemed fit for this study. This is because they are the top management decision-makers and have access to strategic information and knowledge of the organization performance (Zhou et al., 2010). Data were collected by face-to-face interviews and emails depending on the proximity and whether the ICJV project is still ongoing or completed. To increase participation, top managers at targeted firms were contacted through telephone calls and emails to request their cooperation and support. To allow online responses, personalized emails were sent with an embedded web-link and attached a Microsoft *Word* file with a short text explaining the study. The respondents' background information is presented in section 3.3.

Delphi survey

As mentioned earlier, the Delphi survey aimed to establish consensus between local and foreign partners on the common/mutual and separate driver for forming ICJVs. According to Skulmoski et al. (2007), Delphi survey is suitable for achieving consensus where there is limited knowledge on the problem and/or when collective problem solving is required. Thus, where there is inadequate historical and quality data, and alternate methods are applicable. As such, it is carried out using multiple iterations to greatly exclude biases and essentially build consensus on opinion (Yeung et al., 2007). In conducting Delphi survey, the key elements crucial for achieving objectivity and unbiased information include the expert panellists and section requirement, and the validation process through multiple rounds of the survey (Olawumi et al., 2018). Chan et al. (2001) and Yeung et al. (2009) argued that the expert panel and their expertise contribute significantly to the success of a Delphi survey. Therefore,

the expert panel should include a heterogeneous group of members with diversified and expansive knowledge and experience. Consequently, after determining the sample size for the study, the following criteria were devised for identifying qualified respondents. Respondents were only eligible if (1) they had sufficient direct hands-on ICJVs experience globally with at least 10 years of experience; and (2) they had been involved in at least two ICJV projects.

Based on these two criteria, 36 respondents from 18 different ICJVs organizations participated in the rounds of Delphi survey. Fourteen (14) respondents responded to the invitation, with equal representation from both the local (7 members) and foreign partners (7 members), which gives the study's findings a balanced view. More than two-thirds of the respondents (10 members) have more than 15 years of working experience and have been involved in two (2) ICJV projects in different countries/jurisdictions including the US, Singapore, the UK, Hong Kong, Thailand, China, Germany, etc. The remaining four (4) members have had 20 years of working experience with three (3) ICJV projects. The composition of the panel members can be described as more experienced ICJV practitioners who operate at the senior management level and have access to strategic information. Note that these respondents formed part of the overall respondents for the study. However, the Delphi survey was launched before the commencement of the general survey. According to Grisham (2009), two to three rounds of Delphi survey is recommended; however, the experts should reach the desired level of convergence before the closure of the survey. Two rounds of Delphi survey were undertaken to reach the study goal. Studies including Giel and Issa, (2016), Zahoor et al. (2017), Olawumi et al. (2018), etc. utilized a two-round Delphi survey. In addition, to facilitate the credibility and reliability of the Delphi survey, the author ensured the anonymity of the invited respondents, iteration, and feedback of results from each survey round.

ZBWM survey

The ZBWM survey aimed to rank the critical barriers affecting ICJVs success based on their weighted scores. The ZBWM survey was conducted after the general survey. The general survey helped do so in at least two ways. First, the general survey helped in the selection of qualified respondents to participate in the ZBWM survey. In this regard, respective respondents who have had at least 10 years of experience in the construction industry and have been involved in more than two (2) ICJV projects were involved to participate in the ZBWM survey (see Table 3.8). 43 of the respondents representing 36% of the total survey qualified for the ZBWM survey based on the established parameters as mentioned. 17 (40%) out of the 43 respondents participated contingent on their availability and interest. Among them, 8 (47%) were local partners and the remaining – 9 (53%) were foreign partners. The involved experts represent more than enough for the ZBWM survey and compare favorably with similar studies in the construction management domain (e.g., Zhang et al., 2020; Mahdiyar et al., 2020). According to Mahdiyar et al. (2020), a sample size of at least three could be used to produce highly consistent results. Second, contingent on the results from the general survey, the significant barriers to ICJVs success for entering the ZBWM survey were identified.

3.2.2 Data Analysis Methods

The gathered survey data were processed and analyzed using different statistical methods, which are explained in detail in the sections below.

3.2.2.1 Reliability test - Cronbach's alpha technique

The most commonly used reliability test, inter-item reliability, is Cronbach's alpha. The Cronbach's alpha coefficient estimates the internal consistency between items in the test or questionnaire, that is, how closely related a set of survey items are as a group (Fellow and Liu, 2015). It ranges from 0 to 1.0 and could be used to describe the reliability of factors extracted from dichotomous and/or multipoint formatted scale or questionnaire (Santos, 1999). Cronbach's alpha value close to 1.0 denotes a higher level of reliability and vice versa. Usually, reliability is adequate if Cronbach's alpha is 0.7 or greater (Cortina, 1993). Cronbach's alpha was used to test the reliability of constructs regarding drivers, barriers, MC mechanisms, and performance of ICJV in the questionnaire survey. According to Li (2003), the Cronbach's alpha value is computed by:

$$\alpha = \frac{k\overline{cov}\,/\overline{var}}{1+(k-1)\overline{cov}\,/\overline{var}} \tag{3.4}$$

Where α = Cronbach's alpha coefficient value; k = the number of scale items; $\overline{cov}$ = the average covariance among the scale items; and $\overline{var}$ = the average variance in the scale items. Likewise, when the factors are standardized with a common variance, the formula above is then simplified as:

$$\alpha = \frac{k\overline{r}}{1+(k-1)\overline{r}}$$

(3.4.1)

Where $\overline{r}$ = the average correlation among the scale items.

3.2.2.2 Data normality test – Shapiro – Wilk test

To proceed with data analysis, it is crucial to test the normality of the data as many statistical tests require a normal distribution of the data (Kim, 2015). The Shapiro-Wilk test, which is notably the most widely used method for testing data normality was used (Hsu et al., 2000; Razali and Wah, 2011). In conducting the Shapiro-Wilk test, the normally accepted alpha value for testing normality is 0.05. Where the test outcome, *p*-value, is lower than the

required alpha value, then the null hypothesis must be rejected. In this study, the *p*-values obtained using the Shapiro-Wilk test were lower than the threshold value (0.05), indicating that the data collected were not normally distributed. This aided the adoption of nonparametric tests like Kendall's coefficient of concordance (Kendall's *W*) test, and the Mann-Whitney *U* test for analyzing the data. Given the ordered random sample, $y_1 < y_2 < \ldots y_n$, the original Shapiro-Wilk test statistics (Shapiro, 1965) is defined as,

$$W = \frac{(\sum_{i=1}^{n} a_i y_i)^2}{\sum_{i=1}^{n} (y_i - \overline{y})^2} \tag{3.5}$$

Where y_i = the *i*th order statistics; $\overline{y}$ = the sample mean; $a_i = (a_i, \ldots., a_n) = \frac{m^T V^{-1}}{(m^T V^{-1} m)^{1/2}}$; and $m = (m_1, \ldots, m_n)^T$ = the expected values of the order statistics of independent and identically distributed random variables sampled from the standard normal distribution; and *V* = the covariance matrix of those order statistics.

3.2.2.3 Kendall's coefficient of concordance test

The Kendall's coefficient of concordance (Kendall's *W*) test is a non-parametric test primarily employed to measure the agreement level among sets of rankings by different experts (Kendall and Gibbon, 1990). The test aim is to find out whether there is consistency in responses by expert groups. Kendall's *W* ranges from 0 to 1, where 0 denotes no agreement, and 1 indicates perfect agreement or concordance (Siegel and Castellan, 1988). The null hypothesis must be rejected if the significance level of Kendall's *W* is low (*p*-value $\leq$ 0.001) – thus complete lack of consensus among the respondents within one group, otherwise the null hypothesis must be retained. According to Siegel and Castellan (1988), Kendall's *W* can be computed by:

$$W = 12\frac{\sum_{i=1}^{n}(R_n+R)}{p^2(n^3-n)-pT} \quad (3.6)$$

Where *n* denotes the number of factors, *Ri* represents the ratings assigned to the *i*th variable or factor; *R* represents the *Ri* mean values; *p* signifies the number of respondents, and *T* characterizes correction variable or factor for the tied ratings.

3.2.2.4 Mann-Whitney U statistics

As a rank-based nonparametric test, the Mann-Whitney *U* test has been used to determine any divergence of ranking of ICJVs implementation drivers by the experts due to their varied interests or objectives. According to Darko et al. (2017), it has the power of examining dissimilarities between any two independent groups providing their opinion on any continuous variable. With this analysis, the scores given by the experts (any two groups) on each continuous measure are converted to ranks, and then determine whether the ranks for the two groups are different or not. Aside from the non-normal distribution of the data that called for the adoption of this statistical method, it was preferred due to the unequal sample sizes of the two expert groups, that is, local partners and their foreign counterparts of ICJVs (Sheskin, 2011). Using the Mann-Whitney *U* test, the *H0* is that "*there are no significant disparities amongst the two experts (local and foreign partners)*. The *H0* can, therefore, be rejected if the significant level (*p*) is greater than 0.05.

3.2.2.5 Mean score ranking technique

The analysis of determining the mean score of variables/factors and ranking them based on the highest score has been widely used to determine the relative importance/criticality of factors in IJV studies (Bing et al., 1999; Ling et al., 2006; Hwang et al., 2017). In this study,

the mean score ranking technique was used to determine the relative rankings of the various drivers, barriers, management control mechanisms, and performance measures of ICJV, in descending order of importance/criticality as perceived by respondents. When two or more factors are having the same mean score value, the factor with the smallest standard deviation (SD) was ranked higher in that order (Mao et al., 2015). A smaller SD indicates that the differences in responses are not statistically large and thus the average is more likely to be valid for the majority (Staplehurst and Ragsdell, 2010). The mean score ranking was determined by using the equation below:

$$B_i = \frac{\sum_{j=1}^{n} a_{ij}}{n} \tag{3.7}$$

Where n = the total number of respondents; a_{ij} = the importance/criticality of the factor i rated by the respondents j and B_i = the mean score of the importance/criticality of factor i.

3.2.2.6 Factor analysis (FA)

FA is a powerful multivariate statistical technique used for reducing a large number of variables having the same underlying effect into a few underlying dimensions or constructs (Hair et al., 2006; Field, 2013). FA is usually employed when the underlying structure of the variables is unknown, not been established in previous research, and/or has yet to be established with a particular subpopulation (McNeish, 2017). In the academic discipline, uncovering the underlying structure of a set of variables is important for testing hypotheses and building theory. In this study, FA was used to uncover the underlying structures of the drivers for ICJV adoption, and the barriers impeding ICJV success. As established by Chan et al. (2004), FA involves four basic steps, including:

1. Identifying the relevant factors from the literature;
2. Computing the correlation matrix for all of the factors;
3. Extracting and rotating each factor; and
4. Interpreting and naming the principal (grouped) factors as underlying factors.

Following these four-pronged steps, the suitability of FA for the factor extraction had to be investigated before applying FA. Therefore, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were employed to determine the suitability of using FA. The KMO value ranges from 0 to 1. Whereas 0 represents unsuitable FA due to pattern correlations diffusion, a value of 1 indicates relatively compact correlation patterns and thus factor analysis would yield reliable and distinct factors (Field, 2013). Many studies have shown that a KMO value of 0.50 is significant (Norusis, 2008; Field, 2009). The existence of correlations between variables is verified by Bartlett's test of sphericity.

Factor extraction and rotation

Factor extraction and factor rotation are the two main processes of FA. Whereas factor extraction determines the number of factors underlying a set of variables, factor rotation is important for meaningful interpretation of the factors extracted (Norusis, 2008). Rotation of the factor matrix redistributes the variance from earlier factors to later ones to achieve a simpler and theoretically more significant factor pattern. There are two main factor rotation methods, oblique and orthogonal rotation. While the oblique rotation method (e.g. promax, oblimin, and quartimin) allows the correlation of factors, orthogonal rotation (e.g. varimax, equamax, and quartimax) is normally employed based on the assumption that each factor is independent of the other (Henson and Roberts, 2006). The extraction method of principal

component analysis, with varimax rotation, was used in this study. To determine the amount of variance a factor explains, as recommended by Field (2009), only factors with eigenvalues higher than 1 were retained. The naming of factors was done using the common themes that run through the variables approach (Owusu et al., 2019; Adabre et al., 2019). Moreover, in a situation where no common theme exists, the naming was done using a combined theme of the variables with the maximum factor loadings (Zhang et al., 2017). The naming of the six factors followed these two naming techniques.

3.2.2.7 A Multi-criteria decision analysis: ZDM method

Zadeh (2011) introduced the concept of Z-numbers to cover the overall uncertainty theory. A holistic interpretation of the whole theory was to provide a basis for dealing with unreliable numbers. It is expressed as $Z = (\tilde{A}, \tilde{R})$, where $\tilde{A}$ is a fuzzy number that represents a constraint on an uncertain variable X, while $\tilde{R}$ is a measure of reliability for $\tilde{A}$. Z-numbers application has recently increased because of power in handling uncertain information in the real world. Delphi method has been used for knowledge acquisition from experts in different areas of study. However, this method was fraught with low convergence expert opinion, the existence of multiple rounds, and high execution cost. The fuzzy set was fused with the traditional Delphi method (FDM) to overcome these challenges (Ishikawa et al., 1993). Despite the superiority of the FDM, it suffered from the inability to identify new factors and the shortcoming associated with the use of triangular fuzzy numbers (TFNs) (Yih, 2010). To resolve this issue, the concept of Z-numbers (ZDM) was introduced (Zhang and Mohandes, 2020). This method enables experts to methodically identify all the potential factors, and it considers the experts' level of confidence/sureness in evaluating identified potential factors' criticality. The steps involved in ZDM are as follows. The linguistic terms of Z-numbers follow Transformation Rules (TRs), which must be noted.

Suppose a Z-number is represented as $Z = (\tilde{A}, \tilde{R})$, and we have $\tilde{A} = \{(x, \mu_{\tilde{A}}(x))|x \in [0,1]\}$ and $\tilde{R} = \{(x, \mu_{\tilde{R}}(x))|x \in [0,1]\}$ as triangular fuzzy membership functions. It is notable that $\tilde{A} = (l_a, m_a, u_a)$ and $\tilde{R} = (l_r, m_r, u_r)$. According to the defined Z-numbers, the reliability (i.e. the second component of Z-number) can be converted to a crisp number using the following eqns.

$$\alpha = \frac{\int x\mu_{\tilde{R}}(x)dx}{\int \mu_{\tilde{R}}(x)dx} = \frac{l_r + m_r + u_r}{3} \quad (3.8)$$

Afterward, the weights of the second part (i.e. reliability) are added to the first part (i.e. constraint), giving us the weighted Z-numbers as below:

$$\tilde{Z}^{\alpha} = \{(x, \mu_{\tilde{A}^{\alpha}}(x))|\mu_{\tilde{A}^{\alpha}}(x) = \alpha\mu_{\tilde{A}}(x), x \in [0,1]\} \quad (3.9)$$

For example, if Z = $(\tilde{A}, \tilde{R})$ and $\tilde{A}$ = (7,9,10) and $\tilde{R}$ = (0.5,0.7,0.9), using eqn. (3.8), the reliability is converted to a crisp number as, (0.5+0.7+0.9)/3 = 0.7. Based on eqn. (2.9), the weighted Z-number is then converted to the regular fuzzy number as $\tilde{Z}^{\alpha}$ = ($\sqrt{0.7}$ *7, $\sqrt{0.7}$ *9, $\sqrt{0.7}$ *10) = (5.86,7.53,8.37).

After collecting the completed questionnaires from the respondents, the linguistic terms assigned to each potential barrier were first transformed to their respective membership functions (MFs) and then calculated based on the rated pairs (i.e. constraint and reliability). Following the calculation of TRs explained earlier, the linguistic terms of Table 3.3 are transformed as presented in Tables 3.4.

Table 3. 3 Transformation rules of linguistic terms for the factor criticality and reliability (Adapted from Zhang and Mohandes, 2020)

Linguistic terms	MFs (criticality – constraints)	MFs (reliability)
Very low (VL)	(0,0,1)	(0,0,0.1)
Low (L)	(0,1,3)	(0,0.1,0.3)
Medium low (ML)	(1,3,5)	(0.1,0.3,0.5)
Medium (M)	(3,5,7)	(0.3,0.5,0.7)

Medium high (MH)	(5,7,9)	(0.5,0.7,0.9)
High (H)	(7,9,10)	(0.7,0.9,1.0)
Very high (VH)	(9,10,10)	(0.9,1.0,1.0)

Table 3. 4 TRs of linguistic terms and the corresponding MFs used in the proposed ZDM.

Z-number: (criticality level of the identified potential barrier, reliability)	MFs	Z-number: (criticality level of the identified potential barrier, reliability)	MFs
(VL,VL)	(0,0,0.18)	(M,MH)	(2.51,4.18,5.86)
(VL,L)	(0,0,0.37)	(M,H)	(2.79,4.65,6.52)
(VL,ML)	(0,0,0.55)	(M,VH)	(2.95,4.92,6.88)
(VL,M)	(0,0,0.71)	(MH,VL)	(0.91,1.28,1.64)
(VL,MH)	(0,0,0.84)	(MH,L)	(1.83,2.56,3.29)
(VL,H)	(0,0,0.93)	(MH,ML)	(2.74,3.83,4.93)
(VL,VH)	(0,0,0.98)	(MH,M)	(3.54,4.95,6.36)
(L,VL)	(0,0.18,0.55)	(MH,MH)	(4.18,5.86,7.53)
(L,L)	(0,0.37,1.10)	(MH,H)	(4.65,6.52,8.38)
(L,ML)	(0,0.55,1.64)	(MH,VH)	(4.92,6.88,8.85)
(L,M)	(0,0.71,2.12)	(H,VL)	(1.28,1.64,1.83)
(L,MH)	(0,0.84,2.51)	(H,L)	(2.56,3.29,3.65)
(L,H)	(0,0.93,2.79)	(H,ML)	(3.83,4.93,5.48)
(L,VH)	(0,0.98,2.95)	(H,M)	(4.95,6.36,7.07)
(ML,VL)	(0.18,0.55,0.91)	(H,MH)	(5.86,7.53,8.37)
(ML,L)	(0.37,1.10,1.83)	(H,H)	(6.52,8.38,9.31)
(ML,ML)	(0.55,1.64,2.74)	(H,VH)	(6.88,8.85,9.83)
(ML,M)	(0.71,2.12,3.54)	(VH,VL)	(1.64,1.83,1.83)
(ML,MH)	(0.84,2.51,4.18)	(VH,L)	(3.29,3.65,3.65)
(ML,H)	(0.93,2.79,4.65)	(VH,ML)	(4.93,5.48,5.48)
(ML,VH)	(0.98,2.95,4.92)	(VH,M)	(6.36,7.07,7.07)
(M,VL)	(0.55,0.91,1.28)	(VH,MH)	(7.53,8.37,8.37)
(M,L)	(1.10,1.83,2.56)	(VH,H)	(8.38,9.31,9.31)
(M,ML)	(1.64,2.74,3.83)	(VH,VH)	(8.85,9.83,9.83)
(M,M)	(2.12,3.54,4.95)		

The obtained MFs related to each set are then used to compute the criticality of each identified factor based on the respondents' ratings. In this study, the minimum and maximum values of the respondents' opinion were taken as the two terminal points of the newly calculated MFs, while the geometric mean was utilized as the membership degree function of MFs to avoid the effects of extreme values (Ma et al., 2011). The steps involved are as follows.

Assuming the MFs related to No. *j* factor (reference to Table 3.4) given by No. *i* respondent of *n* respondents is $\widetilde{w}_{ij} = (l_{ij}, m_{ij}, u_{ij})$, for $i = 1,2,3,\ldots,n$, and $j = 1,2,3,\ldots m$. Then the following could be obtained.

$$\widetilde{w}_j = (l_j, m_j, u_j) \tag{3.10}$$

$$l_j = \min_i \{l_{ij}\} \tag{3.11}$$

$$m_j = \frac{1}{n}\sum_{i=1}^{n} m_{ij} \tag{3.12}$$

$$u_j = \max_i \{u_{ij}\} \tag{3.13}$$

where $\widetilde{w}_j$ is the fuzzy weight related to No. j barrier, l_j, m_j, and u_j are the minimum, geometric mean, and maximum of all the respondents' evaluation value, respectively.

Defuzzification

The computed $\widetilde{w}_j$ of each identified potential factor was defuzzified using the simple center of gravity (*CoC*) method is used:

$$S_j = \frac{l_j + m_j + u_j}{3}, \text{ for } j = 1,2,\ldots m \tag{3.14}$$

After this process, a threshold value (α) was determined to single out the critical factor as provided below.

If $S_j \geq \alpha$, then No. j factor was considered as a critical factor and retained for further analysis.

If $S_j < \alpha$, then No. j factor was considered uncritical, thus was not included for further analysis.

$\alpha = \frac{\sum_{i=1}^{n} S_j}{K}$, where $\sum_{i=1}^{n} S_j$ = summation of all the *CoC's*, and K is the total number of respondents. This method was used to refine the barriers impeding ICJVs success based on the professionals' ratings.

3.2.2.8 ZBWM method

To compute the weights of factor constructs and sub-factors, the ZBWM proposed by Aboutorab et al. (2018) was adopted. This method requires fewer pairwise comparisons, and it features Z-numbers, which enhances the consistency and accuracy of the results as the respondent's reliability is considered. After defining the set of factors, the respective respondent was asked to conduct a Z-based pairwise comparison for the most important factor (A_B) and the least important factor (A_L). Both the factor constructs, and sub-factors were considered. For each pairwise comparison, respondents were required to determine the importance/least of the respective barrier against the other factors together with the reliability level of making such a decision, using the linguistic terms provided in Table 3.5. The relative MFs (reference to Table 3.6) are computed based on as previously explained. Following this, the Fuzzy Best-to-others vector and Others-to-Worst vector could be represented as:

$$A_B = (\alpha_{B1}, \alpha_{B2}, \alpha_{B3}, \ldots, \alpha_{Bn}), \text{for } j = 1,2,3,\ldots n \quad (3.15)$$

$$A_L = (\alpha_{1L}, \alpha_{2L}, \alpha_{3L}, \ldots, \alpha_{nL}), \text{for } j = 1,2,3,\ldots n \quad (3.16)$$

where α_{Bj} represents the extent to which factor A_B is more important than factor B_j together with the consideration of such confidence level, while α_{Lj} indicates the extent to which factor B_j is more important as compared to A_L together with the consideration of such confidence level. To have a better understanding of the ZBWM survey, a sample of the questionnaire is provided in Appendix C, as mentioned.

Table 3. 5 Transformation rules of linguistic terms for factor importance and reliability

Linguistic terms of importance	MFs	Linguistic terms of reliability	MFs
Equally important (EI)	(1,1,1)	Very low (VL)	(0,0,0.3)
Weakly important (WI)	(2/3,1,3/2)	Low (L)	(0.1,0.3,0.5)
Fairly important (FI)	(3/2,2,5/2)	Medium (M)	(0.3,0.5,0.7)
Very important (VI)	(5/2,3,7/2)	High (H)	(0.5,0.7,0.9)
Absolutely important (AI)	(7/2,4,9/2)	Very high (VH)	(0.7,1.0,1.0)

Table 3. 6 Transformation rules of linguistic terms and the corresponding MFs for ZBWM.

Z-number: (importance of barrier factor, reliability)	MFs
(EI,VL)	(1,1,1)
(EI,L)	(1,1,1)
(EI,M)	(1,1,1)

(EI,H)	(1,1,1)
(EI,VH)	(1,1,1)
(WI,VL)	(0.21,0.32,0.47)
(WI,L)	(0.37,0.55,0.82)
(WI,M)	(0.47,0.71,0.82)
(WI,H)	(0.56,0.84,1.26)
(WI,VH)	(0.63,0.95,1.43)
(FI,VL)	(0.47,0.63,0.79)
(FI,L)	(0.82,1.10,1.37)
(FI,M)	(1.07,1.42,1.78)
(FI,H)	(1.26,1.68,2.10)
(FI,VH)	(1.43,1.90,2.38)
(VI,VL)	(0.79,0.95,1.11)
(VI,L)	(1.37,1.64,1.94)
(VI,M)	(1.78,2.13,2.49)
(VI,H)	(2.10,2.52,2.49)
(VI,VH)	(2.38,2.85,3.33)
(AI,VL)	(1.11,1.26,1.42)
(AI,L)	(1.92,2.19,2.27)
(AI,M)	(2.49,2.84,3.20)
(AI,H)	(2.94,3.36,3.78)
(AI,VH)	(3.33,3.80,4.28)

Computing the optimal fuzzy weight of the factors $\tilde{W}_1^*$, $\tilde{W}_2^*$, $\tilde{W}_3^*$, and $\tilde{\xi}$.

Once the pertinent fuzzy vectors (i.e. A_B and A_L) have been obtained, the constrained optimization model is then built up. The steps involved in computing the optimal weights from the optimization constraints are explicitly elaborated in Appendix D.

Checking the consistency ratio (CR)

After the optimal weights, the decision to accept or reject the respondents' opinion was based on the equation below.

$$CR = \frac{\tilde{\xi}}{CI} \tag{3.17}$$

where *CI* represents the consistency index and can be obtained from Table 3.7, as proposed by Aboutorab et al. (2018). To calculate *CR*, the optimized consistency index (denoted by $\tilde{\xi}^*$) – which has already been computed as explained in Appendix D – needs to be divided by *CI*. If $CR < 0.1$, then the respective respondent's response was accepted; otherwise, the questionnaire should be redistributed to the same respondents.

Table 3. 7 *CIs* for the combined linguistic terms

Scales	(EI,VL)	(EI,L)	(EI,M)	(EI,H)	(EI,VH)
a_{BL}	(1,1,1)	(1,1,1)	(1,1,1)	(1,1,1)	(1,1,1)
CI	3	3	3	3	3
Scales	(WI,VL)	(WI,L)	(WI,M)	(WI,H)	(WI,VH)
a_{BL}	(0.21,0.32,0.47)	(0.37,0.55,0.82)	(0.47,0.71,0.82)	(0.56,0.84,1.26)	(0.63,0.95,1.43)
CI	2.07	2.7	3.11	3.42	3.68
Scales	(FI,VL)	(FI,L)	(FI,M)	(FI,H)	(FI,VH)
a_{BL}	(0.47,0.63,0.79)	(0.82,1.10,1.37)	(1.07,1.42,1.78)	(1.26,1.68,2.10)	(1.43,1.90,2.38)
CI	2.64	3.6	4.22	4.71	5.11
Scales	(VI,VL)	(VI,L)	(VI,M)	(VI,H)	(VI,VH)
a_{BL}	(0.79,0.95,1.11)	(1.37,1.64,1.94)	(1.78,2.13,2.49)	(2.10,2.52,2.49)	(2.38,2.85,3.33)
CI	3.17	4.44	5.27	5.92	6.45
Scales	(AI,VL)	(AI,L)	(AI,M)	(AI,H)	(AI,VH)
a_{BL}	(1.11,1.26,1.42)	(1.92,2.19,2.27)	(2.49,2.84,3.20)	(2.94,3.36,3.78)	(3.33,3.80,4.28)
CI	3.68	5.24	6.27	7.07	7.74

Computing the mean of all the accepted weights of factors

All the accepted weights obtained were aggregated. The computed means of the sub-factors denote the local weights, and to obtain the global weights, the local weights of the respective aggregated sub-factors were multiplied by the respective aggregated factor construct weights. Lastly, the obtained optimal weights were ranked for the overall assessment.

3.2.2.9 Agreement analysis: Inter-rater agreement (IRA) method

The IRA analysis is a perfectly reasonable approach to estimating rater similarity and is widely used in the organizational sciences (Brown and Hauenstein, 2005). This method was used to address questions concerning whether the ratings furnished by local partners are similar to ratings provided by foreign partners on the drivers for implementing ICJVs or not. Thus, it was used to determine the absolute consensus in scores furnished by the two groups of respondents across the two rounds of Delphi survey on the driving forces behind ICJVs implementation. Estimates of IRA are used to address whether scores furnished by the respondents are interchangeable or equivalent in terms of their absolute value (LeBreton et al., 2003). IRA analysis is advantageous because it makes the data independent of the scale

and the study's sample size (Zahoor et al., 2017). Based of Brown and Hauenstein (2005) proposition of IRA estimation ($a_{wg(1)}$) for group agreement level analysis (see Eqn. 2.18), LeBreton and Senter (2008) advanced the IRA method by providing interpretation for the IRA estimations which are: 0.00-0.30 *"lack of agreement"*, 0.31-0.50 *"weak agreement"*, 0.51-0.70 *"moderate agreement"*, 0.71-0.90 *"strong agreement"*, and 0.91-1.00 *"very strong agreement"*. More so, to demonstrate rigor and ensure comprehensiveness, the significance of each factor was determined using the scale interval grading utilized by Zahoor et al. (2017). As follows: *"not significant"* ($M < 1.5$), *"least significant"* ($1.54 \leq M \leq 2.5$), *"fairly significant"* ($2.51 \leq M \leq 3.5$), *"moderate"* ($3.51 \leq M \leq 4.5$), *"significant"* ($4.51 \leq M \leq 5.5$), *"very significant"* ($5.51 \leq M \leq 6.5$), and *"extremely significant"* ($M \geq 6.5$). Thus, the significance of each factor and agreement validation with IRA analysis was used in this study to establish consensus between local and foreign partners on the common/mutual and separate driver for forming ICJVs. The IRA estimation is determined using the eqn. below.

$$a_{wg(1)} = 1 - \frac{(2*SD^2)}{\{(A+B)M - (M^2) - (A*B)\}*\frac{n}{n-1}} \tag{3.18}$$

where SD = standard deviation, A = maximum scale value (i.e. 7), B = minimum scale value (i.e. 1), M = mean value of driver, n = sample size of respondents (i.e. 14 in the Delphi survey).

3.2.2.10 Modeling technique: PLS-SEM method

SEM is a multivariate statistical technique used to investigate relationships between at least two independent and dependent variables (Hair et al., 2013). There are two types of SEM-based technique – the PLS-SEM approach and covariance-based SEM (CB-SEM) approach. In this study, PLS-SEM was used to investigate the impacts of drivers, barriers, and MC mechanisms on the performance of ICJVs. PLS-SEM is deemed more appropriate for

simultaneous estimations of causal relationships among at least two predictor and outcome variables. PLS-SEM is more preferred over the covariance-based (CB) SEM due to its greater statistical power in parameter estimations and maximizing explained variables (Hair et al. 2011). Although the two are more complementary with quite low differences in the estimation, the PLS-SEM is widely known for its superior prediction purposes (Sarstedt et al., 2017). It has gained popularity across diverse disciplines including social science and business research (Zaman et al., 2019). PLS-SEM requires two-step interpretation, measurement model – reliability and validity testing, and structural model – path analysis examination.

Measurement model evaluation

The measurement model was assessed by checking convergent and discriminant validity. Three indices were used to examine the convergent validity, namely Cronbach alpha, composite reliability (CR), and average variance extracted (AVE). Cronbach alpha and CR were used to assess the internal consistency reliability of the measurement items. A recommended threshold or criterion of 0.70 is used to assess a scale's reliability with respect to internal consistency for both Cronbach alpha and CR (Nunnally, 1978). As for AVE, Fornell and Larcker (1981) suggested a score of 0.5 as an acceptable level. According to Hair et al. (2013), discriminant validity shows the extent to which two conceptually similar concepts are distinct. With the discriminant validity, the underlying principle is that items should be strongly correlated to measure the corresponding construct with theoretical support and less correlate with other constructs. High discriminant validity provides greater evidence that a construct is sufficiently unique and captures the phenomenon that another construct cannot. AVE of a latent factor should be greater than the variance shared between the latent factor being considered and the other latent factors (Fornell and Larcker, 1981). The rule is

that the square root of the AVE of each latent variable should be larger than the correlation of two latent variables (Chin, 1998). Discriminant validity was also assessed in terms of the Heterotrait-monotrait (HTMT) criterion. The HTMT leaves behind classic approaches such as the Fornell-Larcker criterion and cross-loading. The HTMT values below the threshold of 0.85 is recommended (Henseler et al., 2015).

Structural model evaluation

After the establishment of confidence in the measurement model, a structural equation model is established and tested to examine the direction and strength of relationships among constructs. The path coefficient was used to evaluate the tested hypothesis. It is grounded in theory that; the path coefficient values denote the strength of the correlations between exogenous (independent) and endogenous (dependent) constructs (Hair et al., 2014). The bootstrapping technique was applied to cross-validate the path coefficient values. Bootstrapping is useful for estimating the distribution of any statistic for a different form of distribution (Jack et al., 2001). The number of bootstrap subsamples was 5,000, which essentially ensured the stability of the results, and the number of cases was equal to the number of responses. The variance described (R^2) and *p*-values of path estimates were used to determine the model predictive accuracy and statistical significance of the relationships, respectively. The significant values, *t*-values, for a two-tailed test were 1.65 (significant level = 10%), 1.96 (significant level = 5%), and 2.58 (significant level = 1%) (Hair et al., 2014). The results of the PLS-SEM are presented and discussed in Chapters 9 and 10.

3.3 BACKGROUND INFORMATION OF RESPONDENTS

Table 3.8 presents the background information of the respondents. Of the 180 distributed questionnaires, 84 completed questionnaires were gathered for data analysis. 38 were administered via email and 46 through a face-to-face interview. 51 (61%) were local partners and the remaining 33 (39%) were foreign partners of ICJV. More than half of the respondents have had over 11 (66%) years of working experience operating in both the domestic and international markets and having specialties in project/construction management, quantity surveying, architecture, and general contracting. Likewise, more than half of the respondents 71 (85%) have been involved in at least 2 ICJV projects. The diversified knowledge and working experiences of the respondents in ICJV implementation enhance the reliability and credibility of the study results.

Table 3. 8 Participant information

Characteristics	Frequency	Percentage (%)
Category of experts		
Local/host/domestic partner	51	61
Foreign/international partner	33	39
Specialties of respondents		
Project manager	25	30
Architect	14	14
Contractor	24	29
Quantity surveyor	13	30
Others	8	10
Working experience		
Less than 5 years	5	6
5 – 10 years	23	27
11 – 15 years	38	45
16 – 20 years	18	22
Number of projects executed		
1	13	16
2	28	33
3	41	49
4	2	2

3.4 CHAPTER SUMMARY

This chapter explained, in detail, the research methodology adopted for the study. It specifically elaborated on the methods including the statistical analysis techniques adopted for the study. A purely quantitative research method was adopted and supplemented by

follow-up interviews for generating insights. A survey questionnaire developed based on a comprehensive review of pertinent literature and modified based on feedback from experts was used for gathering data. The data collection technique is discussed first, followed by an in-depth discussion of the statistical techniques employed to achieve the aim and objectives. Statistical methods used in this study, such as mean score, Mann-Whitney U statistics, ZDM, ZBWM, PLS-SEM, etc. were described. The next chapter introduces reviews of pertinent literature on drivers, barriers, MC mechanisms, and performance evaluation in ICJVs.

CHAPTER 4 LITERATURE REVIEW – DRIVERS FOR AND BARRIERS IN ICJVs IMPLEMENTATION[4]

4.1 INTRODUCTION

A comprehensive literature review of what drives ICJVs adoption and the barriers to their success is presented in this chapter. The awareness and understanding of the drivers provide directions and administrative buttress in implementing ICJVs. Thus, knowledge of the key drivers aids successful implementation strategies – choice of measures which improves organizational performance, and greatly drive competitive advantage. Drivers denote, respectively, the 'push' and 'pull' factors that compel and attract firms to engage in ICJVs. Simply put, they are potential benefits, motivations, and positive influential factors that encourage construction companies to implement ICJVs (Chan et al., 2020). Abridged from a range of theoretical standpoints, including resource dependency, transaction cost, organizational learning, etc., previous studies have highlighted the endless drivers for implementing ICJVs. From the transaction cost perspective, firms can reduce transaction costs by obtaining more effective governance mechanisms (Klijn et al., 2014). ICJV provides a platform for partners to learn from each other (Martin and Emptage, 2019). The resource-based view suggests that cooperative partnerships are largely motivated by the difference in skill level, specialization, input, and urgency of meeting a common target (Tsang, 2000). From this theoretical standpoint, Girmscheid and Brockmann (2010) categorized ICJVs drivers into collective and individual

[4] This Chapter is largely based upon:
Chan, A. P., Tetteh, M. O., and Nani, G. (2020). Drivers for international construction joint ventures adoption: a systematic literature review. *International Journal of Construction Management*, 1-13.
Tetteh, M. O., Chan, A. P., Darko, A., and Nani, G. (2020). Factors affecting international construction joint ventures: a systematic literature review. *International Journal of Construction Management*, 1-45.

drivers. Thus, parties can either pursue common or separate interests. Technology transfer, learning managerial skills, attracting capital investment, and the opportunity to work on large and complex projects constitute a key set of strategic drivers for implementing ICJVs by developing countries/jurisdictions (Devapriya and Ganesan, 2002; Panibratov, 2016). On the other hand, the key strategic drivers for developed countries/jurisdictions include faster entry into local markets, facilitating international expansion, and conforming to the host/local government policy (McIntosh and McCabe, 2003; Mohamed, 2003). However, both developed and developing countries/jurisdictions jointly improve their competitive positions (Gunhan and Arditi, 2005), develop special knowledge and promoting diversification (Norwood and Mansfield, 1999), etc.

Despite the myriad benefits and opportunities that ICJV can bring, it is also not free of uncertainties and challenges. In practice, numerous unfavorable results can occur when implementing ICJVs. This is a result of their complex nature of operation and management. ICJVs are married with multiple uncertainties and challenges, which contribute to their failure. In ICJV literature, most of these influential factors are summarized as risks for conveniences' sake. Thus, barriers to ICJVs success as a stand-alone concept are difficult to find. Following a very careful review of the literature, a list of potential drivers and barriers to ICJVs success has been provided in this chapter that is crucial to developing the survey questionnaire for this study.

4.2 DRIVERS FOR IMPLEMENTING ICJVs

First, a search string was developed to aid the identification of relevant documents. The search string used included but not limited to "international joint ventures", "international construction

joint ventures", "construction joint ventures", etc. For comprehensiveness and to reduce the possibility of neglecting relevant publications, there was no year limitation. Similarly, the term "international joint ventures" was used in the search string to identify relevant/related studies that focused on construction or infrastructure projects but did not use the key terms (i.e. ICJVs). For example, those studies used "international joint ventures in construction", "international joint ventures in infrastructure projects", etc. The Virtual Libraries (VL) of construction management (CM) journals were assessed directly to retrieve related publications. The top 60% CM journals according to Chau's (1997) ranking list were considered – the leading 12 CM journals. Multiple databases such as the Web of Science, Scopus, Engineering Village, etc. were also used to substantiate the search process. For the comprehensive details of the journal selection process including the exclusion and inclusion criteria, interested readers are referred to Chan et al. (2020). The drivers were extracted directly from tables, charts, figures, etc., and through a content analysis, open coding method, where the factors are not shown directly in tables and charts. This is where sections of the literature that focused on the drivers were first extracted, and the factors identified and regrouped based on their homogeneity or similarity in meaning (Oppong et al., 2017). Based on a comprehensive review of 73 selected publications, a total of 48 potential drivers were identified as presented in Table 4.1. To better understand the drivers, and for clarity and simplicity, it is worthwhile to categorize them into constructs to set out the differences that exist among them. More so, to facilitate easy identification of the prevailing drivers and any possible or anticipated future discoveries, it deemed crucial to determine the relational constructs for the identified variables. The 48 drivers were categorized into five main constructs; legal and market-driven drivers, strategic vision drivers, organizational and personal goal drivers, relationship building and operational success drivers, and capacity building drivers

(see Fig. 4.1). The categorization was achieved based on two premises: (1) the relationship that exist among the variables (by definition), and (2) from previous studies that classified some of the variables. For example, Hong (2014) classified “combination of resources, specialist skills and expertise” and “achieving technology exchange and transfer” as organizational benefit in ICJV implementation. The classification of the drivers, therefore, shares a similar ideology with Hong's classification.

Table 4. 1 Drivers for implementing ICJVs (see Chan et al., 2020)

Code	Drivers	References	Sum
D1	Reduce project risk/risk sharing	[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36]	36
D2	Sharing of resources	[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36]	36
D3	Advance construction technology acquisition	[2,3,6,8,10,11,12,13,15,16,21,23,25,29,31,37,38,39,40,41,42,43,44,45,46,47,48,49,50]	29
D4	Improved managerial expertise	[2,3,6,8,10,11,12,13,15,16,21,23,15,19,31,37,38,39,40,41,42,43,44,45,46,47,48,49,50]	29
D5	Government insistence/legal regulation enforcement	[2,13,22,31,41,48,56,57,59,60,71]	11
D6	Increased quality levels of projects	[5,8,11,12,16,28,41,53,72,66]	10
D7	Competition as driving force	[14,36,37,40,41,43,47,53,68]	9
D8	Mode of foreign investment	[2,21,29,45,46,60]	6
D9	Gain economies of scale	[6,10,12,15,16,19]	6
D10	Promotion of economic growth in the long run	[29,43,45,47,53]	5
D11	External regulation support policies	[9,57,59,69,73]	5
D12	Demand for value for money (VM)	[33,51,53,54]	4
D13	Better execution of project	[20,29,37,43]	4
D14	Overcome cultural and political barriers	[17,42,62,63]	4
D15	Enter new construction market	[31,68,69,70]	4
D16	Satisfaction of client requirement/achievement of pre-qualification conditions	[8,47,50,53]	4
D17	Satisfy local development requirement	[2,41,45,53]	4
D18	Increased market share	[12,13,68]	3
D19	Increased productivity at all levels	[37,43,47]	3
D20	Diversification	[17,36,61]	3
D21	Opportunity to work on large and complex projects	[20,42,45]	3
D22	Ensured stability	[12,54,66]	3
D23	Improved company's image	[33,42,67]	3
D24	Serve core customers	[8,31,47]	3
D25	Attract capital investment	[2,31,41]	3
D26	Allows greater ease of work	[5,12,36]	3
D27	Expansion of local construction companies	[12,13]	2

D28	Promote partnering	[49,53]	2
D29	As a front (means to internationalized)	[31,64]	2
D30	Social support	[25,31]	2
D31	Growth in construction globalization	[41,65]	2
D32	Secure financing	[31,41]	2
D33	High in demand for project implementation	[25,72]	2
D34	Competing interest of national development	[41,68]	2
D35	Achieve greater value in construction procurement	[53]	1
D36	Increased efficiency	[53]	1
D37	Improved track records	[42]	1
D38	Overcome the lack of local knowledge of international firms	[54]	1
D39	Building reputation	[33]	1
D40	Increased credibility	[33]	1
D41	Promote industrial integration	[49]	1
D42	Prevention of wholly own foreign companies	[68]	1
D43	Acquire new construction project	[41]	1
D44	Desired for modern conveniences	[72]	1
D45	Overcome environmental deficiencies	[38]	1
D46	Domestic recession	[67]	1
D47	Improved existing imperfect mechanism of the construction industry	[2]	1
D48	Stimulate export-oriented contracting	[2]	1

References: 1 = Hsenh et al. (2007); 2 = Luo et al. (2001); 3 = Ozorhon et al. (2010b); 4 = Leijie et al. (2019); 5 = Jung et al. (2011); 6 = Ozorhon et al. (2007b); 7 = Kazaz and Ulubeyli (2009); 8 = Carrier (1992); 9 = Ling et al. (2006); 10 = Ozorhon et al. (2008b); 11 = Lin and Ho (2013); 12 = West (2014); 13 = Zhang and Zou (2007); 14 = Gunhan and Arditi (2005a); 15 = Ozorhon et al. (2010a); 16 = Girmscheid and Brockmann (2010); 17 = Young (1992); 18 = Jung et al. (2010); 19 = Ozorhon et al. (2008a); 20 = Zhao et al. (2013); 21 = Xu et al. (2005a); 22 = Al-Sabah et al. (2014); 23 = Ochieng and Price (2010); 24 = Melese et al. (2017); 25 = Aleshin, (2001); 26 = Drouin et al. (2009); 27 = Ling et al. (2005); 28 = Ho et al. (2009); 29 = Hwang et al. (2017); 30 = Abdul-Aziz and Cha (2008); 31 = McIntosh and McCabe (2003); 32 = Odediran and Windapo (2016); 33 = Shen and Cheung (2018); 34 = Boeva (1990); 35 = Mansfield and Sasillo (1990); 36 = Norwood and Mansfield (1999); 37 = Devapriya and Ganesan (2002); 38 = Panibratov (2016); 39 = Hansen and Tatum, (1989); 40 = Gunhan and Arditi (2005b); 41 = Sillars and Kangari (1997); 42 = Carrillo (1996); 43 = Ozorhon et al. (2007a); 44 = Ganesan and Kelsey (2006); 45 = Luo (2001); 46 = Gale and Luo (2004); 47 = Walker and Johannes (2003); 48 = Fan (1988); 49 = Munns et al. (2000); 50 = Simkoko (1992); 51 = Walker and Johannes (2003); 52 = Zhao et al. (2013); 53 = Kumaraswamy and Shrestha (2002); 54 = Dulaimi (2007); 55 = Walker and Johannes (2003); 56 = Bing and Tiong (1999); 57 = Xu et al. (2005b); 58 = Kreitl et al. (2002); 59 = Ling and Gui (2009); 60 = Bing et al. (1999); 61 = Neves and Bugalho (2008); 62 = Fisher and Ranasinghe (2001); 63 = Swierczek (1994); 64 = Do and Lee (2012); 65 = Oswald et al. (2018); 66 = Park et al. (2010); 67 = London and Siva, (2011); 68 = Mohamed (2003); 69 = Chen and Messner (2009); 70 =

Martek and Chen (2014); 71 = Jung et al. (2011); 72 = Almohsen and Ruwanpura (2016); 73 = Shen et al. (2001).

4.2.1 Legal and Market-Driven Drivers

Legal and market-driven drivers are drivers that attract and compel companies/organizations to adopt ICJVs for special construction projects. Construction firms from different countries can undertake projects in different locations because of "open door" policy or regulation mainly set by the government or external organizations. The market structure and the intensity of competition determines the entry strategy decision for a firm. The entry mode choice theory explains more about the determinants of this decision (Cheng, 2006). According to Li et al. (2009), the investment restrictions together with cultural and political factors, especially in the domestic market often force foreign companies to adopt ICJVs, to minimize the inefficiencies in the domestic market. The introduction of free trade blocs by governments has increased the construction trade and realigned the construction industry by supporting ICJVs. The need to meet the nation's aspirations by satisfying the host nation's managerial skills and technological gaps, boosting exports, and promoting industrial integrations, preventing the dominance of wholly foreign construction firms, knowledge of local contracting procedures and policies, language requirements, etc. have placed much pressure on the government to incentivize and mandate the adoption of ICJVs. In China, for example, as part of their policy requirement, foreign companies are required to partner with domestic firms through IJVs for the realization of infrastructure projects. Likewise, in Hong Kong, there is no legal restriction on foreign construction firms. However, their engagement in the industry often starts with forming JVs with local firms so that they can tap into the local knowledge and network (Chang et al., 2018). More so, in developing countries, such as Ghana, the introduction of the Local Content and Local Participation, Regulation 2013 L.I 2204, requires foreign firms to form a JV with domestic firms, with

foreigners holding 10% shares. Similarly, in Libya, foreign firms are allowed to hold a maximum of 49% equity stake.

With regards to external regulation support policies, the role of international organizations in regulating international laws is also one of the great importance to integrate countries into the world trade economy (Xu et al., 2005a). An example is the World Trade Organization (WTO) which ensures that foreign companies are permitted to establish JVs without any quantitative restrictions. Also, the growing market/client requirements often play a key role in driving ICJV adoption. ICJVs are formed to ensure that bidding criteria for specific projects are met. For example, owners may demand a certain type of expertise to be present in firms that intend to bid for their projects. Further, governments may require that corporations meet their minority or small-business requirements. Forming ICJV with the right firm might satisfy bidding criteria that would have been difficult for a firm to go alone (Badger and Mulligan, 1995).

4.2.2 Strategic Vision Drivers

Strategic vision drivers focus on the long-term benefits that the local markets and the partners of ICJVs will obtain (Norwood and Mansfield, 1999). Gale and Luo (2004) emphasized that maintaining the domestic market is greatly dependent on creating a changing environment that promotes growth, supporting export-oriented contracting, and promoting industrial integration into the world economy. The factors defining this construct are key in, especially developing countries. ICJVs are seen as a novel approach for constantly providing a way to develop a control and resolution strategy for overcoming future competition (Munns et al., 2000). Thus,

corporate firms develop and build capacity through the acquisition of advanced knowledge to deliver future infrastructure projects (Walker and Johannes, 2003). In the long run, there will be an increase in productivity in construction. This indicates that there would be more adherence to schedule and time savings, which often translates into appreciable financial savings. ICJV provides the opportunity for firms who establish a good relationship with clients/owners, demanding considerable and consistent construction projects, to have a good base workload (Dulaimi, 2007). In the construction market today, clients expect contractors to provide attractive financial packages for the successful implementation of their project. ICJVs can provide far-reaching and innovative finance to the client (Gunhan and Arditi, 2005a). ICJVs bring together advanced knowledge, finance, and technical tools to radically change the way companies operate in the construction industry (Norwood and Mansfield, 1999.

4.2.3 Organizational and Personal Goal Drivers

This construct highlights the self-motivated factors that drive companies to adopt ICJVs. The contextual location of companies determines these basic drivers. The intensification of the local market accompanied with the low level of technology and expertise creates tension which breeds competition to motivate firms to diversify or brand themselves to be competitive in the local market. As no market is forever safe, local firms eventually have to face foreign competition, even when they stay at home (Gunhan and Arditi, 2005a). Building a strong competitive advantage in the construction industry means having strength in the financing, procurement, engineering, and construction. An apparent benefit for ICJVs adoption is the acquisition of the foreign firms' extant knowledge which is sufficient for gaining a competitive advantage in the local market (London and Siva, 2011; Panibratov, 2016). ICJV partners are highly promoted and

given much recognition by the public upon successful completion of a public project that either epitomizes a local revolutionary or one that put forward technical difficulties to contractors (Hong, 2014). It confirms that the increased industrial acknowledgment and status, not only denote the narcissistic image of the company, however, but also provide the opportunity to work on large and more complex projects as well as sustains the long-term development of the industry. Also, to obtain high-quality engineering services at a lower price (demand for VM), corporations with limited capabilities and operational facilities in delivering construction projects form an ICJV with potential partners to fully enjoy the benefit.

4.2.4 Relationship Building and Operational Success Drivers

This construct focuses on the long-term business relationships (Munns et al., 2000), and operational efficiencies (Kumaraswamy and Shrestha, 2002). Ozorhon et al. (2010a) and Tetteh et al. (2019) reported that this construct is one of the key determinants of success for ICJVs. The key variables under this construct are reducing project risk/risk sharing, sharing of resources, gaining economies of scale, and allowing greater ease of work (Hsenh et al., 2007; Ozorhon et al., 2007b; Ochieng and Price, 2010). ICJV allows firms to work in overseas markets while sharing risks with other firms. This is achieved when the host partner can work through the local bureaucracy, customs clearance assistance, certifying work, accessing the local labour market, etc. (Badger and Mulligan, 1995). Several studies have highlighted that the major benefit for entering ICJV is to spread financial and technical risk (Hsenh et al., 2007; Kazaz and Ulubeyli, 2009; Han et al., 2019). This particularly present in the oil and gas sector (for upstream projects) (Almohsen and Ruwanpura, 2016). According to Munns et al. (2000), ICJVs promote cooperation and collaboration, networking opportunities as well as trust. Ozorhon et al. (2010b)

highlighted that a harmonious relationship is a key driver for establishing ICJVs in Turkey. Corporate firms are motivated to team up again when the need arises when they satisfactorily perform well in their previous collaboration. Long-term established relationships through ICJVs facilitate combined strengths in the form of technology, managerial expertise, and capital which breeds opportunities for undertaking more construction projects. Panibratov (2016) highlighted that a stable relationship provides a multi-link of integration especially in the production chain. The continual mutual commitment of partners is expected to stimulate the trust and collaboration between them which brings in advanced knowledge to benefit the host economy and the local firms as well as enhances the relations between the ICJVs (Jung et al., 2011; West, 2014).

4.2.5 Capacity Building Drivers

Capacity building drivers set the platform for an interminable development and strengthening of skills, instincts, abilities, processes, and resources that corporations require to survive, adapt, and thrive in this fast-changing world. With no doubts, ICJVs enable domestic firms to acquire knowledge (Do and Lee, 2012). Local firms lacking the qualifications and capability of completing infrastructure works on their own can be supported by foreign firms that are specialized in those areas through ICJV. In the construction industry, the strength of firms depends crucially on physical assets, knowledge, and human capabilities that enable a more efficient infrastructure delivery and services, innovative construction techniques, organizational know-how, and managerial innovation (Ganesan and Kelsey, 2006). Hence, the imported knowledge when integrated with the existing local expertise stimulates the overall national capacity of local firms. Lewis (2007) mentioned that many construction companies in developing countries consider the factors under this construct as part of their core corporate mission

statement or policy. Forming ICJVs does not only benefit the growth of parties involved but also contributes to boosting the construction capacity, and the internal transfer of expertise to junior domestic firms to build up the resource capacity of the host country (Devapriya and Ganesan, 2002).

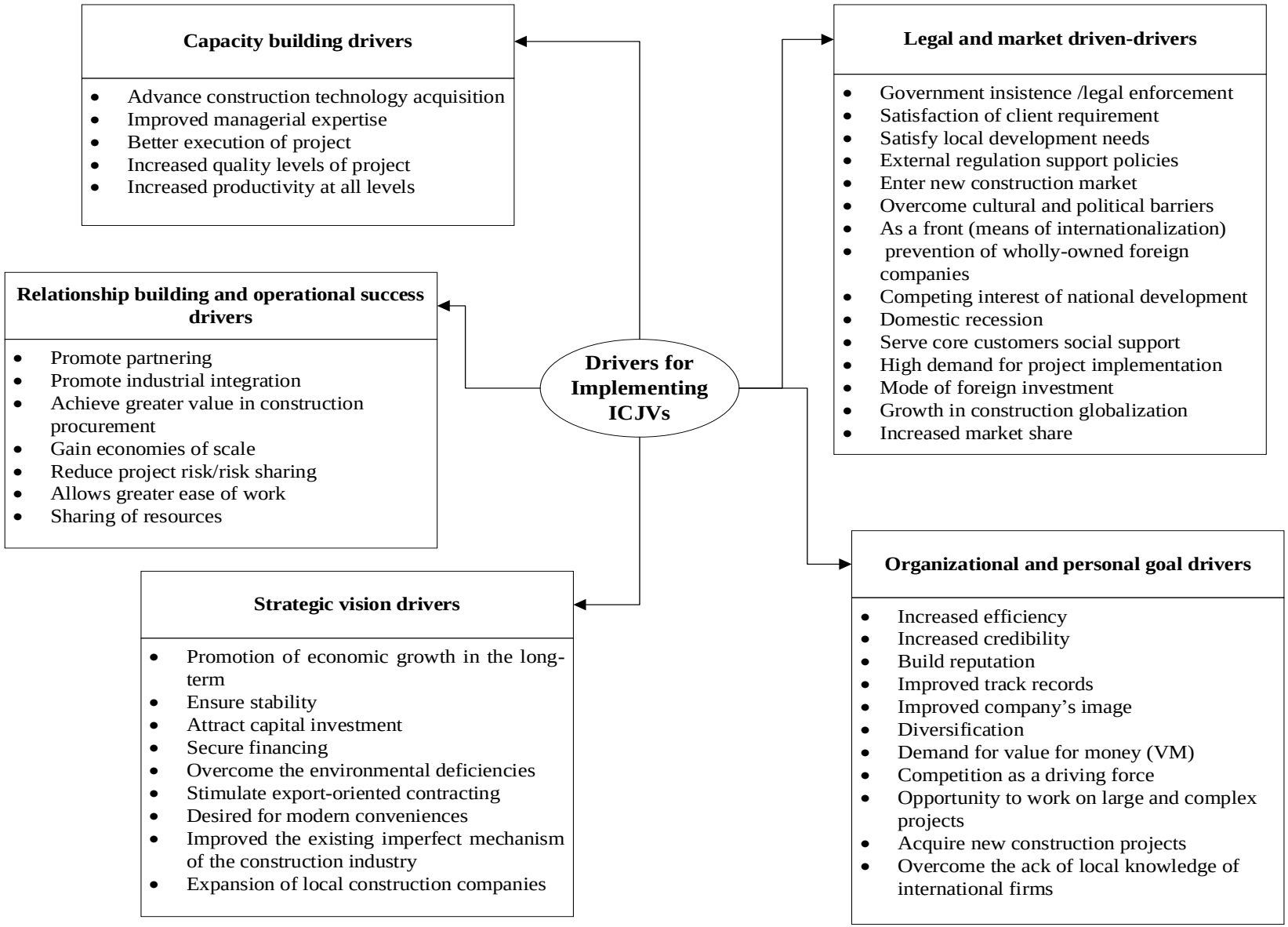

Fig. 4. 1 Conceptual framework of drivers for implementing ICJVs (see Chan et al., 2020)

4.3 KNOWLEDGE GAPS

After a thorough review of pertinent literature, Chan et al. (2020) identified that there are limited studies that have comprehensively analyzed drivers for implementing ICJVs within the context of developing countries. More so, the existing related studies have imputed a single driver to investing firms, although partners may hold different drivers for engaging in ICJVs. This study aims at addressing this gap by exploring important drivers that can be considered by related partnering firms for engaging in ICJVs in the developing country of Ghana. Whereas the current study makes an exceptional contribution to ICJVs body of knowledge through the robust and rigorous identification, categorization, and in-depth and understandable explanations of the main factors that drive ICJVs adoption, it also has practical values. Practitioners and policymakers can focus on the key driving factors to popularize and make informed decisions on ICJVs implementation effectively and efficiently. Thus, it will enable potential parties to evaluate their compatibility before entering the ICJV contract. Besides, it facilitates the possibility of understanding the objectives of partnering firms in ICJVs.

4.4 BARRIERS TO ICJVs SUCCESS

For consistency and clarity, in this study, the term “barriers” refers to the potential factors known to occur and with a solely negative effect on ICJVs success, and require immediate management response (Hong, 2014), and is defined to include challenges, problems, difficulties, obstacles, and issues hindering ICJVs success.

Eissa et al. (2021) found that clashes in sharing technical expertise and managerial disagreement are the most significant barriers in cooperative partnerships between contractors in the construction industry. The management and decision-making right bestowed on each member often creates disagreements, which can be a major disadvantage to corporation success given its dependence on the presence of every partner. Ozorhon et al. (2008b) established that the differences in partners' organizational cultures in terms of working styles, company goals, management control structures, etc., often lead to conflicts, especially in inputs and profit distribution, authority distribution and execution, working procedure, etc. (Zhang and Zou, 2007; Kim et al., 2008) and nonresolution of such conflicts will eventually affect the performance of ICJVs. Aside from the hybrid cultural mix challenges and management frictions, realizing successful ICJVs is greatly dependent on the individuals engaged in the collaboration process (Mohamed, 2003; Gunduz and Abdi, 2020). The incapacitation or incompetence of the management team, especially host/local partners, has been identified to affect ICJVs success (Walker and Johannes, 2003). Liang et al. (2019) emphasized that information relating to management and technical strength of potential partners should be given the needed attention during the selection process. Similarly, the lack of knowledge and understanding of ICJV administrative structures in areas such as contractual terms, communication, and coordination, etc., is a factor that can contribute to ICJVs failure (Prasitsom and Likhitruangsilp, 2015; Maemura et al. 2018). Zhao et al. (2013) and Alashwal and Ann (2019) also noted that successful ICJVs rely heavily on relational forms of exchange characterized by a high level of commitment – enduring desire to maintain a valued relationship. Thus, when there is a lack of commitment from partners, and when the partners are unable to derive values and benefits from the venture it will eventually not function well (Mohamed, 2003). The lack of commitment was

evident in the study by Zhang et al. (2020). McIntosh and McCabe (2003) highlighted that lack of confidence about experience and knowledge among parties is one of the key barriers to ICJVs success as it reduces the total commitment of partners in the cooperation.

Lu et al. (2020) identified inconsistent management styles, incompatible organizational cultures, organizational policy differences, lack of mutual understanding among team members, and inconsistent project objectives among team members as the top significant barriers to CPJVs success. Ho et al. (2009) attributed the barriers in ICJVs to lack of management control, which, in turn, stems from poorly formulated governance structure and lack of proper organizational structure to create and share knowledge, as noted in Munns et al. (2000) and Lin and Ho (2013). Other studies have also mentioned fear of legal action (Shen et al., 2001; Hwang et al., 2017), opportunistic behaviour of parties (Sillars and Kangari, 2004; Han et al., 2019), difficulty in measuring ICJV performance (Gale and Luo, 2004; Ozorhon et al., 2007a; 2010a), etc.

To build a dataset of articles upon which to conduct the review, the Virtual Libraries (VLs) of the top 12 CM journals with average scores above 60% based on Chau's (1997) journals ranking list were used. The keywords used was *"barriers" OR "problems" OR "issues" OR "challenges" OR "difficulties" OR "obstacles" OR "risk" AND "joint venture" OR "international joint venture" OR "international construction joint venture",* with no year limitation. This returned 126 publications. Considering only peer-reviewed journals, 113 of the 126 papers were retained for further analysis. Note that journal papers are known to be a more reputable source and classified as "certified knowledge" in the academic discipline (Ramos- Rodríguez and Ruíz- Navarro, 2004). After this phase, unrelated papers still appeared,

because they met some of the search terms. To filter out unrelated papers, critical appraisement and evaluation of each journal paper was conducted. In doing so, journal papers that made mention of the term IJV and focused on other sectors different from construction or infrastructure were discarded. Journal papers that did not comprehensively study IJV but used it as a context to study some other phenomena were also excluded. These criteria were considered to improve the reliability of the synthesized findings by limiting the review to empirically supported results. For the comprehensive details of the journal selection process including the exclusion and inclusion criteria, interested readers are referred to Tetteh et al. (2020). In total, 43 articles were considered.

Following a thorough review of the 43 relevant publications, this research identified 37 potential barriers to ICJVs success. Table 4.2 presents the 37 potential barriers to ICJVs success. Similarly, to better comprehend the various barriers, and for clarity and simplicity, it is worthwhile to categorize them into constructs to set out the differences that exist among them. More so, to facilitate easy identification of the prevailing drivers and any possible or anticipated future discoveries, it deemed crucial to determine the relational constructs for the identified variables. The identified barriers are classified into six: inter-organizational differences, lack of expertise and confidence by ICJV contracting parties, lack of effective planning and suitable strategies, lack of experiential knowledge of ICJV's fundamentals, conflicts among ICJV entities, and ICJV management difficulties (Fig. 4.2). The classification of the barrier factors in the literature review followed a similar approach and reasons, as mentioned earlier (in Section 4.2). Also, the classification shares a similar ideological concept with Hong (2014).

Table 4. 2 Barrier impeding ICJVs success (see Tetteh et al., 2020)

Code	Barriers	References	Sum
B1	Loss of management control	[2,3,4,6,7,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,27,35,36,39,41]	25
B2	Complicated problems occasioned by organizational cultures	[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,39,41]	18
B3	Language barrier	[2,3,4,6,7,11,14,18,19,20,25,26,36,39,42]	15
B4	Conflicting interest/competing objectives	[1,2,3,4,6,7,11,14,18,19,20,25,26]	13
B5	Unfair gain/pain share among parties	[2,3,8,9,20,24,25,26,30,31,36,39]	12
B6	Differing policies and procedures among entities	[2,3,4,7,11,16,25,36,37,39,40,42]	12
B7	Unfair distribution and execution of authority	[2,3,7,8,9,12,23,25,30,36,42]	11
B8	Incompetence of project management team	[1,2,3,6,7,8,9,14,16,23,25]	11
B9	Difficulty in measuring ICJVs success	[2,3,4,5,10,13,30,33,34]	9
B10	Incomplete contract terms with partner	[1,2,3,6,7,14,19,26,31]	9
B11	Poorly formulated governance structure	[2,3,8,9,10,14,15,17,42]	9
B12	Problems associated with relationship management	[1,6,7,8,9,14,39,40]	8
B13	Lack of mutual commitment of partners	[2,3,11,19,25,36,39,40]	8
B14	Lack of understanding and knowledge at the onset	[11,12,17,18,19,36]	6
B15	Inconsistent project objectives among entities	[1,6,14,16,32,39]	6
B16	Poorly formulated decisions in assigning limited resources	[6,8,9,23,25,32]	6
B17	Unstable agreement for a limited time period	[11,12,14,20]	4
B18	Inappropriate partner selection	[7,12,19,40]	4
B19	Improper project feasibility studies	[1,6,7,14]	4
B20	Fear of legal actions	[7,16,28]	3
B21	Poor spirit of cooperation	[11,14,40]	3
B22	Improper project planning and budgeting	[1,7,14]	3
B23	Fear of exposure of strength and weakness	[8,16,29]	3
B24	Lack of strategic planning for ICJVs operations	[1,6,7]	3
B25	Lack of confidence about experience and knowledge from the local partner	[6,14]	2
B26	Poor problem-solving culture	[11,39]	2
B27	Human resource management problems	[13,39]	2
B28	Blaming habits	[11,12]	2
B29	Extensive external workload of entities to the ICJV	[2,3]	2
B30	Unstructured problems and issues management framework	[12,39]	1
B31	Lack of continuous improvement	[12]	1
B32	Social sense of superiority	[11]	1
B33	Lack of preparedness to accept company philosophy	[11]	1

B34	Reluctance in training local staff/No standardized training	[31]	1
B35	Low productivity of workers	[16]	1
B36	Friction created within ICJV's internal management and client organization and local people	[24]	1
B37	Outdated skills and technology	[16]	1

References: 1 = Hsenh et al. (2007); 2 = Ozorhon et al. (2008a); 3 = Ozorhon et al. (2010a); 4 = Ozorhon et al. (2007a); 5 = Ozorhon et al. (2008b); 6 = Zhang and Zou, (2007); 7 = Shen et al. (2001); 8 = Bing et al. (1999); 9 = Bing and Tiong (1999); 10 = Lin and Ho (2012); 11 = Swierczek (1994); 12 = Williams and Lilley (1993); 13 = Drouin et al. (2009); 14 = McIntosh and McCabe, (2003); 15 = Ho et al. (2009a); 16 = Hwang et al. (2017); 17 = Munns et al. (2000); 18 = Young (1992); 19 = Gale and Luo (2004); 20 = Carrillo (1996); 21 = Luo (2001); 22 = Neves and Bugalho (2008); 23 = Walker and Johannes (2003); 24 = Norwood and Mansfield (1999); 25 = Zhao et al. (2013); 26 = Sillars and Kangari (2004); 27 = Girmscheid and Brockmann (2009); 28 = Odediran and Windapo (2016); 29 = Ling and Gui (2009); 30 = Mohamed, (2003); 31 = Mansfield and Sasillo (1990); 32 = Chen and Messner (2009); 33 = Almohsen and Ruwanpura, (2016); 34 = Ozorhon et al. (2010b); 35 = Han et al. (2018); 36 = Kwok et al. (2000); 37 = Ho et al. (2009b); 39 = Lu et al. 2020; 40 = Alashwal and Ann (2019); 41 = Maqsoom et al. (2020); 42 = Hwang et al. (2016)

4.4.1 Inter-organizational Differences

To a large extent, inter-organizational differences have received a great deal of attention in the ICJVs' studies, and it is seen as a major barrier to the cause of failure in ICJVs (Munns et al. 2000; Ozorhon et al., 2008a; 2008b). The main barriers noted under this construct include complicated problems occasioned by organizational cultures, differing policies and procedures among entities, and a social sense of superiority. In Turkey, for example, Ozorhon et al. (2008a) found a strong relationship between organizational cultures and ICJVs success. Likewise, Sridharan (1995) identified that cultural impact on JV organization is implicit and manifests its presence through conflicts in a clash of cultures. The prime complexity added is the differences in the ideological concepts hold by parties involved, management style, their employees and requirement, etc., and if not addressed well, could lead to the ICJV failure (Hong, 2014). Thus, the wider the cultural gap, the more difficult it will be to create the necessary cohesion (Gale and Luo, 2004). Hung et al. (2002) demonstrated through an empirical survey and found that inter-organizational differences among parties to an ICJV is a key barrier impeding ICJVs success. Similarly, in the UK, Dalle and Potts (1999) reported that the differences in policies frequently result in a weak working relationship which causes major problems in ICJVs. Possible differences and contradictions in the organizational culture pose a serious obstacle to the effectiveness of the cooperation

4.4.2 Lack of Expertise and Confidence by ICJV Contracting Parties

Building competitiveness and maintaining an ICJV relationship are dependent on the capabilities of the parties involved. As such, studies have been devoted to the selection criteria for ICJV

partners (Williams and Lilley, 1993; Liang et al. 2018). An empirical study by Zhao et al. (2013) explicitly demonstrates that forming an ICJV with a company lacking managerial expertise and confidence greatly impacts ICJVs success. Gale and Luo (2004) argued that information relating to the management expertise of potential partners should be given the needed attention during the selection of an ICJV partner. The other critical barriers include fear of legal action, the poor spirit of cooperation, lack of confidence about experience and knowledge which is most evident in local or host partners (Das and Teng, 1998), fear of exposure strength and weakness, low productivity of workers, and the use of outdated skills and technology.

4.4.3 Lack of Effective Planning and Suitable Strategies

As effective strategies contribute or drive the ICJV towards achieving the set goals and objectives, improper planning would lead to failure (Do and Lee, 2015). This barrier construct is critical in almost every organization. The project-based nature of ICJVs means time limitation. Thus, ICJV parties require adequate planning and deliberations even at the pre-conception stage of the venture formation (Hung et al., 2002). The underlying barriers of this construct have been reported in many studies (Swierczek, 1994; Walker and Johannes, 2003) to impede ICJVs' success. For example, lack of project planning and budgeting was recorded by Shen et al. (2001) as one of the difficulties facing Sino-foreign CPJVs in China. Similarly, Do and Lee (2015) emphasized that the failure to carefully analyze the IJV project using systematic and scientific methods has caused completed and current ICJVs project failure.

4.4.4 Lack of Experiential Knowledge of ICJV's Fundamentals

ICJVs are always successful when the fundamentals of their administrative structures are right (Norwood and Mansfield, 1999; Ozorhon et al., 2008b). However, the lack of understanding and without knowing the ICJVs' administrative structures in various related areas such as communication, contract terms, coordination, etc. often hinders the recognition of the ICJVs success (Prasitsom and Likhitruangsilp, 2015). Sometimes, merely out of the intention of participating in a construction project, due to time limitation leads to the ICJV parties not fully evaluating and understanding how well an ICJV should be operated in a desirable manner which results in their failure (Hong, 2014). Some JVs may have been established on an ad-hoc or possibly incomplete basis, or even entirely orally which certainly encounter problems that lead to their failure (Abdul Rashid, 2015). For instance, in Tanzania, the IJV contract between Mwananchi Engineering and Contracting Company (MECCO) and a Dutch Overseas Construction Company (OCC) was unsuccessful and abandoned after two years due to the lack of knowledge by MECCO on ICJVs fundamental issues (Mansfield and Sasillo, 1990). In Singapore, Sridharan (1995) observed that the performance of most European-Singapore JVs was unsatisfactory due to the lack of understanding of objectives. These findings suggest that a dearth of basic knowledge of the essential terms of and key functions for the operation of ICJVs limits the effectiveness of the parties to fulfil the overall goal of the ICJV.

4.4.5 Conflicts among ICJV Entities

There is no conflict-free ICJV relationship as Gale and Luo (2004) and Ho et al. (2009) highlighted. The complex inter-organizational relationships – for example, the IJV partners'

opportunistic behavior, management style, organizational culture, and policy, often lead to conflicts during the operation of ICJVs which in turn results in the unsuccessful relationship (Hong, 2014; Han et al., 2019). According to Han et al. (2019), the goal incongruences among ICJV parties may originate from the disparity in the primary benefits expected by the parent firms. An example can be seen from the integration between the British and the French contractors, Transmanche-Link (TML), who was awarded a contract to design, construct, and commission a transport system by Eurotunnel – client/employer. During the operation, the inconsistent goals coupled with task interdependencies complicated and slowed the work (Young, 1992). As international joint venture agreement stipulates the overall goal of the partners, yet, in operation, partners deviate from the original agreement due to their opportunistic behaviours which lead to conflicts and consequently the venture failure. A more recent study by Liang et al. (2019) explicitly confirms that the presence of competition among ICJV parties outside of the agreement significantly impairs the chances for the survival of the ICJV. It is also important to note that, unfair distribution (e.g. pain and gain) and execution of authority contribute significantly to the failure of ICJVs. Without an equal allocation and sharing of authority, partners' commitment may be impaired due to friction in resource arrangement and allocation, and contributions.

4.4.6 ICJV Management Difficulties

Management issues in ICJV applications have been widely discussed in the literature, and many ICJVs have failed due to this complexity (Luo, 2001; Girmscheid and Brockmann, 2010). The management complexities stem from the complex structures involving at least two partner

organizations typically of diverse cultures, either as competitors or as collaborators (Ozorhon et al., 2008b). Many times, there is immense pressure for rapid decision-making given the project-specific of such ventures. Such a limitation in time usually leads to specific managerial difficulties (Hung et al., 2002). In Russia, for example, Panibratov (2016) reported that many IJVs failed to achieve their goals due to management issues. Munns et al. (2000) put forward that, the complexities related to management structures, tend to be a disadvantage that fails ICJVs. Also, inflexible organizational structures that fail to accommodate varying adjustments during the venture operation due to the environment often lead to the dissatisfaction of IJV parties (Hung et al., 2002).

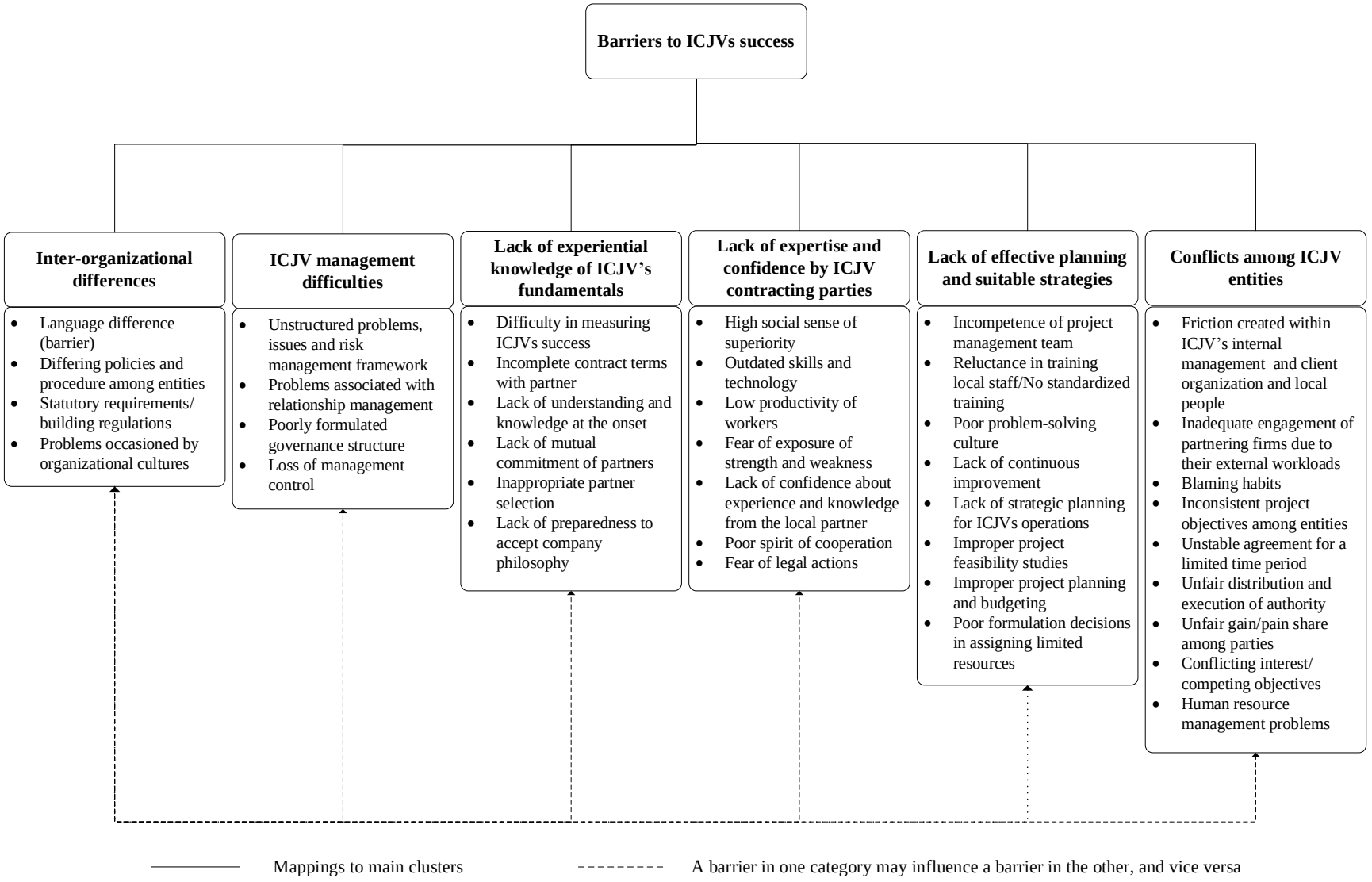

Fig. 4. 2 Conceptual framework for barriers to ICJV success (see Tetteh et al., 2020)

4.5 KNOWLEDGE GAPS

The above literature review identifies that multiple barrier factors hinder ICJVs success, yet empirical investigations of critical barriers are lacking. Further, given the different conditions that exist in different countries, it is necessary to understand the barriers to ICJVs success in specific countries. Therefore, a comprehensive investigation of critical barriers to ICJVs success in Ghana, combining the views of Ghanaians and their foreign partners is worthwhile. The findings of this study not only contribute to bridging the gap in knowledge concerning the barriers to ICJVs success in developing countries but also provide a valuable reference for practitioners and policymakers in developing suitable measures and policies to enhance the successful implementation of ICJVs.

4.6 CHAPTER SUMMARY

This chapter presented a comprehensive literature review on the driving forces behind ICJVs implementation and the barriers to their success. The chapter first presented and discussed comprehensively an aggregated checklist of drivers for ICJVs, which was categorized into five constructs, namely: legal and market-driven drivers, strategic vision drivers, organizational and personal goal drivers, relationship building and operational success drivers, and capacity building drivers. These drivers act as a blueprint for the parties to the venture and may determine the success and failure dynamics of the ICJVs operations. More so, the chapter provided the theoretical foundation on which the drivers appropriate for ICJV adoption in Ghana are explored. Similarly, through a comprehensive literature review on barriers impeding ICJVs success, 37 barriers were identified and categorized into six: inter-organizational differences, lack of

expertise and confidence by ICJV contracting parties, lack of effective planning and suitable strategies, lack of experiential knowledge of ICJV's fundamentals, conflicts among ICJV entities, and ICJV management difficulties. The provision of an exhaustive list of barriers creates a valuable reference and information base for researchers, practitioners, and policymakers to develop more reliable, comprehensive, and proactive management strategies for ICJVs operation. This study is positioned to alleviate the negligence of previous studies that combined the barrier and risk factors as a single list. The following chapter reviews the literature concerning the MC and performance measurement in ICJVs.

CHAPTER 5 LITERATURE REVIEW – MC AND PERFORMANCE MEASUREMENT IN ICJVs[5]

5.1 INTRODUCTION

MC is needed in ICJVs for successful management and performance. While IJV MC and performance concept has been widely explored, in the construction sector, the core understanding of the design and conceptualization of the two concepts is still lacking. A comprehensive understanding of the MC mechanisms is important for ICJV practitioners in making decisions about which ICJV activities to control, and the mechanisms to employ to efficiently and effectively manage ICJV operations. Likewise, knowledge of complete performance assessment parameters for ICJVs would enable practitioners to better assess and enhance the success of ICJVs. This chapter conducts a critical survey of prior studies addressing the conceptualization of MC in IJVs to define and establish practical measures for assessing MC in ICJVs. More so, this chapter presents a comprehensive review of the literature on ICJVs performance assessment by updating and aggregating the discrete ICJVs performance metrics and introducing a new dimension of performance assessment into ICJVs.

5.2 LITERATURE REVIEW ON MC IN IJV

[5] This Chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. *Engineering, Construction and Architectural Management*. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

Tetteh, M. O., Chan, A. P., and Nani, G. (2019). Combining process analysis method and four-pronged approach to integrate corporate sustainability metrics for assessing international construction joint ventures performance. *Journal of Cleaner Production*, *237*, 117781.

Having a broad knowledge of the emergence and configuration of the determinants of MC in IJVs from first principles is relevant for deeper insight. The transaction cost economics (TCE) and relational characteristics such as bargaining power, trust, parental differences, etc. have been used for explaining the emergence of MC in IJVs. Based on the TCE rationale of cost minimization, MC in inter-firm collaboration is heavily reliant on three transaction cost attributes (asset specificity, uncertainty, and frequency) (Williamson, 1985). Asset specificity (tangible or intangible) with high level of investments may lose their value if the involved contracting relationship is terminated (Kamminga and Van der Meer-Kooistra, 2007). Therefore, parent companies exercise MC to protect asset in an IJV (Chalos and O'Connor, 2004). In most cases, MC is needed to limit the opportunistic behaviour of contracting parties due to uncertainties that might be arising from both behavioural risk of the transacting parties and erratic environment produces (Han et al., 2019). The rate of occurrence of repetitive transaction is referred to as transaction frequency (Duan, 2007). It is through control that corporations build a strong corporate culture that produces long-term organizational commitment. Kamminga and Van der Meer-Kooistra (2007) mentioned that transaction frequency is an important feature when comparing governance structures, as it considers whether the frequency of transactions justifies investments in governance structures.

Besides the TCE logic, Van der Meer-Kooistra and Vosselman (2000) argue that the inherent characteristics of parties in any interfirm relationship determine or shape control. This study, therefore, discusses four relational characteristics including parental differences, information asymmetry, trust, and bargaining power. With regards to parental differences, as the omnipresent, conflicting goals or interest, between IJV parties, remains high, MC will be

required to minimize or completely eliminate the effect (Parkhe, 1991). Given that different yet complementary interests of enter IJV, MC shapes the goal or interest of all partner companies. According to Kamminga and Van der Meer-Kooistra (2007), the differences in parents interests is information asymmetry, which extends MC. For example, the differences in knowledge and expertise often require tight control by parents at the expense of the venture's flexibility. In an environment with a high level of uncertainty, the loss of flexibility may be a challenge, as swift changes are very much relevant (Merchant, 1998). In such a case, parents must give management autonomy and exercise lose control. Trust is also an important relational characteristic that has received significant attention in interfirm relationships (Fryxell et al., 2002; Boersma et al., 2003; Girmscheid and Brockmann, 2010). Trust is an effective mechanism used to manage uncertainty resulting in behavioral risks as well as minimize the coordination cost in IJVs (Madhok, 2006). Gulati and Singh (1998) highlighted that any interfirm relationship that is established on trust possesses the spirit of awareness to become aware of rules, routines, and procedures. Lastly, another way of exercising MC is through bargaining process (Lu and Hebert, 2005; Li et al., 2009). Yan and Gray (1994) categorized the bargaining power of a parent into two, namely context-based, and resource-based. The context-based argues that the relative bargaining power of a party depends on the mutual dependence of the parties, especially, the exclusiveness of the dependency; and the alternatives available, as well as partners stake in the venture (Yan and Luo, 2016). In an IJV relationship, the partner having more potential or alternative for entering a market has greater bargaining power. The resource-dependent concerns the contributions or control of critical resources by parties in the venture. The critical resources provided by a parent to a venture determine his ability to control and direct organizational action, and vice versa (Pfeffer and Salancik, 2003). These critical resources could be capital or

noncapital resource-based power. Whereas the capital resource-based power comprises financial or their equivalent in physical or proprietary properties, noncapital resource-based bargaining power includes critical tacit resources like political networks, technology, marketing channels, management expertise, etc.

More so, the application of MC in IJV could be explained by the institutional characteristics of the venture operation country (Knoke, 2001). Meyer and Scott (1992) highlighted that institutionalization ensues by the intensification of legal guidelines and practices in which individuals must comply to have the local support and authority. For example, in developing countries, may regulation constraints including local content policies, partner culture and strategy, and other contextual factors underlying the negotiation of partner's relative bargaining power influence the operational control structures. In developing countries, the most frequently observed phenomenon is that foreign firms are forced to accept a minority position (Lee et al., 2003). In developing countries, such as Ghana, for example, the Local Content and Local Participation, Regulation 2013 L.I 2204, allow the local firms maximum equity participation. Similar practices exist in Libya, where foreign firms can hold a maximum of 49% equity stake. This serves the local partners the dependence that enhances their power over the venture.

5.2.1 Background of MC patterns in IJVs

The theorization and development of MC in IJVs are challenging, due to the multidimensionality of control. In IJV studies, scholars have stressed on MC determinants (e.g., Tomlinson, 1970; Stopford and Haberich, 1976; Yan and Gray, 2001b; Chalos and O'Connor, 2004), and mechanisms (e.g., Ouchi and Maguire, 1975; Flamholtz et al., 1985; Geringer and Herbert,

1989). Geringer and Herbert (1989) conceptualized MC in IJVs as: mechanism of control, the focus of control, and extent of control. The *mechanism* represents the means of exercising control. This view explains how control is acquired which earlier research denotes as the determinant of control (e.g., ownership and voting rights), and other non-equity mechanisms which include cultural, behavioural, and outcome control (Groot and Merchant, 2000; Whitelock and Yang, 2007). In addition, previous studies have defined the mechanism of control to include socialization practices, IJV board of directors' role, staffing, etc. (Yan and Gray, 2001b; Chalos and O'Connor, 2004). More so, it has been referred to as either positive or negative mechanisms in many studies based on the purpose of control (Schaan, 1988; Kamminga and Meer-Kooistra, 2007). Geringer and Herbert (1989) further defined the mechanism of control as content-oriented mechanisms, context-oriented mechanism, and process-oriented mechanism. The content-oriented mechanism is direct and reliant on top managers or key members on board. The context-oriented mechanism relies on informal and cultural means to achieve strategic objectives of firms. And the process-oriented mechanism is more concerned with influencing IJV planning and decision-making process by supporting and reporting relationships. Later, these mechanisms were represented as formalization, socialization, and centralization, respectively (Huang et al., 2015). Ghauri et al. (2013) added that strategic institutional or systematic implanted strategies which are partially reliant on the individuals themselves (policy mechanisms – e.g., support in policy and planning process, training, and learning, etc.), can relate to the process or way the IJV is conducted aside from the personnel mechanism.

The scope or area of activities over which an IJV partner may exert control refers to the *focus* of control. The focus of control could be broad or more specific, i.e. narrow, focus (Ghauri et al.,

2013). It also could be viewed as strategic or operational (Kauser and Shaw, 2004). Whereas strategic control focuses on specific activities at the IJV management level, operational control focuses on the day-to-day activities, regulating across functional areas, making decisions at the operational level, etc. (Whitelock and Yang, 2007).

The *extent* of refers to the degree of control exerted over a specific control mechanism. That is for each specific or operational area individual partners may exercise control on a range from "none" to "total" or "loose" to "tight". Killing (1983) defined JVs grounded on the amount of control shared with an IJV partner. They include management shared by the parents, management dominated by a single parent, and management independent of both parents. Split control was added by Choi and Beamish (2004) to represent the control over distinct functional activities. Acknowledging the multidimensionality of MC, Geringer and Herbert (1989) concluded that studying IJV control as an integrative concept in which the three dimensions incorporated could provide a solid explanation to the performance implications of control. Fig. 5.1 shows the interrelationships between the three dimensions of control.

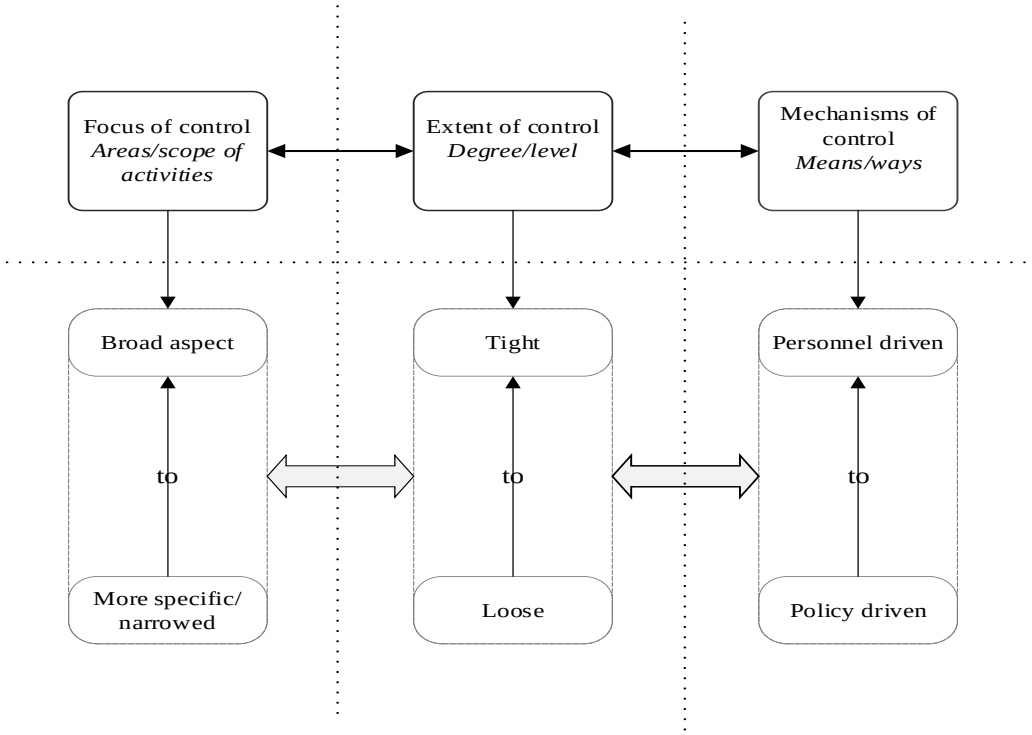

Fig. 5. 1 Dimensions of IJV control (adapted from Giacobbe and Booth, 2009)

5.2.2 Conceptualizing MC in ICJVs

According to Yan and Gray (2001), in the management of IJV, is crucial to understand how control is acquired, and exercised. Drawing on the control theories established in the management field to provide an explanation for IJVs in construction is not wrong. Besides, the very few earlier works on control in ICJVs were firmly established on these theories (e.g., Luo, 2001; Girmscheid and Brockmann, 2010; Ozorhon et al., 2010a; 2010b). More so, Murray and Evers (1989) mentioned that using an established theory from a different domain with a clear definition and position of its applicability in different context to explain a phenomenon important to the field is not wrong. On the other hand, it is worth nothing that IJV is a universal concept. That is, different industries including the manufacturing industries, research institutions, the agricultural industries, etc. can implement IJV. For IJV in construction, the only difference is

that it is project-based – "complete and dissolve" in nature. In the management domain, IJV concept has long existed and practiced. Thus, the literature in management domain is replete with theories and the youth of interdisciplinary fields such as construction or the infrastructure sector has benefited more from such disciplines.

The dimensions of control proposed by Geringer and Herbert (1989) offered a valuable interpretation of MC (i.e., mechanism, focus, and extent). The proposition by Ghuari et al. (2013), personnel and policy-driven mechanisms, based on the understanding of Geringer and Herbert (1989)'s study also provided a strong foundation for this study, in considering the physical, administrative, or legal means that a partner uses to provide direction. These studies also bring to light that the most common or likely response to a fall in performance expectations is an adjustment of the MC mechanisms (Fryxell et al., 2002). The mechanism is an important dimension of MC in IJV by deciding who is supposed to be in control of which function (scope/area of activities). Mostly, partners of IJV usually come into an agreement on the operational areas that they can control effectively (Giacobbe and Booth, 2009). Some critical areas in construction include procurement, general management, and operation, supervision, etc. Above all, the tightness, or loose extent of control within IJVs present to be subjective and overlooked in extant literature. To give a direct link to measurements that are precise and objective, the extent of control could be defined by the number of members to represent each partnering firm and how experienced they are in every specific operation. Realistically, the need for control is not symmetrical (Lee et al., 2003). The institutional norms and environment setting interact to create a unique set of managerial values and control (Luo et al., 2001). For example, in developing countries, apart from the government restrictions on ownership divisions, the local

content and local participation regulation ensure that the local workforce exceeds that of the foreign firms in IJV operations. This policy is largely evident in ICJVs and often becomes predictable, especially in developing countries, (Tetteh et al., 2021a).

5.2.2.1 Personnel MC mechanisms

Personnel MC mechanism relates to the placing of key members on board, or staff them in areas where they can exercise direct influence, both managerial and operational (Ghuari et al., 2013). Notably, direct, and persuasive positions are on the board of directors, and through organizational, operational, and strategic decisions, they facilitate the monitoring and coordination as well as provide directions, which defines the venture establishment. The knowledge and skill-sets ability (both technical and managerial) of the key members to take up this role play an important role in IJV, as rooted under control functions (Park, 2010). For example, in the construction domain, apart from the placing of top management personnel, key functional and operational areas that are contingent on the day-to-day routines and performance-based activities greatly impact the IJV's goal. Particularly, this is one key area that does not need or relate to the majority position in the venture, but base on a clear area of focus to be managed and influenced by the partners (e.g., daily supervision of construction work, and workers on-site).

5.2.2.2 Policy-driven MC mechanisms

Policy-driven mechanism also relates to the systematic implanted strategies that are less reliant on the individuals themselves, but rather based on training and supportive roles in the venture

(Ghauri et al., 2013). Thus, there is a natural split between the personnel selected to occupy top positions of the IJV and the manner or process in which the venture is operated. Policy-driven mechanism is defined by and support in the policy and planning process. In ICJV, training and learning opportunities could be seen in areas like the provision of technological knowledge, market knowledge, cultural knowledge, etc. Likewise, the support in the policy and planning process could be seen in areas like providing support in making human right policies during project planning, monitoring, etc., support in making development plans, reporting project performance, reporting on construction progress and schedules, etc. These can also be captured under Geringer and Herbert's (1989) process-oriented and context-oriented mechanisms.

Table 5.1 presents 17 potential mechanisms by which MC can be exercised, based on the above conceptualization of MC in ICJVs. These mechanisms were adapted and modified from previous studies (e.g., Groot and Merchant, 2000; Luo, 2001; Ho et al., 2009; Ghauri et al., 2013; Lin and Ho, 2013).

Table 5. 1 List of MC mechanisms in ICJVs (see Tetteh et al., 2021a)

Management control	Code	Mechanisms
Personnel driven		
Top management staffing	MCM_TMS1	Staffing of corporate board members
	MCM_TMS2	Staffing of senior executive positions (e.g., Project managers)
Key functional and operational areas	MCM_KFOA1	Key functional areas placement (e.g. Engineers, supervisors, etc.)
	MCM_KFOA2	Operational areas deployment (e.g. labourers)
Policy driven		
Support in policy and planning process	MCM_SPPP1	Human rights policies
	MCM_SPPP2	Making development plans
	MCM_SPPP3	Evaluating project feasibility considering environmental impacts
	MCM_SPPP4	Establishing codes of ethics for projects
	MCM_SPPP5	Health and safety issues
	MCM_SPPP6	Monitoring and reporting
	MCM_SPPP7	Laying down procedures and routines for the ICJV
	MCM_SPPP8	Support in supervisory role
	MCM_SPPP9	Financial and resource allocation planning
Training and learning opportunities	MCM_TLO1	Provision of technological knowledge
	MCM_TLO2	Provision of market knowledge

MCM_TLO3	Provision of cultural knowledge
MCM_TLO4	Provision of knowledge on governmental issues

5.3 KNOWLEDGE GAPS

After the extensive reviews of pertinent literature, it was revealed that limited studies exist that have comprehensively defined practical measures for studying MC, particularly in ICJVs. In addition, studies concerning MC in ICJVs especially from the developing countries context are limited. Notwithstanding that the established MC mechanisms are yet to be tested and explained. This study aims at testing the validity of the MC mechanisms in ICJVs in Ghana through a comprehensive empirical questionnaire survey.

5.4 LITERATURE REVIEW ON ICJVs PERFORMANCE ASSESSMENT

Assessing the performance of ICJVs has been an important research interest for decades. Yet, no unanimity on an apt definition and benchmark of performance measures for ICJVs has emerged. Thus, the core concept of ICJVs performance is still not well understood. While practitioners are challenged with the perspective from which ICJV performance should be measured (i.e. either from the partner perspective, project-based perspective, ICJV itself, or the overall satisfaction), researchers find it difficult to determine indicators for assessing performance. This could be the unevenness and incompatibility of performance determinants in ICJV literature. Both practitioners and researchers often use different and non-equivalent indicators that they subjectively believe are most important. Hence, virtually no unified assessment criteria exist.

Previous studies have used objective and/or subjective measures to assess ICJVs performance (Luo, 2001; Mohamed, 2003; Almohsen and Ruwanpura, 2016). For example, managers'

perceptions of the efficiency and effectiveness of ICJV operations are normally reflected by using subjective measures such as stability, overall satisfaction, reputation, etc. Objective measures focus on hard/independent data, which can be obtained from third parties such as profitability, cost position, duration, etc. (Geringer and Herbert, 1991). Moving forward, for example, Ozorhon et al. (2007a) conceptualized ICJV performance measurement into a three-dimensional construct which includes project performance, partner performance, and the IJV organization itself. In addition, "overall satisfaction" was included to reflect a multi-dimension of ICJV performance (Ozorhon et al., 2010a; 2010b). Largely, these measures to some extent reflect the operational success of ICJVs, however, a complete assessment is lacking due to the neglect of corporate sustainability (CS) indicators (Tetteh and Chan, 2019).

To develop a complete performance measurement framework for ICJVs, 86 relevant peer-reviewed journal papers were reviewed. Following a very careful review of the literature, this study identified a consolidated list of 36 ICJV performance, which included CS indicators (see Table 5.2). Ozorhon et al. (2010a; 2010b) conceptualized ICJVs performance into four key dimensions defined by project-based performance, company/partner-based performance, performance of ICJV management, and overall/perceived satisfaction with 17 underlying measures. Through a careful examination of the existing literature, the author realized that Ozorhon et al. (2010a; 2010b) classification framework could be adopted, with the introduction of additional performance indicators. Hence, the 36 indicators were categorized into five major constructs; project-based performance, company/partner-based performance, perceived satisfaction with the ICJV, performance of the ICJV management, and socio-environmental performance. To do so, the study ensured that there is a balance of the integration of existing and

new indicators for consistency. First, the indicators were carefully studied to distil possible overlaps and merge related factors, following previous review studies (see for instance, Chan and Owusu, 2017; Darko et al., 2017). Second, to minimize or eliminate any variations in views or subjectivity of the classifications, this study followed four robust codified logic: (1) authors were presented with the list of indicators to determine their nature, and the relationship and commonalities that exist among them; (2) results were compared to assess its consistency; (3) it was further compared with previous studies that classified some of the factors (see Ozorhon et al., 2007a; 2010b), as mentioned earlier; and (4) a focus group discussion was launched to finalize on the classification. Fig. 5.2 shows the conceptual framework of the ICJV performance assessment.

Table 5. 2 Performance indicators for ICJVs (see Tetteh et al., 2019)

Code	Indicators	References
P1	Profitability	[1,2,3,4,6,7,9,10,11,12,13,14,15,16,21,22,23,24,27,30,31,32,35,36,38,39,42,44,45,47,48,49]
P2	Overall satisfaction	[3,5,7,8,11,12,13,17,18,20,21,22,23,24,27,29,30,34,35,36,37,39,40,42,45,47]
P3	Avoidance of material wastage	[50,51,52,53,54,55,59,60,64,67,68,69,70,71,74,75,81,83,86]
P4	Client satisfaction	[3,8,12,13,14,15,26,27,29,30,32,33,34,35,36,40]
P5	Stability of the ICJV	[2,3,8,11,13,14,23,27,28,31,39,40,41,44,46,48]
P6	Technology acquisition	[3,6,7,8,10,13,15,18,20,25,31,32,35,36,40]
P7	Market share	[3,5,7,8,10,13,15,16,18,27,31,39,40,44]
P8	Stakeholder engagement	[50,56,58,59,60,61,65,67,72,73,75,76,77]
P9	Environmental performance	[50,52,55,56,59,61,62,65,67,68,69,72,73,75]
P10	Labour practice/relation	[50,54,55,59,64,66,67,68,69,75,78]
P11	Achieving the required project quality	[3,6,8,16,27,32,33,34,35,36,40]
P12	Ethics in management	[59,62,63,65,68,71,79,80,84,86]
P13	Pollution reduction	[50,55,56,59,60,67,71,75,76,77,82]
P14	Completing the project within budgeted cost	[6,8,24,27,32,33,34,35,36,40]
P15	Creating long-term relationships	[2,17,21,31,32,35,36,44,45]
P16	Acquisition of managerial skills	[1,6,7,8,25,27,32,35,36,40]
P17	Reputation	[2,3,5,8,13,15,16,27,40,44]
P18	Corporate governance	[50,55,61,67,69,78,79,85,86]
P19	Sustainable job creation	[50,54,59,63,64,67,76,81,85]
P20	Environmental compliance	[54,62,65,66,67,76,77,82]
P21	Dispute resolution	[8,27,40,41,44,46,48,49]
P22	Effectiveness of the strategic control of the ICJV	[3,13,15,16,32,33,35,36]
P23	Effectiveness of the operational control of the ICJV	[3,13,15,16,32,33,35,36]
P24	Effectiveness of the organizational control of the ICJV	[3,13,15,16,32,33,35,36]
P25	Completing the project within schedule	[6,27,32,33,34,35,36]
P26	Facilitating internationalization from your partner	[3,14,27,32,35,36,44]
P27	Enhancing competitiveness	[8,27,32,35,36,40,49]
P28	Risk and issue management	[50,59,63,66,67,84]
P29	Philanthropy	[51,59,64,68,77,85]
P30	Social reporting	[60,67,69,70,80]
P31	Environmental reporting	[59,66,70,76,77]
P32	Communication, learning, and development	[8,17,19,25,27,40]
P33	Sharing of risks equitably	[32,35,36]
P34	Resource sharing	[32,35,36]
P35	Cost reduction	[3,32,35,36]
P36	Good safety performance	[6,43]

References: 1 = Nielsen (2007); 2 = Chowdhury (1992); 3 = Glaister and Buckley (1999); 4 = Acquaah (2009); 5 = Avny and Anderson (2008); 6 = Bekale and Agumba (2018); 7 = Boateng and Glaister (2002); 8 = Büchel and Thuy (2001); 9 = Calantone and Zhao (2001); 10 = Child and Yan (2003); 11 = Christoffersen et al. (2014); 12 = Farrell et al.

(2008); 13 = Geringer and Hebert (1991); 14 = Glaister and Buckley (1998); 15 = Gong et al. (2005); 16 = Gong et al. (2007); 17 = Huang and Chiu (2014); 18 = Idris and Seng (2011); 19 = Jalalkamali et al. (2018); 20 = Kim et al. (2011); 21 = Klijn et al. (2013); 22 = Kwon (2008); 23 = Larimo and Nguyen (2015); 24 = Larimo et al. (2016); 25 = Lee et al. (2011); 26 = Lin and Ho (2013); 27 = Lu (2008); 28 = Lunnan and Haugland (2008); 29 = Luo (2001); 30 = Mohamed (2003); 31 = Mohr (2006); 32 = Ozorhon et al. (2007a); 33 = Ozorhon et al. (2008a); 34 = Ozorhon et al. (2008b); 35 = Ozorhon et al. (2010a); 36 = Ozorhon et al. (2010b); 37 = Ozorhon et al. (2007a); 38 = Pan and Chi (1999); 39 = Pangarkar and Klein (2004); 40 = Ren et al. (2009); 41 = Reus and Rottig (2009); 42 = Selekler-Gökşen and Uysal-Tezölmez (2007); 43 = Shah (2015); 44 = Almohsen and Ruwanpura (2016); 45 = Tatoglu and Glaister (1998); 46 = Whitelock and Yang (2007); 47 = Yan and Duan (2003); 48 = Zeira et al. (2004); 49 = Zhan and Luo (2008); 50 = Labuschagne et al. (2005); 51 = Hubbard (2009); 52 = Epstein and Roy (2007); 53 = Dutta et al. (2013); 54 = Christofi et al. (2012); 55 = Bansal (2005); 56 = George et al. (2016); 57 = Searcy (2012); 58 = Silva et al. (2019); 59 = Antolín-López et al. (2016); 60 = Ugwu and Haupt (2007); 61 = Morioka and de Carvalho (2016); 62 = Linnenluecke and Griffiths (2010); 63 = Montiel and Delgado-Ceballos (2014); 64 = Jiang et al. (2018); 65 = Engert et al (2016); 66 = Rahdari and Rostamy (2015); 67 = Keeble et al. (2003); 68 = Harik et al. (2015); 69 = Chang et al. (2013); 70 = Lozano (2012); 71 = Witjes et al. (2017); 72 = Atkinson (2000); 73 = Ramos and Caeiro (2010); 74 = Ahi and Searcy (2015); 75 = Tahir and Darton (2010); 76 = Dočekalová and Kocmanova (2016); 77 = Staben et al.(2010); 78 = Schaltegger and Wagner (2006); 79 = Morioka and Carvalho (2016); 80 = Formentini and Taticchi (2016); 81 = Lodhia and Martin (2014); 82 = Lourenço and Branco (2013); 84 = Schrippe and Ribeiro (2018); 85 = Aras et al. (2018); 86 = Engida et al. (2018)

5.4.1 Project-Based Performance

Project-based performance refers to a measure of the extent to which project objectives are met (Ozorhon et al., 2010a). Because ICJVs are typically project-based, their operational success could be measured based on project achievements (Ozorhon et al., 2007b). The organizational success of ICJVs, however, was measured using organizational returns in the form of company growth and the returns from the joint ventures (Sillars and Karagari, 2004). Traditionally, the success of construction projects is typically measured based upon cost, schedule, and quality performance. There have been several calls to extend this traditional iron triangle measures to encompass a wide range of measures (McLeod et al., 2012). Consequently, building upon the study of Ozorhon et al. (2010b), profitability, management ethics, risk management and safety performance are included in measuring the ICJVs project-based performance in this study.

5.4.2 Company/Partner-Based Performance

In ICJV relationships, the goal incongruence among partnering firms indicates that the performance assessment of an ICJV is directly linked to the partnering firms (Han et al., 2019). Another way of measuring the ICJVs performance is to measure the performance of the partnering firms (Han et al., 2019). It is established that partnering firms engage in IJVs with the goal to enhance their performance (Mohr, 2006). Partner performance measurement measures the extent to which organizational objectives are met and has been found to be the most important construct that explains the multidimensionality of ICJVs performance (Ozorhon et al., 2010b). This construct could be measured using such key indicators as the acquisition of technology, acquisition of managerial skills, reduction of costs, market share, facilitation of

internationalization, communication, reputation, sharing resources, sharing risks, corporate governance, learning and development, creating long-term relationships and enhancing competitiveness (Tetteh et al., 2019).

5.4.3 Perceived Satisfaction with the ICJV

A most widely used measure of an ICJV performance is the satisfaction of a partner with the ICJV's overall performance (Choi and Beamish, 2004). This measure allows the ICJV partner to provide information on the extent to which the ICJV has accomplished its overall expansion, survival, financial and other objectives (Ozorhon et al., 2007b). Many studies have viewed it as an omnibus measure of ICJVs performance (Larimo et al., 2016; Boateng and Glaister, 2002). The use of perceived satisfaction as a measure of ICJVs performance has, however, been criticized for its subjectivity (Ren et al., 2009). Different people may perceive satisfaction differently. To overcome this problem, "overall satisfaction" is suggested to incorporate a broad view of the success of the collaboration beyond all objective and financial criteria (Ozorhon et al., 2010b). In addition to overall satisfaction as a measure of perceived satisfaction, stability in an ICJV represents the perceived structural changes in its operation (Almohsen and Ruwanpura, 2016). Overall satisfaction and stability were used as measures for perceived satisfaction in this study.

5.4.4 Performance of the ICJV Management

Measuring the effectiveness of control over the ICJV operations is the focus of this construct, which measures the ICJV success at the centralized level (Ozorhon et al., 2010b) while project

and partner performance do so at the project and partner company levels, respectively. Control refers to the influence the ICJV partners have on the management of the ICJV operations. According to Geringer and Herbert (1989), management control in ICJV can be defined as the power of participating in managerial duties which rely on management skills and technical superiority. The scope of ICJV management control has been defined from structural, operational, and strategic dimensions (Yan and Gray, 2001). In Ozorhon et al. (2010a)'s study, this construct was measured by the level of effectiveness of management control in terms of strategic control at the board-of-directors level, operational control at general management level and organizational control executed by the partners when forming the operating routines, processes and organizational structure of the venture.

5.4.5 Socio-environmental Performance

As a sustainability-oriented construct, this construct measures the extent to which the ICJV partner organizations have achieved social and environmental objectives (Tetteh et al., 2019). The social aspect focuses on sustainable job creation, health and safety performance, stakeholder engagement, capacity development, labour practice, community cohesion, etc. The environmental aspect is mainly concerned with environmental sustainability performance such as pollution prevention and control, and environmental reporting, protection, and compliance. Today, there is great pressure (from initiatives such as the United Nations Sustainable Development Goals (SDGs)) on ICJVs to ensure not only economic sustainability but also social and environmental sustainability. However, attempts to measure the sustainability performance of ICJVs are scarce. Socio-environmental performance was used in this study as one of the constructs to measure the ICJV performance.

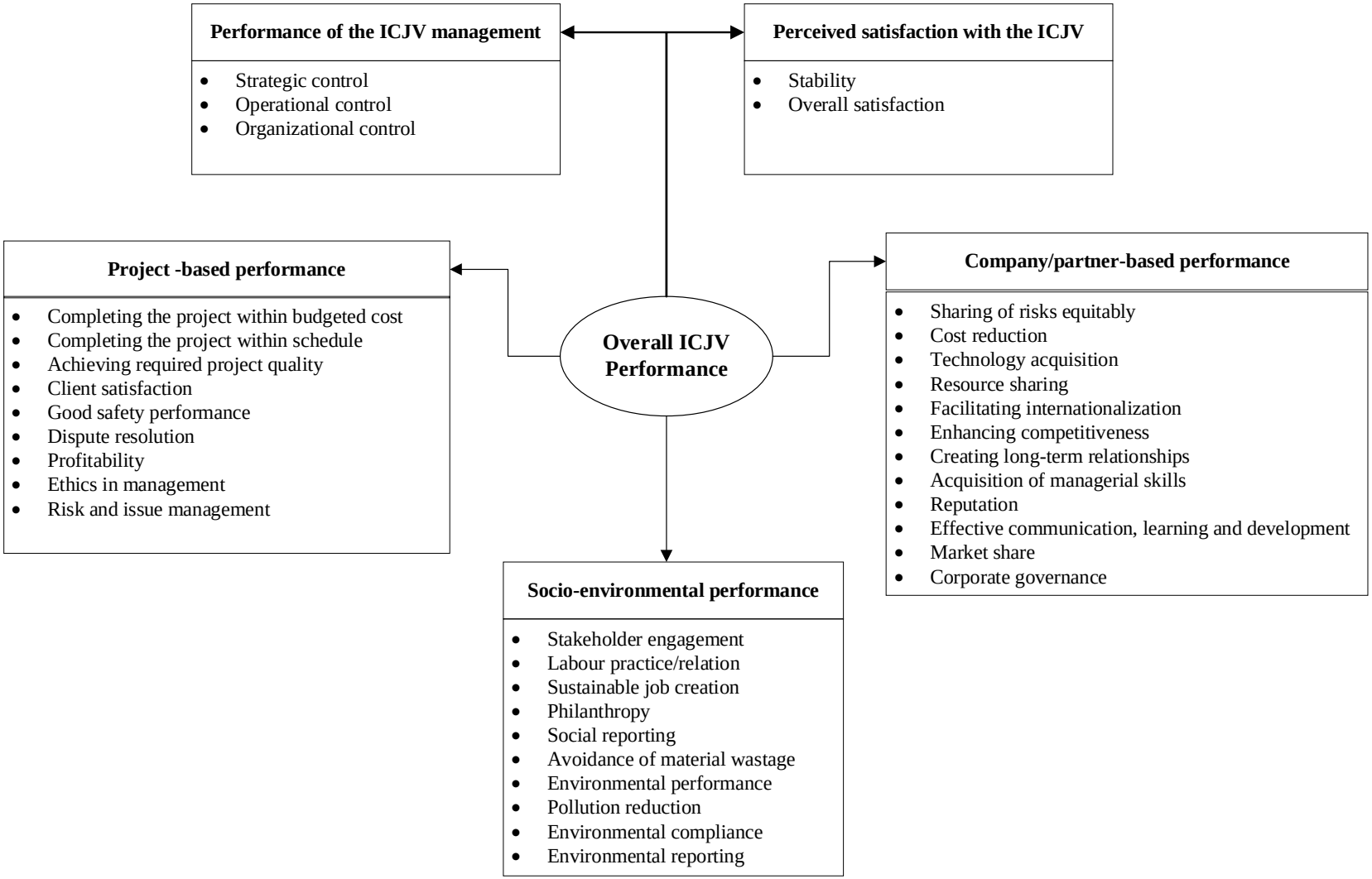

Fig. 5. 2 Conceptual framework of ICJV performance measures (see Tetteh et al., 2019)

5.5 KNOWLEDGE GAPS

Whereas the literature reviewed proves the completeness of ICJVs performance dimensions, the validity of the underlying measures has yet to be thoroughly investigated. An exception is Ozorhon et al. (2010a), yet it did not consider the views of the foreign partners and lacks the socio-environmental focus of ICJVs performance. Mohr (2006) argued that IJV performance is not only multidimensional but also has to be seen from all partners' perspectives. Performance measures in harmony with the strategic objectives of all partners would facilitate better cooperation capabilities in optimizing solutions and enhancing ICJVs performance. More so, there is a lack of research on the prioritization of the measures for assessing the performance of ICJVs by focal firms. A critical survey of the literature advocates that an adequate combination of the indicators should allow addressing the multidimensionality of ICJVs performance (Tetteh and Chan, 2019). In addition, a general observation of related studies worldwide shows a limited number of studies from the developing countries' perspective. Therefore, using a developing country such as Ghana as a reference point to test these indicators is promising.

5.6 CHAPTER SUMMARY

This chapter comprehensively reviewed prior studies addressing the conceptualization of MC in IJVs and proposed a framework for studying MC in ICJVs. As a result, 17 factors reflecting MC mechanisms in ICJVs were identified for the empirical questionnaire survey. More so, through a comprehensive literature review, this chapter has identified 36 ICJVs performance indicators and categorized them into five: project-based performance, company/partner-based performance, perceived satisfaction with the ICJV, performance of the ICJV management, and socio-

environmental performance. This chapter also pointed out the gaps warranting the need for the current study. The following chapter presents the results from the questionnaire survey about the drivers for implementing ICJVs in Ghana.

CHAPTER 6 DATA ANALYSIS AND RESULTS – DRIVERS FOR IMPLEMENTING ICJVs IN GHANA[6]

6.1 INTRODUCTION

The previous chapters provided the research background, explicated the research methodology, and comprehensively reviewed pertinent literature. This chapter reports on the partial findings from the questionnaire survey conducted in Ghana. Specifically, it reports on the driving forces behind ICJVs implementation in Ghana. Intending to develop an effective management framework for the successful management of ICJVs in Ghana, this chapter's objectives are to identify the common/mutual and separate drivers for implementing ICJVs in Ghana and uncover the structure of the drivers to aid the final model development. To achieve the objectives, a two-round Delphi survey and a general survey were conducted. These two survey techniques have been thoroughly discussed in Chapter 2. The two-round Delphi survey was achieved by an expert panel constituted of 14 ICJV practitioners in total with equal representation from the two groups (local and foreign partners) in ICJVs hosted in Ghana. As these respondents formed part of the 84-sample size used in this study, the general questionnaire survey was conducted with the remaining respondents. The overall profiles of the respondents are shown in Table 2.8. However, Section 2.2.1.2 provides a brief demographics of the 14-panel members for the Delphi survey. Whereas the Delphi survey was used to achieve consensus among the respondents on the drivers,

[6] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Darko, A., Yevu, S. K., Nwaogu, J. M., and Boateng, E. B. (under review). Key drivers for implementing international construction joint ventures (ICJVs): Global insights for sustainable growth. *Engineering, Construction and Architectural Management*.

Tetteh, M. O., and Chan, A. P. (under review). Modeling the performance implications of critical barriers to international construction joint ventures success: Implications for sustainability. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-10816.

Chan, A. P., Tetteh, M. O., and Nani, G. (2020). Drivers for international construction joint ventures adoption: a systematic literature review. *International Journal of Construction Management*, 1-13.

the general survey was used to validate the established consensus for further analysis. Although 47 drivers were identified via a comprehensive literature review, 31 potential drivers were used for both surveys after modification to the questionnaire through piloting (see Chapter 2, Section 2.2.1.2). In both surveys, the respondents were asked to rate their degree of agreement on each driver for implementing ICJVs using a seven-point rating scale (1 = strongly disagree, 2 = disagree, 3 = disagree somewhat, 4 = neither agree nor disagree, 5 = agree somewhat, 6 = agree, and 7 = strongly agree). The data collected were subjected to various statistical analyses using SPSS 26.0 statistical package and agreement analysis. The findings from these two surveys are therefore discussed in this chapter. The findings from this chapter contribute to the ICJV body of knowledge by investigating the symmetrically coupled and separate drivers that partnering firms hold for in ICJVs within the developing country of Ghana. Practically, the findings will provide directions and administrative buttress in implementing ICJVs. Thus, knowledge of the key drivers aids successful implementation strategies – choice of measures that improves organizational performance, and greatly drive competitive advantage.

6.2 STATISTICAL ANALYSES

Prior to the data analyses, Cronbach's alpha test and Shapiro-Wilk test were used to test the data reliability and normality, respectively. The Cronbach's alpha values for the respective groups in the two-rounds Delphi survey and the general survey were all above the recommended threshold of 0.70, indicating that the seven-point rating scale and hence the data gathered are reliable and excellent for further analyses. The Shapiro-Wilk test aided the usage of nonparametric tests like the Mann-Whitney *U* test and Kendall's coefficient of concordance test due to the nonnormal distribution of the data. That is the *p*-values obtained for both rounds of the Delphi survey and

general survey were below the recommended threshold of 0.05. Further, mean analysis, IRA analysis, and FA were used to analyze the data, after the initial examination. Section 2.2.2 describes in detail and justifies the methods used. It is worth noting that the initial categorization of the drivers was based on the preliminary analysis (by literature review), and thus necessitate empirical groupings and justification. Besides, these drivers were identified from multiple studies undertaken in different countries/jurisdictions around the world and grouped without the statistical knowledge of their underlying effects. Moreover, the present study determined the interests of two groups at the dyad level, to identify the natural separation of the drivers, and thus there was a need to further explore the interrelationships between the drivers. The mean analysis was used to determine the relative ranking of the 31 drivers by the two different groups. Note that drivers with low SD were ranked higher in that order, wherein drivers have equal means (see Section 2.2.2.5 for explanation and justification). Kendall's coefficient of concordance test was used to measure the level and consistency of agreement between the two respondents groups' rankings of the drivers. In particular, it was used in the two rounds Delphi survey. The Mann-Whitney *U* test was used to determine any divergence of ranking of the drivers by the respondents. The IRA analysis was used to determine the absolute consensus in scores furnished by the two groups across the two rounds of the Delphi survey. Here, the significance and agreement validation of each factor was used to establish consensus between local and foreign partners on the common/mutual and separate driver for forming ICJVs. Explicitly, drivers that appeared significant and showed a strong agreement level in both groups were considered common/mutual; the reverse is rather true. Finally, FA was used to identify the clusters underlying the drivers.

6.3 ANALYSIS RESULTS AND DISCUSSION

6.3.1 Respondents Agreement within the Expert Panel Groups for Delphi Survey

Tables 6.1 and 6.2 display the first and second-round results of the Delphi survey, respectively. The results show that the level of agreement increased significantly in the second round of the Delphi survey for the two groups. The Kendall's W^a value for all respondent groups increased from 0.184 to 0.444, comparable results were obtained for the local partners' group (0.342-0.568) and foreign partners' group (0.535-0.713). In addition, the chi-square test value increased from 82.629 to 103.589 in the first and second round, respectively; higher than its critical value of 50.234 ($p = 0.05$) and 57.478 ($p = 0.01$) given a degree of freedom (df) of 30. The overall results confirm the achievement of a strong consensus among the two groups at a significance level of 0.000. In a Delphi survey, one of the key objectives is to achieve consensus among the expert panel at the rounds of the survey. More so, a consensus was derived for the top ten (10) drivers in the second round of the Delphi survey among the two groups of partner firms. The local partners' ranking featured 8 out of the top 10 drivers, while the foreign partners' ranking has 7 out of 10 (see Tables 6.1 and 6.2). Aside from that the overall ranking contained 9 out of the 10 drivers and two drivers, "D1 – Risk/resource sharing" and "D17 – Improve company's image", appeared first and second, respectively in the two rounds Delphi survey. Finally, two of the drivers, "D2 – Acquisition of advance technology and managerial skills" and "D10 – Enter new construction market", showed a significant constant variation in rank order between the two groups of respondents. While the local partners ranked D2 and D10 as first (1) and last (31) respectively in both rounds of the Delphi survey, foreign partners ranked them as 31 and 7 in the first round, and 31and 2 in the second round. This particular finding is consistent with the

argument that host/local partners enter ICJVs to learn and acquire knowledge and technology, whereas foreign/international partners use ICJVs as an entry strategy (McIntosh and McCabe, 2003; Chen and Messner, 2009; Girmscheid and Brockmann, 2010).

Table 6. 1 First round of Delphi survey on the drivers for implementing ICJVs

		All respondents			Local partner			Foreign partner		
Code	Drivers	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
D1	Risk/resource sharing	6.17	0.286	1	6.10	0.318	3	6.23	0.254	1
D2	Acquisition of advance technology and managerial skills	4.82	0.896	24	6.41	0.202	1	3.22	1.590	31
D3	Improve quality level of construction projects	5.56	0.808	7	5.43	0.806	15	5.68	0.809	5
D4	Prevention of wholly own foreign companies	4.96	0.967	21	5.71*	0.721	9	4.21	1.213	25
D5	Gain economies of scale	5.75	0.517	4	5.73	0.333	7	5.77	0.700	3
D6	Promote economic growth	5.41	0.920	11	5.92	0.717	6	4.89	1.123	21
D7	Demand for value for money	4.71*	0.784	26	5.18	0.623	23	4.23	0.945	24
D8	Better execution of projects	5.47	0.597	9	5.57*	0.438	13	5.37	0.755	8
D9	Overcome cultural and political barriers	5.03	0.854	20	4.71	1.205	29	5.35	0.502	10
D10	Enter new construction market	4.56	0.937	29	3.59	1.417	31	5.52	0.456	7
D11	Pre-qualification condition	5.77	0.452	3	5.71*	0.213	8	5.83	0.691	2
D12	Increase market share	5.62	0.602	5	6.02	0.201	4	5.21	1.003	15
D13	Increase productivity	4.75	0.746	25	5.08	0.673	25	4.41	0.818	23
D14	Diversification	5.34	0.747	13	5.33	0.588	19	5.34	0.905	11
D15	Opportunity to work on large and complex projects	5.46	0.750	10	5.98	0.511	5	4.94	0.989	20
D16	Ensure stability	5.30	0.601	14	5.24	0.775	20	5.36	0.427	9
D17	Improve company's image	5.99	0.590	2	6.22	0.610	2	5.75	0.570	4
D18	Secure financing	4.82	0.694	23	5.59	0.433	11	4.05	0.955	27
D19	Growth in construction globalization	5.50	0.577	8	5.67	0.325	10	5.32	0.829	13
D20	Competing interest of national development	3.96	1.232	31	4.45	1.270	30	3.46	1.194	30
D21	Improve competitive position	5.29	0.686	15	5.39	0.641	18	5.18	0.731	16
D22	Improve track records	5.40	0.596	12	5.51	0.544	14	5.28	0.648	14
D23	Overcome the lack of local knowledge of international firms	4.59	0.889	28	5.00	0.625	27	4.17	1.152	26
D24	Build reputation	5.11	0.710	18	5.22	0.457	21	4.99	0.963	19
D25	Increase credibility	5.19	0.750	17	5.20	0.775	22	5.17	0.725	17
D26	Promote industrial integration	5.07	0.911	19	5.12	0.706	24	5.01	1.116	18
D27	Increase efficiency	4.71*	0.886	27	5.41*	0.536	17	4.00	1.235	28
D28	Acquire new construction project	5.59	0.481	6	5.57*	0.431	12	5.61	0.531	6
D29	Overcome environmental deficiencies	5.20	0.835	16	5.06	0.829	26	5.33	0.841	12
D30	Improve existing imperfect mechanism of the construction industry	4.46	0.860	30	5.41*	0.500	16	3.50	1.219	29
D31	Stimulate export-orienting contracting	4.90	0.703	22	4.98	0.843	28	4.82	0.562	22
Respondents no.		14			7			7		
Cronbach's alpha		0.802			0.783			0.816		

Kendall's W[a]	0.184	0.342	0.535
Chi-Square (X^2)	82.629	82.082	112.281
X^2-critical value: (a: $p = 0.05$; b: $p = 0.01$)	50.234[a] (57.478[b])	50.234[a] (57.478[b])	50.234[a] (57.478[b])
df	30	30	30
P-Value	0.000[c]	0.000[c]	0.000[c]

Note: SD = Standard Deviation; Kendall's W[a] = Kendall's coefficient of concordance; df = degree of freedom
*Equal mean, wherein factors with low SD are ranked higher in that order
[c]Significant *p*-value

Table 6. 2 Second round of Delphi survey on the drivers for implementing ICJVs

		All respondents			Local partner			Foreign partner		
Code	Drivers	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
D1	Risk/resource sharing	6.28	0.261	1	6.12	0.310	3	6.43	0.212	1
D2	Acquisition of advance technology and managerial skills	4.47	0.656	29	6.38	0.191	1	2.56	1.120	31
D3	Improve quality level of construction projects	5.42	0.492	9	5.50	0.601	14	4.59	0.383	8
D4	Prevention of wholly own foreign companies	4.66*	1.156	26	5.06	1.101	25	4.25	1.211	24
D5	Gain economies of scale	5.51	0.622	5	5.73	0.333	8	5.28*	0.911	11
D6	Promote economic growth	4.97	0.803	18	5.18	0.711	23	4.46	0.894	19
D7	Demand for value for money	4.73	0.850	24	5.22	0.689	20	4.23	1.010	25
D8	Better execution of projects	5.55	0.418	4	5.59	0.422	12	5.50	0.413	4
D9	Overcome cultural and political barriers	4.86	0.804	21	4.05	1.255	30	5.67	0.353	3
D10	Enter new construction market	4.76	0.820	23	3.59	1.417	31	5.93	0.222	2
D11	Pre-qualification condition	5.51	0.206	6	5.67*	0.210	10	5.34	0.201	7
D12	Increase market share	5.50	0.718	7	6.02	0.201	5	4.97	1.235	17
D13	Increase productivity	4.70	0.836	25	5.08	0.673	24	4.32	0.998	22
D14	Diversification	5.33	0.535	11	5.33	0.588	18	5.33	0.482	9
D15	Opportunity to work on large and complex projects	4.97	0.803	19	6.01	0.276	6	3.92	1.330	28
D16	Ensure stability	5.22	0.594	13	5.24	0.775	19	5.20	0.412	12
D17	Improve company's image	5.67	0.591	2	6.23	0.419	2	5.11	0.762	13
D18	Secure financing	5.06	0.840	17	6.06	0.450	4	4.05	1.229	26
D19	Growth in construction globalization	5.35	0.504	10	5.67*	0.325	9	5.03	0.682	14
D20	Competing interest of national development	4.23	1.154	31	5.00	1.113	27	3.46	1.194	29
D21	Improve competitive position	5.16	0.652	15	5.46	0.417	16	4.85	0.886	18
D22	Improve track records	5.61	0.396	3	5.94	0.144	7	5.28*	0.648	10
D23	Overcome the lack of local knowledge of international	4.66*	1.165	27	4.67	1.218	29	4.64	1.111	20

	firms									
D24	Build reputation	4.87	0.790	20	5.22*	0.457	21	4.52	1.122	21
D25	Increase credibility	5.25	0.539	12	5.50	0.311	14	5.00	0.766	16
D26	Promote industrial integration	5.12	0.575	16	5.22*	0.239	20	5.01	0.911	15
D27	Increase efficiency	4.80	0.875	22	5.60	0.515	11	4.00	1.235	27
D28	Acquire new construction project	5.49	0.472	8	5.57	0.431	13	5.40	0.513	5
D29	Overcome environmental deficiencies	5.18	0.697	14	4.99	0.612	28	5.37	0.781	6
D30	Improve existing imperfect mechanism of the construction industry	4.31	0.919	30	5.41	0.500	17	3.21	1.338	30
D31	Stimulate export-orienting contracting	4.63	0.751	28	5.00*	0.668	26	4.51	0.833	23
Respondents no.		14			7			7		
Cronbach's alpha		0.857			0.861			0.843		
Kendall's W[a]		0.444			0.568			0.713		
Chi-Square (X^2)		103.589			94.089			142.375		
X^2-critical value: (a: p = 0.05; b: p = 0.01)		50.234[a] (57.478[b])			50.234[a] (57.478[b])			50.234[a] (57.478[b])		
df		30			30			30		
P-Value		0.000[c]			0.000[c]			0.000[c]		

Note: SD = Standard Deviation; Kendall's W[a] = Kendall's coefficient of concordance; df = degree of freedom

*Equal mean, wherein factors with low SD are ranked higher in that order

[c]Significant *p*-value

The rank order of the drivers for the two groups of partner firms indicates that respondents modified their previous rating of the 31 drivers, however, with a marginal effect within respective groups. For instance, within the local partners' group, drivers such as D2, D17, D1, etc. maintained their rankings and some have their ranking enhanced in the second round of Delphi survey, these include factor D18 from rank 11 to 4, factor D22 from rank 14 to 7, factor D27 from rank 17 to 11, etc. Similarly, the ranking of some drivers reduced such as factor D12 from rank 4 to 5, factor D6 from rank 6 to 23, factor D4 from rank 9 to 25, etc. Notwithstanding the above, comparatively, there is a considerable difference in rank order of drivers between both groups. This provides reasonably strong support that partnering firms have varying degrees of interest in engaging in ICJVs (Brockmann and Girmscheid, 2009). Although there are differences in the ranking of the drivers between the two groups, the two groups of partner firms may share symmetrical significance and agreement level about some drivers which need to be identified for the development of the final PLS-SEM model (Chapter 10).

6.3.2 Significance of Drivers and Agreement Validation with IRA analysis

When drivers are combined and evaluated, it becomes evident that some drivers are beneficial to the local partners in ICJVs while others are of value to the foreign partners. To distinguish between the common/mutual and separate drivers, the mean score values of the drivers after the second round of Delphi survey (see Table 6.2) and agreement level analysis based on eqn. 2.18, as explained in Section 2.2.2.9. To determine the significance of each driver, the scale interval grading was used (Section 2.2.2.9). More so, the Mann-Whitney U test results, based on the general survey, was used to validate the differences in the agreement of the various drivers. Tables 6.3 and 6.4 present the significance grading and IRA analysis, and Mann-Whitney *U* test

results from the general survey, respectively. As mentioned earlier, drivers that showed strong agreement level and significant grading between the two groups of partner firms are identified as common/mutual drivers, and those that did not show strong agreement and significant grading are regarded as separate drivers.

The results from Table 6.3 show varying degrees of strong agreement level and significance of drivers after the second round of Delphi survey. Overall, 17 out of the 31 drivers showed strong agreement level and significant grading between the two groups of partner firms, including D1, D5, D7, D8, D11, D14, D16, D17, D19, D21, D22, D24, D25, D26, D28, D29, and D31. Among these drivers, D7, D17, and D26 agreement and significant level improved from "moderate" to "strong agreement" and "significant" level. Although none of the drivers is graded "extremely significant" after the second round, 8 out of the 17 including D1, D5, D8, D11, D17, D19, D22, and D28 were graded "very significant". Again, there is a structural imbalance for the group of separate drivers. Thus, the interest of local and foreign partners always clashes in the agreement and significance of the drivers. For instance, while local partners have a "very strong agreement" and "significant" level for factor D3 in the second round of Delphi survey, foreign partners have a "strong agreement" and "moderate" level of significance. More so, while local partners have a "moderate agreement" and "very significant" level for factor D15 in the second round, foreign partners have a "very strong agreement" and "moderate" significant level. In all, 14 drivers including D2, D4, D6, D9, D10, D12, D13, etc. are considered separate due to the structural imbalance among the two groups. The "lack of agreement" and "weak agreement" among the two groups regarding factor D2 and D10 is understandable because the mean measure of the two drivers is either too high or low as rated by respondents within the respective groups.

As shown in Table 6.4, the results from the test indicate that 13 drivers (D2, D3, D4, D6, D9, D12, D13, D15, D18, D20, D23, D27, and D30) have significant differences among the two groups. Unsurprisingly, it is evident in Table 6.3 that there is a structural imbalance for these groups of drivers which confirms asymmetries between the local partners and their foreign partners in their motivation towards ICJVs implementation. The remaining 18 drivers showed no significant differences between the two groups. The results support the consensus achieved by the two respondents and validate the agreement among them. Only driver "D10 – enter new construction market", was not supported, however, previous studies have strongly stressed that this particular driver is of much value to the foreign partner (Brockmann and Girmscheid, 2009; Girmscheid and Brockmann, 2010; Famakin et al., 2012) and aside from that the results from the two rounds Delphi survey confirm that. Thus, D10 was added to the separate drivers. To better appreciate the various drivers for implementing ICJVs, and as a supplement to the analysis conducted in the present study, FA was applied to explore the underlying dimensions of both the common and separate drivers for future research and the PLS-SEM in Chapter 10.

Table 6. 3 Significance grading and IRA analysis of the drivers for implementing ICJVs

	Local partner						Foreign partner					
	First round			Second round			First round			Second round		
Factor code	$a_{wg(1)}$ score	Agreement level	Significance level	$a_{wg(1)}$ score	Agreement level	Significance level	$a_{wg(1)}$ score	Agreement level	Significance level	$a_{wg(1)}$ score	Agreement level	Significance level
D1*	0.946	V. strong	V.significant	0.939	V. strong	V.significant	0.932	V. strong	V.significant	0.933	V. strong	V.significant
D2	0.254	Lack	V.significant	0.528	Moderate	V.significant	0.948	V. strong	F. significant	0.958	V. strong	F. significant
D3	0.713	Strong	Significant	0.948	V. strong	Significant	0.757	Strong	V.significant	0.859	Strong	Moderate
D4	0.599	Moderate	V.significant	0.600	Moderate	significant	0.767	Strong	Significant	0.613	Moderate	Significant
D5*	0.770	Strong	V.significant	0.711	Strong	V.significant	0.950	V. strong	V.significant	0.950	V. strong	Significant
D6	0.617	Moderate	V.significant	0.765	Strong	Significant	0.723	Strong	Significant	0.831	Strong	Moderate
D7*	0.756	Strong	Significant	0.722	Strong	Significant	0.870	Strong	Moderate	0.839	Strong	↑Significant
D8*	0.793	Strong	V.significant	0.934	↑V. strong	V.significant	0.922	V. strong	Significant	0.927	V. strong	Significant
D9	0.909	V. strong	Significant	0.946	V. strong	Moderate	0.578	Moderate	Significant	0.573	Moderate	V.significant
D10	0.918	V. strong	Moderate	0.973	V. strong	Moderate	0.443	Weak	V.significant	0.444	Weak	V.significant
D11*	0.763	Strong	V.significant	0.986	↑V. strong	V.significant	0.980	V. strong	V.significant	0.981	V. strong	Significant
D12	0.660	Moderate	V.significant	0.527	Moderate	V.significant	0.976	V. strong	Significant	0.976	V. strong	Significant
D13	0.815	Strong	Significant	0.726	Strong	Significant	0.854	Strong	Moderate	0.854	Strong	Moderate
D14*	0.707	Strong	Significant	0.917	↑V. strong	Significant	0.877	Strong	Significant	0.877	Strong	Significant
D15	0.699	Moderate	V.significant	0.521	Moderate	V.significant	0.849	Strong	Significant	0.954	V. strong	Moderate
D16*	0.934	V. strong	Significant	0.943	V. strong	Significant	0.795	Strong	Significant	0.795	Strong	Significant
D17*	0.850	Strong	V.significant	0.811	Strong	V.significant	0.697	Moderate	V.significant	0.854	↑Strong	Significant
D18	0.753	Strong	V.significant	0.591	↓Moderate	V.significant	0.923	V. strong	Moderate	0.871	↓Strong	Significant
D19*	0.756	Strong	V.significant	0.853	Strong	V.significant	0.954	V. strong	Significant	0.954	V. strong	Significant
D20	0.598	Moderate	Moderate	0.598	Moderate	Significant	0.551	Moderate	Moderate	0.611	Moderate	F.significant
D21*	0.821	Strong	Significant	0.764	Strong	Significant	0.849	Strong	Significant	0.934	↑V. strong	Significant
D22*	0.854	Strong	V.significant	0.854	Strong	V.significant	0.884	Strong	Significant	0.989	↑V. strong	Significant
D23	0.639	Moderate	Significant	0.646	Moderate	Significant	0.878	Strong	Moderate	0.572	Moderate	Significant
D24*	0.710	Strong	Significant	0.746	Strong	Significant	0.929	V. strong	Significant	0.929	V. strong	Significant
D25*	0.825	Strong	Significant	0.816	Strong	Significant	0.798	Strong	Significant	0.962	↑V. strong	Significant
D26*	0.609	Moderate	Significant	0.739	↑Strong	Significant	0.837	Strong	Significant	0.981	↑V. strong	Significant
D27	0.587	Moderate	Significant	0.587	Moderate	V.significant	0.894	Strong	Moderate	0.890	Strong	Moderate
D28*	0.882	Strong	V.significant	0.902	V. strong	V.significant	0.924	V. strong	V.significant	0.924	V. strong	↓Significant
D29*	0.748	Strong	Significant	0.779	Strong	Significant	0.780	Strong	Significant	0.883	Strong	Significant
D30	0.583	Moderate	Significant	0.470	↓Weak	Significant	0.907	V. strong	F. significant	0.907	V. strong	F. significant
D31*	0.906	V. strong	Significant	0.810	Strong	Significant	0.779	Strong	Significant	0.860	Strong	Significant

Note: V. strong = Very strong agreement; Lack = Lack of agreement; V.significant = Very significant; F. significant = Fairly significant; ↑- increase; ↓- decrease

*Drivers with strong agreement level and significant grading between the two groups of partner firms

Table 6. 4 Mann-Whitney *U* test between local and foreign partner on the drivers for implementing ICJVs

	Local partner	Foreign partner	Mann-Whitney *U* test statistics			
Factor code	Mean	Mean	U stats	*W*	*Z*	*P*-value
D1	6.42	6.23	3.000	565.000	-7.924	0.000*
D2	6.22	5.25	655.500	1981.500	-3.848	0.065
D3	5.86	5.68	489.000	1815.000	-3.474	0.001
D4	5.58	5.54	746.500	2072.500	-0.997	0.319
D5	6.01	5.77	521.000	1082.000	-3.191	0.001*
D6	5.84	5.88	741.000	1302.000	-1.091	0.275
D7	5.04	5.24	184.500	1510.500	-6.248	0.000*
D8	5.48	5.37	201.000	1527.000	-5.993	0.000*
D9	5.11	5.35	715.500	2041.500	-1.314	0.189
D10[b]	5.87	4.48	656.500	1217.500	-4.793	0.001*
D11	5.61	5.83	495.500	1056.500	-3.383	0.001*
D12	6.17	5.70	622.000	1948.000	-2.225	0.026
D13	5.35	5.20	94.500	655.500	-3.026	0.059
D14	5.54	4.94	601.500	1927.500	-2.319	0.000*
D15	5.79	5.36	686.500	2012.500	-1.526	0.127
D16	5.62	6.15	667.500	1993.500	-1.717	0.006*
D17	5.41	5.25	722.500	1283.500	-1.300	0.001*
D18	5.69	5.65	422.500	983.500	-2.182	0.030
D19	5.74	4.68	813.500	1374.500	-3.277	0.000*
D20	4.83	5.18	605.000	1931.000	-2.316	0.021
D21	5.55	5.45	536.500	1097.500	-3.309	0.001*
D22	5.52	5.25	484.000	1808.000	-3.631	0.000*
D23	4.96	4.99	731.000	1292.000	-1.147	0.252
D24	5.72	5.17	648.500	1209.500	-2.191	0.001*
D25	5.46	5.12	827.500	1388.500	-3.153	0.000*
D26	5.26	5.17	466.500	1027.500	-3.913	0.000*
D27	5.79	5.61	792.500	1353.500	-0.503	0.615
D28	6.10	5.33	773.500	2099.500	-3.671	0.002*
D29	4.98	5.29	516.000	1842.000	-3.191	0.001*
D30	5.59	5.31	700.000	1261.000	-1.392	0.164
D31	5.12	4.82	789.000	2115.000	-4.503	0.000*

Note: *W* = Wilcoxon W; and MWU = Mann-Whitney *U* at significant level of 0.05
*Significant *p*-values
[b]Driver that varies from the agreement validation

6.3.3 FA Results

It should be mentioned that FA was conducted separately for the common/mutual drivers (17 driving factors) and separate drivers (14 driving factors). To determine the suitability of the FA, the KMO and Bartlett's test of sphericity was first assessed. An acceptable KMO of (0.603 – common/mutual drivers; 0.760 – separate drivers) and a large value of Bartlett's test of

sphericity (178.888 – common/mutual drivers; 129 – separate drivers), with an associated level of significance of 0.000. Adhering to factor loadings ≥ 0.50 (Darko, 2019; Adabre et al., 2020), 7 drivers (D3, D16, D20, D23, D25, D30, and D31) were deleted as their factor loadings and communalities were relatively below the threshold. Among these deleted drivers, three of which fell within the category of common drivers (D16, D25, and D31), and the remaining four under separate drivers (D3, D20, D23, and D30). Even though the potential similarities that the two groups share at the dyad level of interests was achieved, the inferences that could be drawn are that partnered firms, especially host/local partner firms, do not hold strong interests for drivers (i.e., benefits) that are indirect/intangible (e.g., "stimulate export-orienting contracting – (D31)", and "increase credibility – (D25)") or of much national interest (e.g., "competing interest of national development – (D20)", and "improve existing imperfect mechanism of the construction industry – (D30)"). National governments and organizations across many sectors provide support for ICJVs implementation to tackle critical social and environmental challenges as well as minimize the inefficiencies in the domestic/local market (Li et al., 2009; Chang et al., 2018). More so, for the indirect/intangible benefits, Tetteh et al. (2021c) highlighted that they are normally attained after completion or involved in several ICJV projects. Thus, partners motivation for long-term impacts could be less supported. One of the major reasons why developing countries enter ICJVs is to "improve quality level of construction projects – (D3)" (Gunhan and Arditi, 2005; Brockmann and Girmscheid, 2009; Martin and Emptage, 2019). However, it is surprising that this particular driver did not come through as significant for implementing ICJVs in Ghana. These findings imply that there is not only multi-interest in the rationales why partners form ICJVs, but also that partners have priorities to the venture and not use it as a mechanism to improve project performance. The principal component analysis and

varimax with Kaiser normalization was employed as the factor extraction method to identify the underlying group drivers. Besides, all the generated factors satisfied the eigenvalue criteria of 1.0 (Norusis, 2008). Table 6.5 presents the overall FA results on the drivers for implementing ICJVs. Overall, 14 drivers were finally considered under the common/mutual drivers from which two components are extracted: operational success drivers and organizational-driven drivers. Also, 10 drivers were retained under the separate drivers, wherein two components are extracted: strategic positioning drivers and market power drivers. As explained already, the naming of the components was based on the variables with high loadings within each grouping and their common features. With these underlying group drivers, 68.025% of the variance is explained by the common/mutual drivers for ICJVs implementation and 70.705% is explained by the separate drivers for ICJVs implementation. These variances explained are unquestionably higher than the minimum threshold of 60% as emphasized by Wuni and Shen (2020). The following sections discuss the components in detail.

6.3.3.1 Operational success drivers

This component forms part of the common/mutual drivers for implementing ICJVs (consisting of 8 factors: D1, D8, D11, D5, D19, D28, D29, and D7) and highlights the need for efficiency and effectiveness in delivering complex and large-scale infrastructure projects. It explains 32.904% of the total variance and an average factor loading of 0.746. Without ICJVs, numerous technically complex projects or large-scale infrastructure projects worldwide would not have been successful (Tetteh and Chan, 2019). Aside from the increasing complexities and high-tech involved in constructing megaprojects, the high capital investments force organizations or even national governments to scale up initiatives and accelerate progress towards achieving these

goals. ICJVs have emerged to improve this value proposition of growth in the global construction market. The direct impact of growth in the global construction market can be seen in areas such as better safety performance, efficient resource utilization, integrated solutions of efficiency improvement, etc. (Ning, 2014). ICJV helps partners harness the knowledge and competencies of international professionals to expand their capacities in taking advantage of the inherent synergies between sustainable building and constructability practices. For example, the uncertainties in overseas markets affect business climate and harm project implementation, exposing international firms to losses that are not common in domestic markets (Xiaopeng and Pheng, 2013). ICJVs allow firms to operate in overseas markets while sharing risks with other firms. ICJVs help to alleviate the uncertainty of changes inherent in a foreign environment (e.g., unstable government policies, socio-cultural gaps, etc.). The utilization of local knowledge and expertise minimizes the foreign partner's risk by working through the local bureaucracy, assisting custom clearance, obtaining payments, certifying work, understanding of the contract with government and industry, and assessing the local labour markets. More so, as the local partners are already established and understand the local labour market, thus, negotiating for lower labour cost and benefit are easy (Barringer and Harrison, 2000). This helps to truly achieve outstanding project outcomes of reducing project costs and construction time, while still maintaining high-quality final products in local/foreign markets.

Table 6. 5 FA results on drivers for implementing ICJVs

Code: Common/mutual drivers	Component		$\bar{x} = \sum xi/n$
	OSD	OD	
OSD – Operational success drivers			0.746
D1 Risk/resource sharing	0.839		
D8 Better execution of projects	0.791		
D11 Pre-qualification condition	0.797		
D5 Gain economies of scale	0.753		
D19 Growth in construction globalization	0.748		
D28 Acquire new construction project	0.718		
D29 Overcome environmental deficiencies	0.686		
D7 Demand for value for money	0.639		
OD – Organizational-driven drivers			0.755
D17 Improve company's image		0.816	
D21 Improve competitive position		0.765	
D14 Diversification		0.751	
D22 Improve track records		0.735	
D24 Build reputation		0.732	
D26 Promote industrial integration		0.728	
Eigenvalues	2.981	1.700	
Variance explained	32.904	10.025	
Cumulative variance (%)	32.904	68.025	
KMO measure of sampling adequacy			0.603
Bartlett's test of sphericity approximated Chi-square			178.888
Degree of freedom			136
Significance			0.000

Code: Separate drivers	Component		$\bar{x} = \sum xi/n$
	SPD	MPD	
SPD – Strategic positioning drivers			0.825
D27 Increase efficiency	0.869		
D12 Increase market share	0.856		
D6 Promote economic growth	0.792		
D18 Secure financing	0.781		
D13 Increase productivity	0.711		
MPD – Market power drivers			0.774
D2 Acquisition of advanced technology and managerial skills		0.877	
D4 Prevention of wholly own foreign companies		0.784	
D10 Enter new construction market		0.764	
D15 Opportunity to work on large and complex projects		0.725	
D9 Overcome cultural and political barriers		0.719	
Eigenvalues	3.805	2.467	
Variance explained	46.950	17.478	
Cumulative variance (%)	46.950	70.705	
KMO measure of sampling adequacy			0.760
Bartlett's test of sphericity approximated Chi-square			208.458
Degree of freedom			129
Significance			0.000

Note: $\bar{x} = \sum xi/n$, where $\bar{x}$ = factor loadings, $\sum xi$ = summation of factor loadings, n = number of variables or items in each component/construct
Extraction method: Principal Component
Analysis Rotation Method: Varimax with Kaiser Normalization

6.3.3.2 Organizational-driven drivers

In the present study, this driving theme forms the principal impetus for deciding to enter ICJVs with an average factor loading of 0.755, under the common/mutual drivers. It is made up of 6 driving factors (D17, D21, D14, D22, D24, and D26) and explains the highest level of variance of 68.025%. This component focuses on the desire of corporate firms to strive for the success and branding of their companies. Thus, it is more corporate-motivated inclined. ICJVs create an environment for parties to gain both tangible and intangible benefits within the global construction market. ICJV projects are unique considering their characteristics, including large-scale investment, political importance, and far-reaching impacts on the environment, and society. Therefore, participating in the construction of these projects is one of the pathways for organizations to maintain or strengthen their ties with the national government. In most cases, ICJV partners are more likely to get a political promotion when they successfully deliver those projects. As one of the hallmarks of success, ICJV partner firms consider themselves as winners in certain areas, and they would value their organizational growth or other long-term interests over only focusing on maximizing economic benefits (Ozorhon et al., 2010a). A good brand or reputation will improve a company's competitiveness, thus contribute to an increase in long-term potential interest (Chan et al., 2020). In effect, all partnering firms in ICJV are intrinsically motivated by the driving variables under this construct.

6.3.3.3 Strategic positioning drivers

This component, under the separate drivers, contains 5 driving factors (D27, D12, D6, D18, and D13) summarizing the longstanding impact on the host/local market. It explains 46.950% of the

total variance, with an average factor loading of 0.825. Specifically, the underlying factors of this component are of much value to the host/local partners (Dong and Glaister, 2006; Girmscheid and Brockmann, 2010). Increasing efficiency means completing projects within schedule, reducing duplications – not mistakenly repeating processes, as well as enabling continuous improvement (Panibratov, 2016). In developing countries, local partners are constantly challenged with efficiency attainment, and it gets worse where the project is large and complex. Eventually, the adoption of ICJVs improves productivity in the local/host market. Thus, complex, and large-scale infrastructure projects would be completed in less time than would be required under a normal situation. By longstanding impact, Munns et al. (2000) affirmed that ICJV supports the development of continuous control and resolution strategy for overcoming future complications. The promotion of economic growth is a long-term gain that host countries attain. ICJVs offer innovative financing to the client (Gunhan and Arditi, 2005). Especially in developing and emerging economies, infrastructure projects require large upfront capital investment firms to meet the combined effect of high demands and the tradition of late and insufficient supply through adequate and timely construction (McIntosh and McCabe, 2003). Satisfying this need is deeply grounded on developing a resilient environment that supports collaborating contracting forms such as ICJVs (Gale and Luo, 2004).

6.3.3.4 Market power drivers

This component explains 70.705% of the total variance with 5 driving factors (D2, D4, D10, D15, and D9), and an average factor loading of 0.774. It highlights the competitive advantage and market penetration efficiencies that ICJVs offer. Girmscheid and Brockmann (2010) stated that "*acquisition of advance technology and managerial skills – D2*", "*prevention of wholly own*

foreign companies – D4", and "*opportunity to work on large and complex projects – D15*" are beneficial to the local partners in an ICJV while "*enter new construction market – D10*", and "*overcome cultural and political barriers – D9*" are of value to the foreign partners. In the construction industry, the main elements driving eco-innovation are technology push, market pull, and regulatory push/pull. ICJV implementation supports the development of firms' innovation capabilities, which generally drive the economy of a country/jurisdiction into a more sustainable economic growth path. Local partners seek to gain a competitive advantage in the global construction market by acquiring new technology, absorbing new knowledge, and supporting innovation to help transform and advance their capabilities (Martin and Emptage, 2019). As entry mode choice theory explains, market structure and pressure (i.e., institutional forms for operating abroad), determine the alliance model required (Chen and Messner, 2009). In many developing countries such as Ghana, the easier way for foreign companies to penetrate the local construction market is via ICJVs. For example, clients may require contractors who intend to bid for their project to possess some unique expertise, which certainly calls for such a collaboration arrangement. It is also a requirement for certain types of government projects (Zhao et al., 2013). For example, the government may require that corporations meet their minority or small business requirements by forming ICJV with the right firm to satisfy the need.

6.4 CHAPTER SUMMARY

ICJVs have become a good strategy for firms' survival and as an effective approach to global construction market advancement. This chapter aimed to identify the common/mutual and separate drivers for implementing ICJVs in Ghana and uncover the structure of the drivers to aid the final model development. To this end, a comprehensive literature review aided the

identification and development of a survey questionnaire made of 31 ICJVs drivers. A two-round Delphi survey with 14 expert panel members of ICJV practitioners and a general questionnaire survey with 70 ICJV practitioners were utilized in this chapter. Statistical analysis including mean analysis, IRA analysis, Mann-Whitney *U* test, and FA were used to analyze the data. The results from the mean and IRA analysis of the two rounds of Delphi survey revealed 17 common/mutual drivers and 14 separate drivers for ICJVs implementation. The Mann-Whitney *U* test results based on the general questionnaire survey supported the consensus achieved by the expert panel and validated the agreement among them. The top five key drivers were: (1) risk/resource sharing, (2) improve company's image, (3) improve track records, (4) better execution of projects, and (5) gain economics of scale. Furthermore, factor analysis was conducted on the data, and 14 drivers were finally considered under the common/mutual drivers and produced two non-overlapping components: operational success drivers and organizational-driven drivers. Likewise, 10 drivers were retained under the separate drivers and produced two non-overlapping factors: strategic positioning drivers and market power drivers. In a departure from previous studies which often assume a single driver for ICJVs, this study showed that partnered firms have different reasons to establishing ICJVs.

The ensuing chapter focuses on diagnosing the barriers to ICJVs success in Ghana.

CHAPTER 7 DATA ANALYSIS AND RESULTS – BARRIERS TO ICJVs SUCCESS: THE CONTEXT OF GHANA[7]

7.1 INTRODUCTION

While the previous chapter analyzes the drivers for implementing ICJVs in Ghana, the present chapter aims to examine the criticality of barriers to ICJVs success in Ghana. As mentioned earlier, a two-round questionnaire survey with local partners and their foreign counterparts of ICJVs in Ghana was utilized to achieve this goal. The first round of the questionnaire survey was conducted with 84 ICJVs practitioners in Ghana and the second round constituted 17 panel members of ICJVs practitioners. Note that the first-round questionnaire survey helped in the selection of qualified respondents befitting to enter the second survey. Through a comprehensive literature review and modifications via pilot study, 34 barriers were identified and presented in the survey questionnaire. The respondents were asked to rate the criticalities of the 34 barriers and their confidence/reliability level base on the decision made using a seven-point rating scale (1 = very low, 2 = low, 3 = medium low, 4 = medium, 5 = medium high, 6 = high, 7 = very high).

In this chapter, as highlighted in Chapter 2, the data concerning the barriers were analyzed using ZDM, FA, confirmatory factor analysis (CFA), and ZBWM. The first-round survey questionnaire data was analyzed using the ZDM. Afterward, FA was conducted to identify the

[7] This Chapter is largely based upon:
Tetteh, M. O., Chan, A. P., Mohandes, S.R., and Agyemang, D.Y. (under review). Diagnosing Critical Barriers to International Construction Joint Ventures Success in a Developing Country Context: The Case of Ghana, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4263R1.
Tetteh, M. O., Chan, A. P., Darko, A., and Nani, G. (2020). Factors affecting international construction joint ventures: a systematic literature review. *International Journal of Construction Management*, 1-45.

underlying structure of the retained barriers and then the CFA. The ZBWM method was used to analyze the second-round survey. The ZDM was used to refine the identified barriers (see Section 2.2.2.7 for more detail of the analysis process). The CFA was used to test the significance of the barriers after their grouping through factor analysis. In doing so, SPSS 26.0 was used for the factor analysis, and the software R package *lavaan* and *semPlot* were used. R is a popular open-source statistical platform for computations and data analysis. Although SEM software packages are available, in the R environment, the *lavaan* and *semPlot* package is recommended because it is easy to use and, rich with modeling features. It also can handle non-normal data and a small sample size (Oberski, 2014). Finally, ZBWM method was employed to rank the critical barriers based upon their computed final weights (see Section 2.2.2.8 for more detail of the computation process). The outcome of this chapter is used for the final PLS-SEM model, Chapter 10. The findings of this chapter not only contribute to the ICJV body of knowledge by analyzing the critical barriers to ICJVs success within the context of a developing country but also provide invaluable insights into promoting broader, better implementation of ICJVs and contributing to their success.

7.2 ANALYSIS RESULTS AND DISCUSSION

7.2.1 ZDM Evaluation – Barriers Refinement

Table 7 summarizes the final decision regarding the selection and rejection of the barriers based on the defuzzification values. The level of each barrier criticality was assessed based on the computed threshold value (5.258) (see Section 2.2.2.7 for the computation process).

Table 7. 1 ZDM results on the barriers to ICJVs success.

Code	Barriers	Fuzzy weight	Defuzzification	Selection/Rejection
B01	Lack of management control	(0.55,5.9973,9.83)	5.459	Select
B02	Competing objectives	(2.56,8.1658,9.83)	6.858	Select
B03	Language barrier	(0.71,7.0286,9.83)	5.856	Select
B04	Incompetence of host/local management team	(0,0,9.83)	3.277	Reject
B05	Different organizational cultures	(2.12,7.5745,9.83)	6.509	Select
B06	Difficulty in measuring ICJV performance	(2.51,8.0213,9.83)	6.788	Select
B07	Incomplete contract terms with partners	(0.84,6.4076,9.83)	5.692	Select
B08	Poorly formulated governance structure	(0.55,6.3486,9.83)	5.576	Select
B09	Lack of clear understanding and knowledge of ICJV fundamentals	(1.28,7.0255,9.83)	6.045	Select
B10	Relationship management issues	(2.51,7.5027,9.83)	6.615	Select
B11	Unstable agreement for a limited period	(0.91,5.9670,9.83)	5.571	Select
B12	Lack of mutual commitment of partners	(0,0,9.83)	3.277	Reject
B13	Poorly formulated decisions in assigning limited resources	(1.28,6.1086,9.83)	5.740	Select
B14	Difficulty in selecting suitable partners	(1.28,6.7410,9.83)	5.950	Select
B15	Lack of proper project planning and budgeting	(0.55,5.5909,9.31)	5.149	Reject
B16	Fear of legal action	(0.91,7.0805,9.83)	5.942	Select
B17	Lack of corporation	(4.18,5.7991,9.83)	6.605	Select
B18	Lack of confidence about experience and knowledge among parties	(0,6.1237,9.83)	5.319	Select
B19	Lack of strategic planning for the ICJV operations	(1.28,7.0329,9.83)	6.048	Select
B20	Fear of exposure of strength and weakness	(0,0,9.31)	3.103	Reject
B21	Blaming habits	(0,0,8.85)	2.950	Reject
B22	Unstructured problems, issues, and risk management framework	(2.74,7.6924,9.83)	6.754	Select
B23	Lack of continuous improvement	(0,4.1325,9.83)	4.655	Reject
B24	High sense of superiority	(0,4.3326,9.31)	4.547	Reject
B25	Lack of preparedness to accept company philosophy	(0.55,7.2270,9.83)	5.869	Select
B26	Poor problem-solving culture	(0,0,9.83)	3.277	Reject
B27	Lack of proper organizational structure to create and share knowledge	(0.55,5.3880,9.83)	5.16	Reject
B28	Human resource management issues	(0,4.2603,9.31)	4.523	Reject
B29	Technological deficiency of co-partners	(0,0,9.83)	3.277	Reject
B30	Conflicts created between the partners of ICJV, client organization and stakeholders	(0,6.0288,9.83)	5.287	Select
B31	Unfair power and responsibilities among entities	(0.55,6.0466,9.83)	5.475	Select
B32	Unfair distribution of salary package among entities	(0,0,9.83)	3.277	Reject
B33	Lack of knowledge about host/local statutory requirement	(0.84,6.8881,9.83)	5.852	Select
B34	Opportunistic behaviour of parties	(0.84,5.6766,9.83)	5.448	Select
Threshold				5.258

Thus, barrier factors less than the threshold value were rejected. 22 of the 34 barriers to ICJVs success were considered critical in the Ghanaian context. The majority of rejected or non-critical barriers (e.g., "lack of proper project planning and budgeting – (B15)", "lack of proper organizational structure to create and share knowledge – (B27)", "technological deficiency of co-partners – (B29)", etc.) demonstrate that issues connected to pre-inception basics and planning are not perceived to be critical in ICJVs implementation in Ghana. Although difficulties may exist in finding suitable partners for ICJV projects, critical attention given to the identification of partners with good collaborative performance and technically trained could offset some potential barriers that would have easily degrade the ICJVs' success in the future. Further, individual traits such as "high sense of superiority – (B24)" and "fear of exposure of strength and weakness – (B20)", which normally develop in the decision making of ICJVs due to partners differences in size, unequal venturing experience, and different perspectives on the details of a venture's activities, etc. are not regarded as critical barriers to ICJVs success. More importantly, the understanding that ICJVs are formed by combining complementary resources to address skills and knowledge deficiencies in executing complex construction projects justifies ICJVs potentiality in addressing operational problems (Martin and Emptage, 2019). It is, therefore, not surprising that "poor problem-solving culture – (B26)" is seen not to be a critical barrier in ICJVs in Ghana.

7.2.2 FA and CFA evaluation results

As mentioned earlier, the initial categorization was based on the preliminary analysis (by literature review), and thus necessitate empirical groupings and justification. Besides, the barrier factors were identified from multiple studies undertaken in different contexts around the world

and grouped without the statistical knowledge of their underlying effects. Moreover, the varying severity levels of the barriers as observed based on the defuzzification values provide support for further exploration of the interrelationships between the retained factors. In this phase, the 22 critical barriers to ICJVs success were first analyzed using FA. The identified barriers were suitable for FA due to the realization of meeting key validation test requirements, which include the KMO, and Bartlett's test of sphericity. The KMO and Bartlett's test of sphericity demonstrated the suitability of the FA with values of 0.640 and 1327.991, respectively. With an acceptable factor loading (FL), a threshold value of at least 0.50, five components were extracted from the 22 critical barriers and explained 64.862% of the total variance. Since all the FL were greater than or equal to the threshold value, all the 22 barrier factors were regarded as significant in contributing to their respective component, thus all the barrier factors were retained. These components include organizational-related barriers, cultural-related barriers, knowledge-related barriers, individual-related barriers, and logistics-related barriers.

To determine the significance and relationship between the underlying barriers of each component, CFA was employed. The validation process involved three basic validities: convergent validity, construct validity, and discriminant validity. For convergent validity, a unidimensional assessment was conducted, and all barriers with FL below 0.50 were removed (Hair et al., 2014). All the barriers have acceptable FL for their respective latent constructs. Table 7.2 shows the CFA results and reliability analysis. From the table, all the constructs have greater composite reliability (CR) and Cronbach's alpha values (α) (i.e., >0.70) confirming the reliability of the data sets. Also, the average variance extracted (AVEs) are above 0.50, which denotes that the latent variables have a convergence ability that is equal to ideal. For construct

validity, the required goodness of fit indices that correspond with the root mean square error of approximation (RMSEA = 0.046), non-normed fit index (NNFI = 0.686), comparative fit index (CFI = 0.931), standardized root mean square residual (SRMSR = 0.083), and Tucker-Lewis index (TLI = 0.919) demonstrated high and acceptable fit indices for further analysis, as shown in Table 7.3. A discriminant validity test (see, Table 7.4) also confirmed that all the barrier components are different from each other as the square root of the AVEs is higher than the inter-component correlations. Overall, the CFA model achieved sufficient goodness of fit, which validates the significance or criticality of the barriers to ICJVs success in Ghana.

Table 7. 2 Summary of CFA and reliability analysis

Barrier construct	Barrier Code	Measurement and reliability analysis			
		FL (>0.50-1.00)	CR (>0.70)	α (>0.70)	AVE (>0.50)
Organizational-related barriers (OB)	B01	0.846	0.822	0.794	0.541
	B06	0.712			
	B08	0.693			
	B10	0.641			
	B22	0.683			
	B31	0.552			
Cultural-related barriers (CB)	B02	0.724	0.854	0.789	0.540
	B03	0.795			
	B05	0.698			
	B25	0.766			
	B30	0.705			
Knowledge-related barriers (KTB)	B09	0.899	0.778	0.742	0.655
	B33	0.658			
Individual-related barriers (IB)	B16	0.850	0.828	0.737	0.550
	B17	0.785			
	B18	0.657			
	B34	0.656			
Logistics-related barriers (LB)	B07	0.761	0.890	0.848	0.618
	B11	0.804			
	B13	0.783			
	B14	0.781			
	B19	0.801			

Note: α – Cronbach's alpha; AVE – Average variance extracted; and CR -Composite reliability; FL – Factor loading

Table 7. 3 Summary of CFA test fit indices for all measurement model

Measure	Recommended value	Achieved fit indices
NNFI	0 (no fit) to 1 (perfect fit)	0.686
CFI	0 (no fit) to 1 (perfect fit)	0.931
RMSEA	< 0.10 indicates good fit	0.046
SRMR	< 0.10 indicates good fit	0.083
TLI	0 (no fit) to 1 (perfect fit)	0.919

Table 7. 4 Discriminant validity results

	Correlation matrix[b]				
Code	OB	CB	KTB	IB	LB
OB	**0.736**				
CB	0.228	**0.735**			
KB	0.027	0.085	**0.809**		
IB	0.146	0.156	0.048	**0.741**	
LB	0.122	0.189	0.088	0.138	**0.786**

Note: [b]Bold values on the diagonal represents the square root of AVE of each latent construct. Off-diagonal values are the correlation between constructs.

7.2.3 ZBWM evaluation – Barriers Weights and ranking

Fig 7.1 and Table 7.5 show the hierarchy of the retained critical barriers and the results from the ZBWM computed for the barrier components and sub-barrier factors, respectively. The weight computation was performed based on the pairwise comparison of the critical barriers recorded by 17 local partners and their foreign partners of ICJVs (the profile of the respondents is presented in Section 2.2.1.2). Based on the aggregated CR for all the respondents, a high level of CR (0.0290) was obtained (see Section 2.2.2.8 for more detail of the computation process). To better understand the computation of the ZBWM execution to obtain the pertinent weights, an example case for one respondent is elaborated in Appendix F.

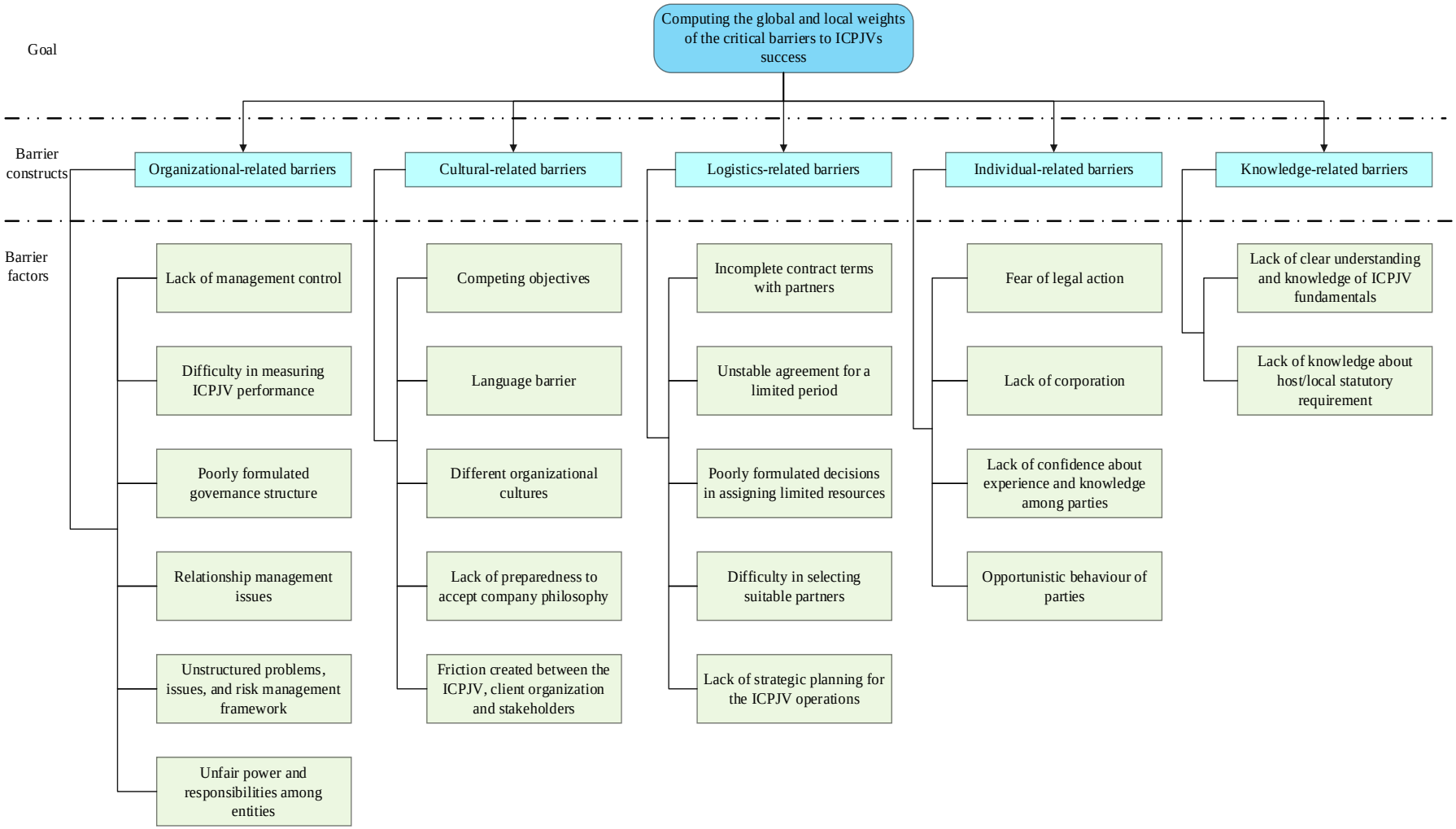

Fig. 7. 1 The hierarchy of the retained critical barriers and components

Table 7. 5 The relative average of calculated weights for each barrier and sub barrier

Barrier construct	Mean	Sub barriers	Local weights	Global weight	Rank
OB	0.2179	B01	0.2593	0.0565	5
		B06	0.2270	0.0495	8
		B08	0.1366	0.0298	17
		B10	0.1037	0.0226	21
		B22	0.1578	0.0344	12
		B31	0.1142	0.0249	19
CB	0.1327	B02	0.2344	0.0726	2
		B03	0.1337	0.0414	10
		B05	0.1622	0.0502	7
		B25	0.2539	0.0786	1
		B30	0.1929	0.0597	4
KB	0.3096	B09	0.2490	0.0330	14
		B33	0.4253	0.0564	6
IB	0.1613	B16	0.2094	0.0338	13
		B17	0.1943	0.0313	16
		B18	0.1973	0.0318	15
		B34	0.3780	0.0610	3
LB	0.1531	B07	0.2477	0.0379	11
		B11	0.1758	0.0269	18
		B13	0.2723	0.0417	9
		B14	0.1243	0.0190	22
		B19	0.1502	0.0230	20
Total average $\tilde{\xi}$			0.2243		0.0290

7.2.4 Discussion

7.2.4.1 Organizational-related barriers

The complex organizational structures of ICJVs coupled with task difficulties reflect the difficulty of establishing well-defined organizational arrangements and work processes for their operations. For example, the lack of management control (B01) occurs due to the differences in management and organization practices of partnering firms. Inflexible organizational structures that fail to accommodate varying adjustments during the venture operation cause paralysis and partner dissatisfaction (Hong, 2014). There have always been difficulties when measuring ICJVs

performance (B06) due to the long and complex chain of management tasks alongside the varied goals of parties involved. Parties then fail to efficiently evaluate their venture performance due to inadequate systems and measures. More so, unfair power and responsibilities among entities (B31) is seen as one of the critical barriers to ICJVs success. This is mostly reflected in areas such as the organization's decision-making, planning, operation, etc., which often creates dissatisfaction of the local partners to fully engage and support. Likewise, unstructured problems, issues, and risk management framework (B22) is prevalent in most organizations.

7.2.4.2 Cultural-related barriers

The hybrid nature of ICJVs complicates operation and management, which causes their failure. While national cultures represent the most predominant differences cited, the different organizational cultures (B05) stemming from working style, organizational goal, employees, and requirement, etc. protract the process of achieving cooperation and success in ICJVs (Lu et al., 2020). Drawing on the inference of relational demography logic and the similarity-attraction archetype, homogenous parties (i.e. partner companies within the same country) in interfirm cooperation are known to have less conflicts, better team integration, and improve performance (Adobor, 2004). Equally, heterogenous parties (i.e. partner companies from different countries) in collaboration (ICJV) will put partners at odds with each other rather than encourage complementarity (Luo et al. 2001). Thus, the larger the differential gap, the more likely that both internal – between parties and external – between parties and the client organization conflicts (B31) will arise. Conflicts stemming from maximizing private interest and unproductive differences (Westman and Thorgren, 2016). Maximizing private interest may include misunderstanding on resource distribution such as corporate board staffing, key functional and operational areas placement, etc. and unproductive differences include differences in strategic goals, each party's leadership, technology systems, etc., and (Westman and Thorgren, 2016). In developing countries such as Ghana, for

example, the unequal equity and increase in size differences of partner companies often create conflicts in ICJVs. Larger partner organizations (foreign companies) from developed countries, which are diametrically opposite to that of the Ghanaian companies in terms of size, technology, expertise, authority, etc. often form ICJVs. The differential gap between the two companies often favors the larger firms to exert more control. However, in Ghana, in addition to the restrictions on foreign direct investment, the Local Content Policy 2013 stipulates that the local workforce should be prioritized in ICJVs operations. Whereas foreign partner companies do not want to lose their independence completely, local partner companies capitalize on the market regulations. Thus, there are always incompatible interests in the relationship and for autonomy, which often dwarf ICJVs success. Similarly, attaining a cultural fit between partners of different cultures, especially in language (B03), to effectively work together and have a well-formalized grounds upon which confidence and trust can be developed is challenging in ICJVs.

7.2.4.3 knowledge-related barriers

Having professional knowledge and understanding of ICJVs fundamentals is a major factor for successful ICJVs implementation (Ozorhon et al., 2008a). Conversely, the lack of basic knowledge of the essential terms and key functions for the operation of ICJVs (B09) limits the effectiveness of the parties to fulfill the overall goal of the ICJV. At times, merely out of the intention of participating in a construction project, due to time limitation leads to the ICJV parties not fully evaluating and understanding how well an ICJV should be operated in a desirable manner, which results in their failure. Further, the lack of knowledge about local/host statutory requirements (B33) creates an enduring problem for ICJVs as the right procedures for establishing and operating ICJVs may be undermined. For example, in developing countries where foreign partners often retain overall control of the venture, such a limitation on the part of

foreign partners increases coordination and transaction costs (i.e., time cost in getting the deal up and running effectively, and the cost of emotional energy necessary get through interactions). Besides, relying more on foreign management will stunt ICJV project performance and management (Gale and Luo, 2004).

7.2..4 Individual-related barriers

In ICJVs, partners' competence and experience play a huge role in completing the project successfully and building a firm relationship. As ICJV projects have their trouble alongside the complex organizational structures, it is important that all partners are competent and technically trained to effectively handle the complexities involved in the project and the contract system. More so, while partners reach a broad agreement at the outset of the ICJV on technical and operational interactions, problems are bound to occur as the venture gets underway. Some problems appear to result from lack of corporation (B17), lack of confidence about experience and knowledge (B18), and fear of legal action (B16), and opportunistic behaviour of partners (B34). These create unpleasant and unwelcome surprises for the partners, which can contribute to venture failure (Sillars and Kangari, 2004; Han et al., 2019). In Ghana, the combined technological strength and expertise of foreign partners mask ICJVs operation and domestic/local partners hedge their confidence in being credible and experienced, which deter collaboration progress for success realization.

7.2.2.5 Logistics-related barriers

The foundation for effective and winning collaboration is adequate planning right from inception to completion (Liang et al., 2019). In ICJVs, effective protocols for resolution strategies, resource allocation, contractual terms, etc. are identified as key for successful implementation. For example, while there are no conflict-free ICJVs, the lack of appropriate conflict resolution strategies can result in an unstable agreement for a limited period (B11) that could lead to the total breakdown of the venture. Given the complex and diverse uncertainties and challenges peculiar to megaprojects and international transactions, oftentimes, managers consider partners' issues soft and unimportant compared to operation and technical issues. Thus, they neglect the day-to-day planning and relationship aspects that translate to achieving the value creation objectives of the ICJV. The wrong selection of potential partners (B14) often leads to implementation problems.

Overall, the results from the ZBWM analysis showed that ICJVs are faced with both minor and serious problems, irrespective of how strategically sound and well-structured they are. The top five critical barriers to ICJVs success are discussed. They are “lack of preparedness to accept company philosophy (B25)”, “competing objectives (B02)”, “opportunistic behaviour of parties (B34)”, “conflicts created between the partners of ICJV, client organization, and stakeholders (B30)”, and “lack of management control (B01)”. It is not surprising that these critical barriers are connected to culture, individual, and organization as previous studies have emphasized (Ozorhon et al., 2008a; Ho et al., 2009). The cultural mix in ICJVs makes it very difficult for partnering companies to easily translate their organizational norms and values into the venture. The relational demographic theory confirmed that excessive heterogeneity may result in slower

agreement on matters, which often leads to operational delays (Adobor, 2004). "*Lack of preparedness to accept company philosophy"* is more evident at the implementation stage of ICJVs, where resources are being exploited for the actual construction work. Differences set-in between partners in the setting of priorities and operational management. For example, if one company is used to a centralized management style while the partner company supports an autonomous, decentralized management style, complete acceptance or integration will be difficult. In Ghana, while the local partners may prefer daytime hours working, foreign partners may prefer both daytime and nighttime hours. Similarly, ICJV projects are highly mechanized, which places foreign partners in the operational and management front because of their expertise. The far-out knowledge of local partners in managing such projects limits and weakens their operational strategies. These gaps reinforce the distinctiveness of the partners and erect barriers to establishing a common philosophy for venture success. The reconciliation of this gap could be achieved by either adopting one partner's philosophy as dominant or separating the spheres of partners operation to minimize interaction and hence the probability of operational culture.

Similarly, the presence of "*competing objectives*" and "*opportunistic behavior*" among parties produce serious collaboration problems, which result in ICJVs failure (Lin and Ho, 2013; Yu et al., 2017). These two barriers flock together and can be a noxious infusion, highly detrimental to ICJVs success. The competing objectives cover the ICJV goal setting, objectives, decision making, time orientation, competitive behaviour, etc. Opportunistic behaviour could be seen in areas like avoiding contractual duties (shirking), benefiting from partners' decisions (free-riding), and exploiting the partners' dependency on the ICJVs (hold-up). Han et al. (2019) mentioned that an important governance instrument to respond to this challenge and achieve satisfying or preset

objectives is management control. The issue of competing objectives could best be explained by the question: *what drives ICJVs implementation?* While parties may jointly pursue mutual goals, it is certainly true that they also follow up on separate goals. For example, whereas host/local partners enter ICJVs to complement skills, foreign parties use them as an entry mechanism (Girmscheid and Brockmann, 2010). Without a constructive joint objective, partners pursue their own goals irrespective of the project goal, leading to numerous conflicts. As a result, this would get worsened, and eventually, the relationship fails. In Ghana, ICJVs are mainly established to satisfy managerial and technological gaps and build the capacity of local firms. Notwithstanding, partners place too much emphasis on financial gains, which reduces their commitments toward the overall ICJV goal. The hunt down of individual objectives produces confusion and uncertainty and conflicts over control of specific activities where the partners had superior capabilities to exploit. It is, therefore, important for partners to recognize each other's interests and run the ICJV in a way that serves the interest of both. Also, partners participating in each other's executive development programs, cross-cultural training for ICJV staff, exchange visits, and workshops, etc. are essential and more integrative approaches to managing these critical barriers in ICJVs (Kelly et al., 2002).

As previously mentioned, there are no conflict-free ICJVs. "*conflicts created between the partners of ICJV, client organization, and stakeholders"* are bound to occur when the venture gets underway. While relational and operational-related conflicts are common among ICJV partners, task and process-related conflicts are widely pronounced between ICJV partners and the client organization. Among the partners, interpersonal incompatibility and confusion over the respective roles and responsibilities or poor understanding of who is responsible for what

function or activities often result in partner conflicts, which are detrimental to ICJVs success. It is also important to note that the unfair distribution of primary benefits derails the success of ICJVs. On the other hand, task and process-related conflicts are caused by the size and duration of the project, the complexity of the contract documents, financial issues, poor communication, changed conditions, labour issues, etc. These issues are prevalent in normal construction projects especially in developing countries (Harmon, 2003) and, an extending complication exists in ICJVs. To minimize frictions in ICJVs, negotiations should reflect the ultimate desire of all parties to establish a positive atmosphere for the ICJV project. Within the interorganizational system, managers should endeavor to create a situation where all parties perceive the benefits to be high and the risks to be equally shared. A dynamic, prompt, and efficient communication system is helpful to encourage information sharing and reducing misunderstanding. It can also promote cooperation at all levels by enabling all parties to reach a consensus on common goals and the means of achieving them. While successfully building up efficient communication systems, trust is an important means of establishing strategic and operational convergence by providing parties with assurances that the collaboration will not be exploited (Girmscheid and Brockmann, 2010).

Last but not least, "*lack of management control*" over ICJVs operations and governance is one of the reasons for ICJVs underperformance or complete failure. Management control characterizes a process through which an entity influences the behaviour and performance of another entity to varying degrees through bureaucracy, power, or informal mechanisms (Geringer and Herbert, 1989). Management control, therefore, acts as a significant determinant of ICJVs performance. The complex structures involving at least two partnering firms commonly of different cultures,

either as competitors or as collaborators (Ozorhon et al., 2008a), is the main source of this barrier. Effective management control will help partners coordinate project activities and efficiently utilize complementary resources. Many of the highlighted critical barriers could also be minimized or eliminated when dynamic management control structures are established. Overall, as collaboration remains a pivotal enabler of sustainable development, the ability to form and execute ICJVs successfully is a source of competitive advantage for companies. Therefore, a deeper understanding of the critical barriers will embellish ICJVs executives to be more adept at dealing with them and increasing performance.

7.3 CHAPTER SUMMARY

The successful implementation of ICJVs is hindered by several barriers. The critical barriers to ICJVs success need detailed investigation for suitable measures to be developed. Few studies have been conducted on the barriers to ICJVs success in developing countries. This chapter aimed to examine the critical barriers to ICJVs success with reference to the developing country of Ghana. Through a comprehensive literature review, 34 barriers were identified, and a two-round survey with 84 ICJV practitioners in the first round and a panel of 17 ICJV practitioners in the second round was utilized to achieve the present chapter aim. The data were analyzed using ZDM, FA, CFA, and ZBWM techniques. First, the ZDM results revealed the criticality of 22 barriers to ICJVs success in Ghana. The FA and CFA results confirmed the significance of five underlying grouped barriers: organizational-related barriers, cultural-related barriers, knowledge-related barriers, individual-related barriers, and logistics-related barriers. The results from the ZBWM revealed the weights and ranking of the critical barriers to ICJVs success in Ghana. The top five critical barriers are lack of preparedness to accept company philosophy, competing

objectives, opportunistic behaviour of parties, conflicts created between the partners of ICJV, client organization, and stakeholders, and lack of management control. The results also showed that the majority of top critical barriers are more cultural, individual, and organizational-related, which implies that the adeptness of key players and intercultural diversity management and control in ICJVs are critical to their operational success.

The following chapter reports the empirical findings on the MC mechanisms and performance measures for ICJVs in Ghana.

CHAPTER 8 DATA ANALYSIS AND RESULTS – MC MECHANISMS AND PERFORMANCE MEASUREMENT OF ICJVs IN GHANA[8]

8.1 INTRODUCTION

The previous chapter investigated the barriers impeding ICJVs success in Ghana. The present chapter analyzes the MC mechanisms and performance measurement of ICJVs in Ghana. The objectives of this chapter are to identify the significant mechanisms use to exercise MC in ICJVs in Ghana and to identify, validate, and rank the measures for assessing the performance of ICJVs in Ghana. The outcome of these two key constructs is used for the PLS-SEM model (Chapter 9), to investigate the performance implications of the MC mechanisms in ICJVs, and the final PLS-SEM model (Chapter 10). The analysis results and discussion of the MC mechanisms are present first in the succeeding section and then the performance measurement of ICJVs analysis follows. To achieve the first objective of this chapter, 17 MC mechanisms that were identified from the comprehensive literature review (Table 5.1) were presented in a survey questionnaire, and respondents were asked to rate their importance using a seven-point rating scale (1 = not important, 2 = least important, 3 = fairly important, 4 = moderate, 5 = important, 6 = very important, 7 = most important). With the second objective, 35 performance measures were identified from the comprehensive literature review (Table 5.2) were presented in a survey questionnaire and respondents were requested to rate both the importance (1 = not important, 2 = least important, 3 = fairly important, 4 = moderate, 5 = important, 6 = very important, 7 = most

[8] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Oppong, G.D., Nani, G., and Darko, Amos (under review). Impacts of Management Control Mechanisms on the Performance of International Construction Project Joint Ventures, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4338.

Tetteh, M. O., Chan, A. P., Darko, A., Ozorhon, B., and Adinyira, E. (under review) Multidimensional prototype of performance measures for international construction joint ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-10969.

important), and realization (1 = not realized, 2 = least realized, 3 = fairly realized, 4 = moderate; 5 = realized, 6 = highly realized, 7 = most realized) of the measures for assessing the performance of ICJVs. The questionnaire was conducted with 84 ICJVs practitioners (Table 2.8). The data regarding the MC mechanisms and performance measures were subjected to initial check using SPSS 26.0. The Cronbach's alpha values of 0.768 and 0.921, respectively, indicated that the data collected are reliable for further statistical analyses. The Shapiro-Wilk test indicated that the data are not normally distributed as the *p*-values were lower than 0.05. The mean score (MS) ranking analysis and SD were applied to rank the MC mechanisms in ICJVs, followed by normalization for identifying the important MC mechanisms among the 17 mechanisms and the Mann-Whitney *U* test to determine any divergence of ranking of the MC mechanisms by the respondents. It is important to mention that some of the existing-related studies have empirically tested the significance of some of these issues, and so, the already classified constructs were used for the analyses. Different from the related issues previous analyzed and discussed in the earlier chapters, the validity of the constructs and measurement reliability and relevance were the major concerns of this chapter. Regarding the performance measures, CFA was conducted using the software R package to validate the importance of the measures. A two-dimensional realization analysis was performed using the mean scores of the performance measures realization data and the loading coefficient from the CFA to identify and rank the significant performance measures. This chapter not only adds to the ICJV body of knowledge but contributes to a better understanding of the mechanisms to employ to efficiently and effectively manage ICJV operations. The significant performance measures can be used by ICJV practitioners as a post-project appraisal tool after the completion and evaluation stage of the ICJVs lifecycle. It also will

provide guidance for practitioners to assess multiple aspects of the ICJV performance, and to reflect on how they operate and enhance their performance.

8.2 ANALYSIS RESULTS AND DISCUSSION

Table 8.1 presents the MS analysis, normalization, and Mann-Whitney *U* test of the MC mechanisms utilized in ICJVs (the MC mechanism code follows that of Table 5.1). The inferences made by the respondents (local and foreign partners) on the MC mechanisms clearly show varying interests of the mechanisms used to exercise MC in ICJVs, while they share a close interest in some of the MC mechanism. From Table 8.1, within the overall group, the MSs of the importance of the MC mechanisms range from 5.21 to 6.14. Likewise, the MSs within the local and foreign partner's group range from 4.58 to 6.39 and 4.88 to 6.39, respectively. It is worth mentioning that the MSs of all the MC mechanisms within the respective groups are above the average of the ranking scale of 4.5, indicating their significance in the management and accomplishment of ICJVs objectives. In the local partners group, among the 17 MC mechanisms, the top five significant MC mechanisms include "staffing of corporate board members (MCM_TMS1) – (MS = 6.19)", "key functional areas placement (e.g. engineers, supervisors, etc.) (MCM_KFOA1) – (MS = 6.16)", "provision of market knowledge (MCM_TLO2) – (MS = 6.14)", "staffing of senior executive positions (e.g., Project managers) (MCM_TMS2) – (MS = 6.02)", and "operational areas deployment (e.g. labourers) (MCM_KFOA2) – (MS = 6.00)". Overall, all the personnel MC mechanisms appeared among the top five significant MC mechanisms. Exercising MC in ICJVs through personnel is marked as an effective and direct means to manage ICJVs operations. Accordingly, these mechanisms are centred on the expertise and capability of the people placed in the position to exercise control (Ghauri et al., 2013). For

example, Selekler-Gökşen and Uysal-Tezölmez (2007) highlighted that corporate board members fulfil certain duties that include monitoring of managers who have been appointed as representative of the shareholders, provision of advice and counsel to management on administrative and other managerial issues. In doing so, they shape the ICJV's strategic goals and actions. The least significant MC mechanism was "provision of technological knowledge (MCM_TLO1) – (MS = 4.58)", and it falls under training and learning opportunities MC mechanisms. The reason for the lower rank of this MC mechanism is that local partners lack the technology and expertise to sustain rapid construction and expect foreign partners to provide them, thus, they rated it low. Besides, developing countries in general value market, cultural, and government knowledge as critical in creating competitive advantage compared to technology (Kim et al., 2011). Based on the normalization analysis (i.e., values ≥ 0.50), 13 out of the 17 MC mechanisms were identified as significant.

Table 8. 1 Mean score ranking, normalization, and Mann-Whitney *U* test statistics of the MC mechanisms in ICJVs

Code	Overall					Local partners				Foreign partners				Mann-Whitney *U* test statistics			
	Mean	SD	*p*-value	Rank	*N*-value	Mean	SD	Rank	*N*-value	Mean	SD	Rank	*N*-value	*U* stat	*W*	*Z*	*p*-value
MCM_TMS1	6.19	0.828	0.000	1	1.00*	6.39	0.812	1	1.00*	6.39	0.659	1	1.00*	445.500	1771.500	-3.848	0.000*
MCM_TMS2	6.07	0.803	0.000	3	0.88*	6.02	0.905	4	0.80*	6.15	0.619	2	0.84*	786.000	2112.000	-3.541	0.001*
MCM_KFOA1	6.05	0.790	0.000	5	0.86*	6.16	0.674	2	0.87*	6.06	0.659	3	0.66*	679.000	1258.000	-3.412	0.000*
MCM_KFOA2	6.14	0.809	0.000	2	0.95*	6.00	0.917	5	0.78*	4.88	1.111	17	4.88	668.500	1994.500	-1.697	0.090
MCM_SPPP1	5.68	0.809	0.000	10	0.52*	5.69	0.860	11	0.61*	5.67	0.736	10	0.52*	800.500	1361.500	-3.408	0.000*
MCM_SPPP2	5.85	0.829	0.000	7	0.65*	5.86	0.722	6	0.71*	5.82	0.983	8	0.62*	826.500	2152.500	-3.149	0.000*
MCM_SPPP3	5.48	0.983	0.000	13	0.50*	5.43	0.831	15	0.47	5.36	0.549	13	0.32	628.000	1189.000	-2.083	0.004*
MCM_SPPP4	5.50	0.871	0.000	12	0.51*	5.57	0.755	13	0.55*	5.39	1.029	12	0.34	817.000	1378.000	-2.244	0.008*
MCM_SPPP5	5.48	1.012	0.000	14	0.50*	5.45	0.832	14	0.48	5.52	1.253	11	0.42	746.500	2072.500	-3.922	0.000*
MCM_SPPP6	5.48	1.156	0.000	15	0.50*	5.84	0.987	8	0.70*	4.91	1.182	16	0.10	470.000	1031.000	-1.570	0.216
MCM_SPPP7	5.75	0.805	0.000	9	0.55*	5.73	0.896	9	0.64*	5.79	0.650	9	0.60*	836.000	2162.000	-4.055	0.000*
MCM_SPPP8	5.80	1.003	0.000	8	0.60*	5.63	0.896	12	0.58*	5.88	0.927	6	0.78*	663.500	1989.500	-1.754	0.080
MCM_SPPP9	5.47	1.093	0.000	16	0.50*	5.39	1.148	16	0.45	5.94	1.474	5	0.70*	770.000	1331.000	-3.716	0.000*
MCM_TLO1	5.21	0.814	0.000	17	0.00	4.58	0.750	17	0.61*	5.00	0.857	15	0.10	562.000	1123.000	-2.744	0.006*
MCM_TLO2	6.06	0.700	0.000	4	0.87*	6.14	0.723	3	0.86*	5.94	0.609	4	0.70*	699.000	1260.000	-3.448	0.000*
MCM_TLO3	5.89	0.905	0.000	6	0.69*	5.86	0.749	6	0.71*	5.12	1.088	14	0.16	741.500	2067.500	-0.984	0.325
MCM_TLO4	5.58	0.529	0.000	11	0.56*	5.69	0.775	10	0.00	5.88	0.846	6	0.66*	668.500	1869.000	-0.754	0.568

Note: Overall Cronbach's alpha = 0.891; Normalization (*N*) value = (actual mean-minimum mean)/ (maximum mean-minimum mean); SD = standard deviation; Grouping variable = developed and developing countries; *W* = Wilcoxon W; and MWU = Mann-Whitney *U* at significant level of 0.05.

[b]Represents equal mean, wherein factors with low SD are ranked higher in that order

[a]Significant *p*-values and *N*-values

Within foreign partners group, the top five significant MC mechanisms include “staffing of corporate board members (MCM_TMS1) – (MS = 6.39)”, “staffing of senior executive positions (e.g., project managers) (MCM_TMS2) – (MS = 6.15)”, “key functional areas placement (e.g., engineers, supervisors, etc.) (MCM_KFOA1) – (MS = 6.06)”, “provision of market knowledge (MCM_TLO2) – (MS = 5.94)”, and “financial and resource allocation planning (MCM_SPPP9) – (MS = 5.94)". Similarly, among these MC mechanisms, the top two ranked are linked to personnel mechanism. Foreign partners consider these MC mechanisms as a very strong measure in terms of organizational control to implement designs and ideas according to the needs of the parent firm (Wang et al., 1998). More so, the “provision of market knowledge" is seen as intangible know-how and skills that include managerial and marketing capabilities that foreign partners chance on in ICJVs to exercise control. ICJV requires effective planning and management concerning "financial and resource allocation planning". Thus, given the high expertise of foreign partners in these areas, they leverage that to exert control in ICJVs. Within this group, the least MC mechanism is "operational areas deployment (e.g., labourers) (MCM_KFOA2) – (MS = 4.88)". This is reasonable because in the developing country of Ghana, especially with construction, the Local Content and Local Participation, Regulation 2013 L.I 2204, ensure that the number of the local workforce, especially in the operational and functional areas, in ICJVs operations exceeds that of the foreign firms. Besides, Luo (2001) confirmed that foreign partners often reduce their burden by not participating at the operational level of ICJVs. 10 out of the 17 MC mechanisms are significant according to the normalization results.

The results from the Mann-Whitney *U* test indicate that these five MC mechanisms: MCM_KFOA2, MCM_SPPP6, MCM_SPPP8, MCM_TLO3, and MCM_TLO4 have significant

differences among the two respondents. As mentioned earlier, from the foreign partners' perspective, the local restrictions and dis-burden from the operational level management resulted in the reduced level of their positive evaluation of MCM_KFOA2, MCM_SPPP6, and MCM_SPPP8. Equally, MCM_TLO3 and MCM_TLO4 are more important to host/local partners for exerting control in ICJVs due to the country-specific knowledge they possess.

The top five MC mechanisms based on the overall results correspond to the respective groups, especially that of the local partners. This is because the local partners constitute most of the respondents. However, differences exist in the ranking of the MC mechanisms. For example, while "staffing of corporate board members (MCM_TMS1)" appeared first in both contexts, the remaining four MC mechanisms differ in their ranking. The normalization results proved the significance of all the MC mechanisms except "provision of technological knowledge (MCM_TLO1) – (MS = 5.21)." According to Kim et al. (2011), the competitive advantage of a firm in exercising control is more sustainable when the firm's resources are valuable, and appropriable. Based on Miller and Shamsie's (1996) classification of resources, property-based and knowledge-based resource, MCM_TLO1 could be considered as property-based – physical property primarily including resources such as machinery, facilities, and related technologies that are required for modern construction. Developing countries, such as Ghana, have been short of technology and expertise required to sustain its rapid economic development and has expected foreign firms to provide them (Isobe et al., 2000). That is to say that the technology supplied by partnered firms from the developing countries are likely to constitute a performance liability rather than asset as they are obsolete (Child and Yan, 2003). Therefore, one could understand why MCM_TLO1 was not significant. Besides, as mentioned earlier, it is the local/host partnered

firms that constitute majority of the respondents. The significant MC mechanisms are used in the PLS-SEM model to investigate their impact on the performance of ICJVs (Chapter 9).

8.3 ANALYSIS RESULTS AND DISCUSSION

8.3.1 Validation of the Performance Measures for ICJVs

Table 8.2 presents the summary of the test results of measurement reliability of ICJV performance measures. The results demonstrated that the adequacy of the initial CFA model was good enough based on the model fit indices (Tables 8.3 and 8.4). From Table 8.2, the reliability was sustained by greater composite reliability and Cronbach's alpha values (i.e., > 0.9). All the factor loadings (FL) and AVEs were greater than 0.50, indicating their significance in contributing to interpreting their respective performance constructs. Convergent validity, which tests whether all the indicators are measuring their respective constructs, was supported by high and acceptable goodness-of-fit indices as listed in Table 8.3. The goodness-of-fit indices include the ratio of chi-square to the degree of freedom (χ^2/D_f = 1.652), non-normed fit index (NNFI = 0.791), comparative fit index (CFI = 0.938), root mean square error of approximation (RMSEA = 0.063), standardized root mean square residual (SRMSR = 0.066), and Tucker-Lewis index (TLI = 0.932). From Table 8.4, discriminant validity, which tests whether all the performance measure constructs are different from each other, as evidenced with all correlations significantly different from unity and suggesting no multicollinearity. Thus, the square root of the AVE scores is greater than the off-diagonal correlations, indicating good discriminant validity. Overall, the validity of the constructs was achieved. Fig. 8 shows the final CFA model of ICJV performance measures. Although the majority of the responses were obtained from the local partners, the

involvement of the foreign partners homogenizes the results for wider adoption and implementation.

Table 8. 2 Test results of measurement reliability of ICJV performance measures

		Measurement and reliability analysis							
Code	Performance measures of ICJVs	MS	SD	FL	SE	α	AVE	CR	Rank
PP	Project-based performance	5.05	0.813	0.794	0.337	0.946	0.663	0.947	
PP1	Completing the project within budgeted cost	4.49	1.217	0.787	0.264				6
PP2	Completing the project within schedule	4.33	1.261	0.756	0.429				7
PP3	Achieving the required project quality	5.35	0.245	0.861	0.352				1
PP4	Client satisfaction	5.32	1.244	0.801	0.258				4
PP5	Good safety performance	5.58	0.197	0.823	0.361				3
PP6	Dispute resolution	4.93	0.197	0.794	0.311				5
PP7	Profitability	5.54	0.521	0.858	0.361				2
PP8	Ethics in management	4.25	1.227	0.792	0.372				8
PP9	Risk and issue management*	4.35	1.209	0.675	0.321				9
CP	Company/partner-based performance	4.99	0.854	0.770	0.265	0.971	0.735	0.970	
CP1	Sharing of risks equitably	5.65	1.358	0.659	0.310				8
CP2	Resource sharing	4.74	1.267	0.785	0.233				7
CP3	Costs reduction	5.07	0.614	0.857	0.308				4
CP4	Technology acquisition	4.55	0.584	0.876	0.294				3
CP5	Facilitating internationalization from your partner*	4.13	1.241	0.683	0.238				11
CP6	Enhancing competitiveness	5.87	0.251	0.628	0.269				9
CP7	Creating long-term relationships	5.05	0.491	0.887	0.289				2
CP8	Acquisition of managerial skills	5.52	0.867	0.612	0.203				10
CP9	Reputation	5.15	1.284	0.826	0.317				6
CP10	Communication, learning, and development	4.73	1.275	0.893	0.232				1
CP11	Market share	4.98	0.263	0.831	0.213				5
CP12	Corporate governance*	4.47	0.749	0.700	0.276				12
PM	Performance of ICJV management	4.50	0.857	0.913	0.093	0.967	0.907	0.967	
PM1	Effectiveness of the strategic control of the ICJV	4.48	0.416	0.890	0.076				3
PM2	Effectiveness of the operational control of the ICJV	4.54	1.496	0.948	0.102				1
PM3	Effectiveness of the organizational control of the ICJV	4.49	0.658	0.902	0.102				2
PS	Perceived satisfaction with the ICJV	4.51	0.436	0.911	0.293	0.970	0.836	0.850	
PS1	Overall satisfaction	4.57	0.480	0.989	0.278				1
PS2	Stability of the ICJV	4.44	0.392	0.833	0.307				2
SP	Socio-environmental performance	4.36	0.723	0.709	0.312	0.946	0.673	0.951	
SP1	Sustainable job creation	4.50	0.656	0.906	0.545				1
SP2	Stakeholder engagement	4.12	0.351	0.895	0.313				2
SP3	Labour practice/relation*	4.03	0.774	0.609	0.312				7
SP4	Philanthropy*	4.44	0.704	0.622	0.381				9
SP5	Social reporting*	4.01	1.374	0.617	0.340				6
SP6	Avoidance of material wastage	4.55	0.409	0.622	0.251				5
SP7	Environmental performance*	4.24	1.360	0.628	0.223				8

SP8	Pollution reduction	4.73	0.525	0.631	0.311	4
SP9	Environmental compliance	4.65	0.352	0.853	0.130	3

Note: SD – Standard deviation; SE – Standard error; α – Cronbach's alpha; AVE – Average variance extracted; and CR -Composite reliability; MS – Mean score; FL – Factor loading
*Item deleted for further analysis based on the two-dimensional realization analysis

Table 8. 3 Summary of CFA test fit indices for all measurement model

Measure	Recommended value	Achieved fit indices
χ^2/D_f	1 – 2	1.652
NNFI	0 (no fit) to 1 (perfect fit)	0.791
CFI	0 (no fit) to 1 (perfect fit)	0.938
RMSEA	< 0.10 indicates good fit	0.063
SRMR	< 0.10 indicates good fit	0.066
TLI	0 (no fit) to 1 (perfect fit)	0.932

Table 8. 4 Discriminant validity results

	Correlation matrix[b]				
Success DNA code	PP	CP	PM	PS	SP
PP	**0.831**				
CP	0.075	**0.870**			
PM	-0.021	-0.017	**0.969**		
PS	-0.149	0.097	0.061	**0.914**	
SP	0.130	0.010	0.090	0.2	**0.851**

Note: [b]Bold values on the diagonal represents the square root of AVE of each latent construct. Off-diagonal values are the correlation between constructs.

8.3.2 Ranking and Two-dimensional Realization Analysis of Performance Measures

From Table 8.2, the 35 indicators have been ranked within their respective dimensions based on the FL values. To conserve space, the top three performance measures within each respective dimension have been discussed in detail. Table 8.2, column 10, shows the ranking of the measures. Under project-based performance (PP), the ranking of the measures according to their FL values is given as PP3>PP7>PP5>PP4>PP6>PP1>PP2>PP8>PP9. The top three measures include "achieving the required project quality (PP3) – 0.861", "profitability (PP7) – 0.858", and "good safety performance (PP5) – 0.823". Project performance measures keep evolving in recent

times. In this era (21st century), stakeholders are more concerned with the efficiency of the project (Turner and Xue, 2018). Thus, whether the project is done right, time after time. Compared with normal-sized projects, ICJV projects receive more attention from the government, the public, and the media because of their nature (i.e., large-scale investment, political importance, and socio-economic and environmental impact). In Ghana, the majority of ICJV projects are government-funded, so the money is generated from taxes. Therefore, the public pays more attention to the news on ICJV projects, while the government implements stricter regulations for smooth construction. In a recent study by He et al. (2020), achieving the required project quality is a key benchmark of success for large and complex infrastructure projects. Profitability is an imperative project performance measure that parties accept and translate into a management framework for performance realization. Safety issues in Ghana's infrastructure projects are prevalent, compared to countries like the UK, USA, Singapore, etc. The awareness and practice of achieving "zero injuries, zero pollution, and zero accident" have been an important agenda for every construction organization in Ghana (Manu et al., 2018). One of the key measures used in pushing this agenda is that government contracts are awarded to firms who have good safety performance records.

Under company/partner-based performance (CP), the ranking of the underlying measures is given as CP10>CP7>CP4>CP3>CP11>CP9>CP2>CP1>CP6>CP8>CP5>CP12. The primary objective to enter ICJV especially for firms in developing countries is to build capacity in diverse forms, including include but not limited to knowledge acquisition, improve managerial skills, etc. (Chan et al., 2020). It is, therefore, not surprising that performance measures such as “communication, learning, and development (CP10) – 0.893”, “creating long-term relationships

(CP7) – 0.887", and "technology acquisition (CP4) – 0.876", appeared as the highly ranked metrics. According to Ozorhon and Oral (2017) realization of these factors significantly contributes to improving sustainability in the construction environment worldwide. Under performance of ICJV management (PM), the ranking of the underlying measures is as follows: PM2>PM3>PM1. The "effectiveness of exercising operational control of the ICJV (PM2) – 0.948" and "effectiveness of the organizational control of the ICJV (PM3) – 0.902" are considered as key measures of ICJV performance as they are not dependent on equity position of corporate firms. Similarly, under perceived satisfaction with the ICJV (PS), the rankings of the measures is given as PS1>PS2. "Overall satisfaction (PS1 – 0.989" gives an overall impression of the ICJVs performance beyond all financial and objective assessment. According to Mohamed (2003), overall satisfaction allows managers to have a continued relationship with their partners beyond the project under investigation. Lastly, the ranking of the underlying measures under the socio-environmental dimension (SP) is given as SP1>SP2>SP9>SP8>SP6>SP5>SP3>SP7>SP4. The top three indicators are "sustainable job creation (SP1) – 0.906", "stakeholder engagement (SP2) – 0.895", and "environmental compliance (SP9) – 0.853". ICJVs create massive job opportunities and stimulate job mobility, especially in the local/host markets. Job creation is always viewed as an important measure for assessing the performance of ICJVs. In Ghana, the local content policy, Regulation 2013 L.I 2204, ensures that the number of local workforces in ICJVs operations exceeds that of the foreign firms. Also, the large and complex projects of which ICJVs are formed to deliver lie in improving people's lives and facilitating social development (Shen et al., 2011). Without satisfying the needs of stakeholders, the project may be regarded as a failure (He et al., 2020). Therefore, the performance of ICJVs is also connected to the success in engaging key stakeholders. More so, in Ghana, there are regulations governing the

environmental practices of infrastructure projects, and ICJVs need to adhere to those policies. Compliance with those regulations represents a great mark of performance for ICJVs. Overall, the highly ranked variables suggest that ICJVs performance is more focused on efficiency, societal improvement, and organizational gains.

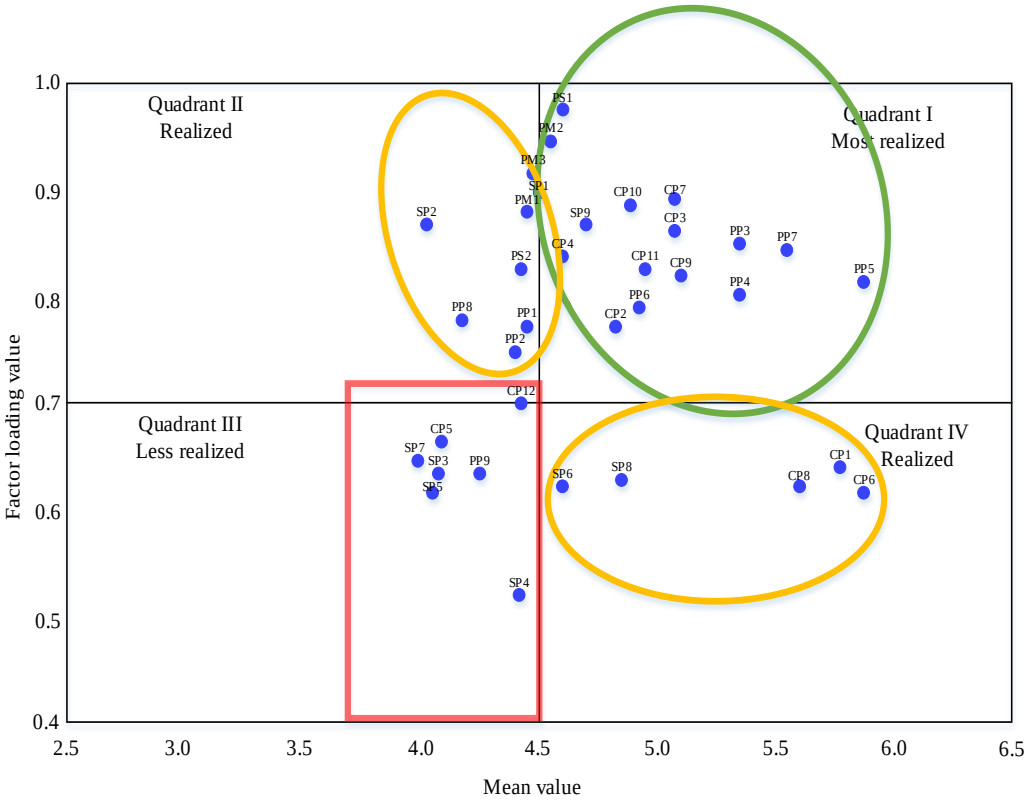

Fig. 8. 1 Two-dimensional realization analysis diagram of performance measures

After verifying the significance of the performance measures based on the first part of the survey which focuses on the importance of the measures, a two-dimensional realization analysis was conducted based on the second part of the survey – level of realization of the performance measures. To demonstrate rigor, the FL values from the first part of the survey and the MSs (third column of Table 8.2) of the performance realization data were combined to identify the

most significant and mutually acceptable performance measures based on their realization in ICJVs (see for example, Yuan et al., 2018). It was necessary to do so because a performance measure may have the highest FL value, but the MS value may below as compare with those in the same group. Fig. 8.1 shows the two-dimensional realization analysis diagram of performance measures. This helped to identify the most realized and less realized performance measures of ICJVs in Ghana. The significant measures in terms of realization are used for the PLS-SEM model (Chapters 9 and 10). From Fig. 8.1, with MSs on the *x*-axis and FL values on the *y*-axis, the "*most realized"* measures fall in Quadrant I, where both the MS and FL value exceeds the average (FL = 0.70 and MS = 4.5). Conversely, when both the MS and FL values are below the average, the measure is defined as "*less realized"* and falls within Quadrant III. Thus, all the measures that fell within Quadrant III (SP3, SP4, SP5, SP7, PP9, CP5, CP12) were not included in the subsequent analysis. On the other hand, when either the MS value or the FL exceeds the average, the measure is projected as "*realized"* and falls within Quadrant II or IV. As shown in Fig. 8.1, 16, and 12 indicators fell in Quadrant I – *"most realized"* and Quadrant II/IV – *"realized"*, respectively. Among the 16 measures that fell in Quadrant I, the majority (7) of the indicators were related to company/partner-based performance. This demonstrates that ICJVs performance measurement is directly linked to the partnering firms. In Ozorhon et al's. (2010a) investigation of the Turkish partners of ICJVs, the company/partner-based performance dimension was rated high among the other constructs explaining the multidimensionality of ICJVs performance. The goal incongruence among partners in ICJV prelude the attention for this performance measure dimension. The results further indicate that majority of the measures that promote sustainability are *"less realized"* – Quadrant III (i.e., "labour practice/relation – SP3", "philanthropy – SP4", "social reporting – SP5" and "environmental performance – SP7").

Despite the unbalanced views and infancy of sustainable performance attainability, especially in developing countries (Goyal et al., 2013; Shen et al., 2016; Sun et al., 2020), one of the possible reasons that could result in the less realization of the socio-environmental performance measures may be due to a lack of suitable determinants or indicators for the successful performance management. According to Yeung et al. (2008), the poor semantic interpretations of these measures are as a result of the lack of complete convergence between the practice of and research into the determinants of the measures, thus making performance monitoring and benchmarking difficult. Tetteh et al. (2019) mentioned that leveraging corporate sustainability performance measures in corporate firms contributes to sustainable development and value for society, ecosystems, and business. Aside from helping practitioners to improve their organizational performance towards sustainability potentials by modifying their present approach, it will also necessitate the development of more strategic evaluation tools for determining their sustainability drive.

8.4 CHAPTER SUMMARY

This chapter aimed to identify the significant mechanisms use to exercise MC in ICJVs and to identify, validate, and rank the measures for assessing the performance of ICJVs in Ghana. A comprehensive literature review and expert interviews were conducted to identify 17 MC mechanisms and 35 ICJVs performance measures that were presented in a questionnaire. An empirical questionnaire was carried out with 84 ICJV practitioners to identify the significant factors. The analysis results indicated that 16 out of the 17 MC mechanisms were significant in ICJVs. Among the significant MC mechanisms, “staffing of corporate board members”, “staffing of senior executive positions (e.g., project managers)”, “key functional areas placement (e.g.,

engineers, supervisors, etc.)", "provision of market knowledge" and "operational areas deployment (e.g. labourers)" were the top five significant MC mechanisms. Mann-Whitney *U* test results also showed some significant differences in the rankings of the MC mechanisms between the two respondents. The results indicated that all the measures are significant and valid for assessing the performance of ICJVs. The top most significant measures within each respective performance dimension: "project-based performance", "company/partner-based performance", "performance of ICJV management", "perceived satisfaction with the ICJV", and "socio-environmental performance" are "achieving the required project quality", "communication, learning, and development", "effectiveness of operational control", "overall satisfaction", and "sustainable job creation", respectively. The results also revealed that 28 out of the 35 performance measures are realized. Overall, not much is realized of the underlying measures of socio-environmental performance. This calls for further investigation to find a point of convergence between the practice of, and research into the socio-environmental performance of ICJVs.

The following chapter reports the PLS-SEM model findings on the impact of the MC mechanisms and the performance of ICJVs in Ghana.

CHAPTER 9 DATA ANALYSIS AND RESULTS – MC MECHANISMS AND PERFORMANCE IMPLICATIONS IN ICJVs IN GHANA[9]

9.1 INTRODUCTION

The previous chapter analyzes the MC mechanisms and performance measures of ICJVs and identified the significant variables underlying the two concepts that are relevant for further analysis. The present chapter aims to investigate the performance implications of MC mechanisms in ICJVs in Ghana. Note that the significant factors identified in Chapter 8 were used in this chapter. To this end, PLS-SEM is applied to investigate and model the impact of MC mechanisms on the performance of ICJVs. This chapter contributes to the ICJV body of knowledge by analyzing the impact of MC mechanisms on the ICJVs performance, enabling ICJVs practitioners and policymakers to better enhance their control structures and the ICJVs performance. A model that shows the performance impacts of MC mechanisms from both perspectives is necessary to deepen the understanding of that relationship. This greater understanding can act as the foundation for improved ICJVs management heuristics, allowing the venture to modify its mechanisms and to develop alternatives for improving overall performance.

[9] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Oppong, G.D., Nani, G., and Darko, Amos (under review). Impacts of Management Control Mechanisms on the Performance of International Construction Project Joint Ventures, ASCE's *Journal of Management in Engineering*, Ref.: Ms. No. MEENG-4338.

Tetteh, M. O., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. Engineering, Construction and Architectural Management. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

9.2 OVERALL RESEARCH MODEL AND ANALYSIS

In this chapter, the MC mechanisms have been mapped to the performance measures of ICJVs (Fig. 9.1). Fig 9.2 and Table 9.1 show the expanded model of the research framework and the constructs and their corresponding measurement items, respectively. It is proposed that each of the MC mechanisms positively influences ICJV performance. These propositions are established in a dual perspective (i.e., local, and foreign partners perspectives) to understand the dynamics of control effects on performance within the developing country of Ghana as well as develop a clear-cut and more focused strategies to improve overall performance. The succeeding sections discuss the rationalization behind the model development.

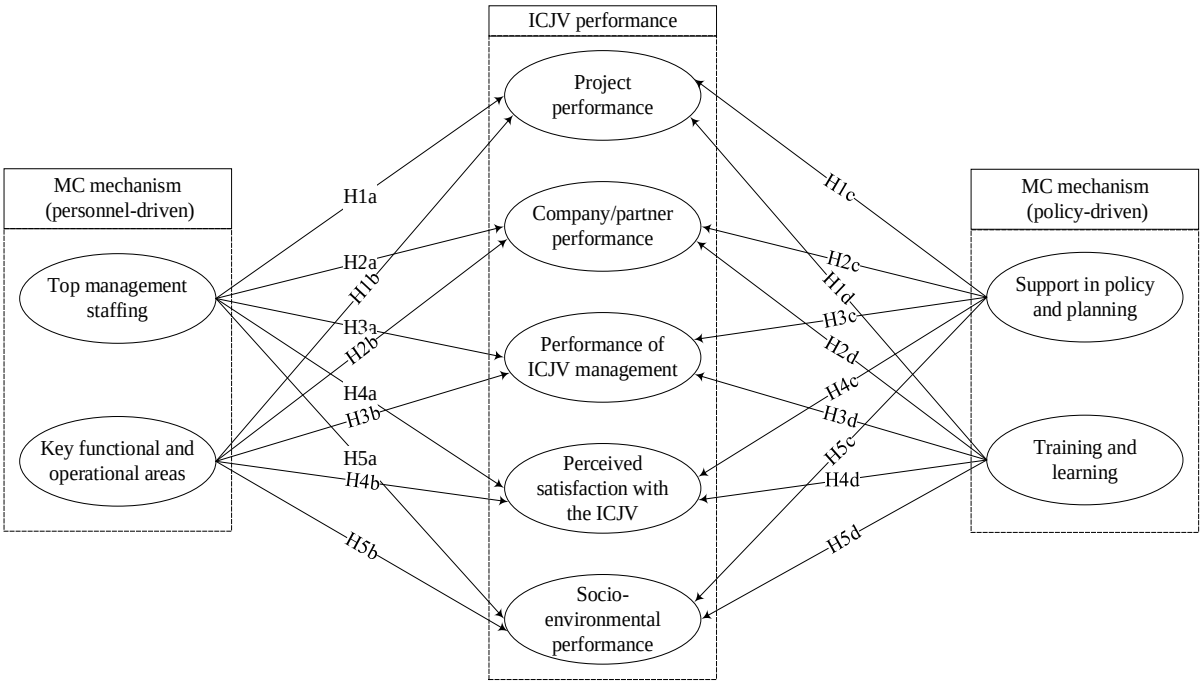

Fig. 9. 1 Research model

Table 9. 1 Constructs and their corresponding measurement items

Constructs	Code	Measurement items
MC mechanisms in ICJVs		

Top Management Staffing	MCM_TMS1	Staffing of corporate board members
	MCM_TMS2	Staffing of senior executive positions (e.g., Project managers)
Key Functional and Operational Areas	MCM_KFOA1	Key functional areas placement (e.g., Engineers, supervisors, etc.)
	MCM_KFOA2	Operational areas deployment (e.g., labourers)
Support in Policy and Planning Process	MCM_SPPP1	Human rights policies
	MCM_SPPP2	Making development plans
	MCM_SPPP3	Evaluating project feasibility considering environmental impacts
	MCM_SPPP4	Establishing codes of ethics for projects
	MCM_SPPP5	Health and safety issues
	MCM_SPPP6	Monitoring and reporting
	MCM_SPPP7	Laying down procedures and routines for the ICJV
	MCM_SPPP8	Support in supervisory role
	MCM_SPPP9	Financial and resource allocation planning
Training and Learning Opportunities	MCM_TLO2	Provision of market knowledge
	MCM_TLO3	Provision of cultural knowledge
	MCM_TLO4	Provision of knowledge on governmental issues
ICJV performance measures		
Project-based Performance	PERM_PP1	Completing the project within budgeted cost
	PERM_PP2	Completing the project within schedule
	PERM_PP3	Achieving the required project quality
	PERM_PP4	Client satisfaction
	PERM_PP5	Good safety performance
	PERM_PP6	Dispute resolution
	PERM_PP7	Profitability
	PERM_PP8	Ethics in management
Company/Partner-based Performance	PERM_CP1	Sharing of risks equitably
	PERM_CP2	Resource sharing
	PERM_CP3	Costs reduction
	PERM_CP4	Technology acquisition
	PERM_CP6	Enhancing competitiveness
	PERM_CP7	Creating long-term relationships
	PERM_CP8	Acquisition of managerial skills
	PERM_CP9	Reputation
	PERM_CP10	Communication, learning, and development
	PERM_CP11	Market share
Performance of ICJV Management	PERM_PM1	Effectiveness of the strategic control of the ICJV
	PERM_PM2	Effectiveness of the operational control of the ICJV
	PERM_PM3	Effectiveness of the organizational control of the ICJV
Perceived Satisfaction with the ICJV	PERM_PS1	Overall satisfaction
	PERM_PS2	Stability of the ICJV
Socio-environmental performance	PERM_SP1	Sustainable job creation
	PERM_SP2	Stakeholder engagement
	PERM_SP6	Avoidance of material wastage
	PERM_SP8	Pollution reduction
	PERM_SP9	Environmental compliance

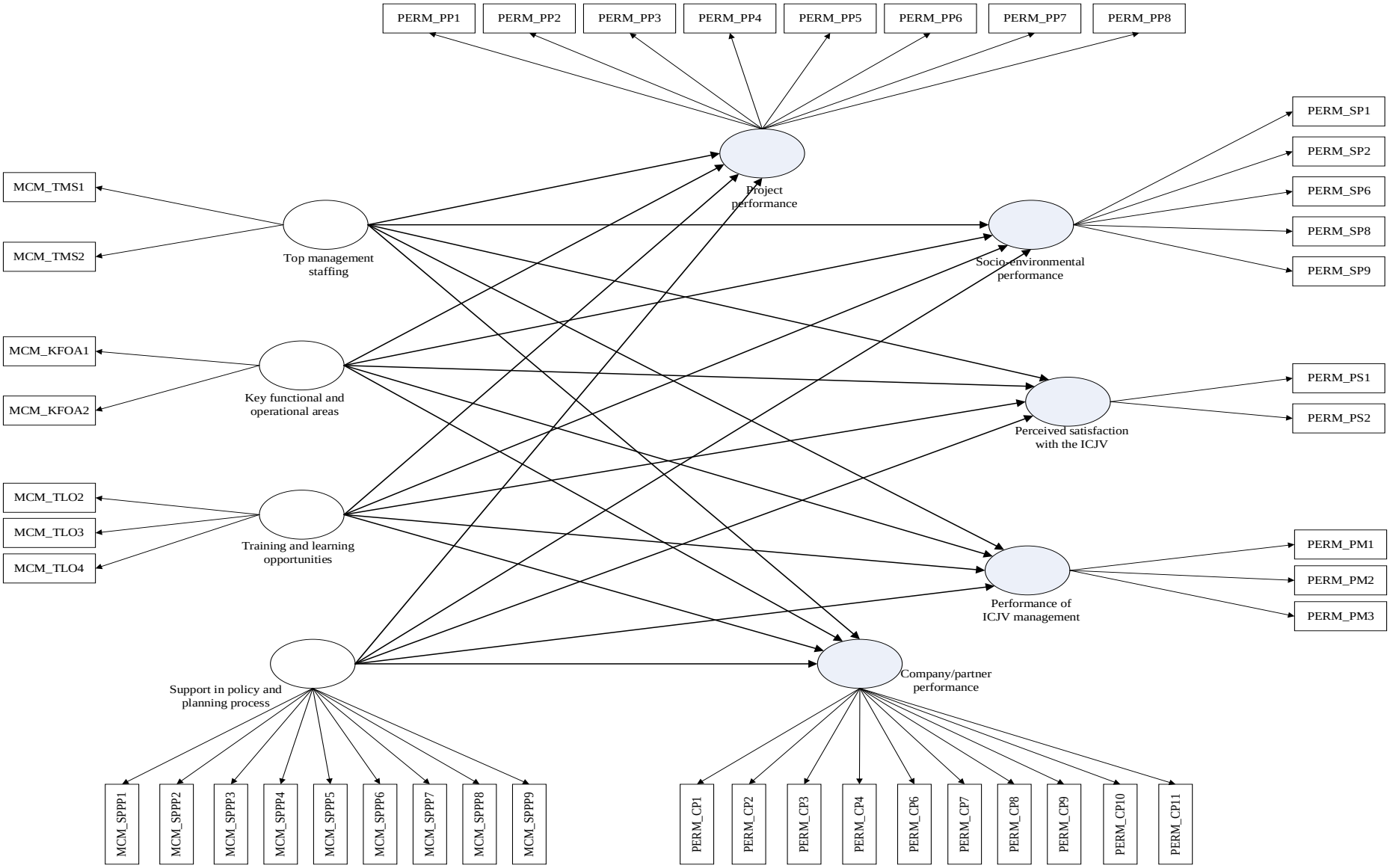

Fig. 9. 2 The expanded research model

9.2.1 Personnel-driven Mechanisms

9.2.1.1 Top management staffing (TMS) and ICJV performance

The most direct and persuasive positions to exercise control in international collaboration are on the corporate board members (Reuer et al., 2014; Cuypers et al., 2017). Board members, in general, engage in organization-wide fundamental and strategic decisions that shape the long-term performance goal of organizations. TMS represents an important aspect of organizational control used to bring to success the operational objectives of the parent firm (Ghuari et al., 2013). With ICJVs hosted in developing countries, given the limited capacities of local partners (Chan et al., 2020), foreign partners' competence reflected in their superior technological and organizational skills can redress the strategic weakness of local partners and determine the venture's sustained competitive position in the local market. Thus, concerning performance, foreign partners enhance ICJV's capabilities (to achieve faster results more wisely and promote sustainability) and satisfaction by maintaining leadership and strategic control through TMS. Prior studies have emphasized that with foreign parents' directives and control, the venture is less likely to make operational mistakes or losses, thereby improving IJV's productivity (Ravasi and Zattoni, 2006; Li et al., 2009).

Conversely, efficiency considerations suggest that exclusively relying on foreign partners' management at the board level without local partners' involvement may stunt the overall achievements of the ICJV due to information asymmetry (Cuypers et al., 2017). ICJVs projects are complex and need to be delivered on time. The unpredictability of host/local environments, especially in developing countries, poses a great challenge to foreign partners occupying top

management positions (Hwang et al., 2017). ICJV performance will be affected as foreign partners' ability to adapt to the local environment and connect to local stakeholders to secure resources critical to the success of the venture will not be timely. Under such circumstances, the involvement of local partners will speed up decision-making on policies or other changes and transacting with local stakeholders on a timely basis as local conditions dictate (Reuer et al., 2014). Similarly, in contributing to sustainability-related objectives, the essential market dialogue in the host/local environment needs to be better understood. Thus, ICJV sustainability performance should benefit from the local partners' understanding of the local market. This not only impacts the performance of ICJVs positively but also leaves the guiding principles to local partners to apply their directions or goals upon the ICJV. Overall, TMS is a vital mechanism used in creating control in an ICJV. It is, therefore, proposed that:

H1a. Staffing top management positions with foreign/local partners positively relates to ICJV project performance.

H2a. Staffing top management positions with foreign/local partners positively relates to company/partner performance in ICJV.

H3a. Staffing top management positions with foreign/local partners positively relates to performance of ICJV management.

H4a. Staffing top management positions with foreign/local partners positively relates to perceived satisfaction with the ICJV.

H5a. *Staffing top management positions with foreign/local partners positively relates to socio-environmental performance of ICJV.*

9.2.1.2 Key functional and operational areas (KFOAs) placement and ICJV performance

Another significant personnel-based control mechanism relevant to both foreign and local partners is KFOAs' position. Despite institutional/local policies that support the majority of local parties staffing in these areas especially in developing countries (Luo, 2001), the knowledge and expertise held by foreign partners in these areas will help streamline processes to better enhance the capacity, efficiency, and quality of ICJV operations. Foreign partners are attuned to cleaner technologies and advanced environmental systems and practices, granting them the operational power to standardized environmental management systems across their operations. Le Nguyen et al. (2019) argued that foreign partners' engagement in these areas promotes inter-organizational learning and innovation, which positively impacts firms' capabilities and venture performance. Ghuari et al. (2013) maintained that an increase in performance related to this function is that as the knowledge base is greater and the hands-on experience is readily available there will be smoother integration and transfer of technology between firms in the IJV.

One of the core socio-environmental attributes of ICJVs is job creation, which local/host countries normally benefit from (Tetteh et al., 2019). Local partners occupying KFOA positions (e.g., supervisors, engineers, etc.) directly improve ICJVs performance as they have access to and ability to manage the local workforce towards a predefined ICJV project goal (Kim et al., 2011). Previous research has pointed out that local partners' involvement is necessary for IJVs to realize superior performance (Luo et al., 2001; Selekler-Gökşen and Uysal-Tezölmez, 2007). More so, the increased involvement of local partners in the day-to-day operations of the venture improves company/partner performance and overall project performance. More importantly,

participation and involvement promote work motivation as well as increase partner satisfaction. Therefore, the propositions are stated as follows:

H1b. The deployment of foreign/local partners in KFOAs positively relates to ICJV project performance.

H2b. The deployment of foreign/local partners in KFOAs positively relates to company/partner performance in ICJV.

H3b. The deployment of foreign/local partners in KFOAs positively relates to performance of ICJV management.

H4b. The deployment of foreign/local partners in KFOAs positively relates to perceived satisfaction with the ICJV.

H5b. The deployment of foreign/local partners in KFOAs positively relates to socio-environmental performance of ICJV.

9.2.2 Policy-driven mechanisms

9.2.2.1 Support in policy and planning process (SPPP) and ICJV performance

The operational competencies of foreign partners directly indicate that ICJV relies upon their direct participation through the policy and planning process. Similarly, this mechanism becomes very important when discussing foreign partners' technological input as it relates to both the perception of control and the ability to protect sensitive information (Mjoen and Tallman, 1997). The level of involvement of foreign partners in this area contributes significantly to knowledge creation and transfer within ICJVs (Steensma and Lyles, 2000). The implications are that it helps ICJV fill knowledge gaps, increase innovation and corporate sustainability attainment, encourage

leadership, improve the efficiency of ICJV and partnering firms, and thus prevent negative performance impact (Martin and Emptage, 2019). The utilization of prior knowledge and experience in the support role by foreign partners eliminates predictions and uncertainty faced by new ventures.

On the other hand, active engagement of local partners in this area sends a signal to them as insiders (Li et al. 2009). This increases their satisfaction and invariably enhances venture management and performance. It is also difficult for foreign partners to completely mimic local practices with which they have little experience. For example, misunderstanding of the host countries' socio-cultural norms results in missteps when foreign partners are actively involved in this area (Shah, 2015). It could also be in the form of misinterpreting environmental regulations, antagonizing government officials, making decisions that negatively impact local ecology, and taking stances that earn public disdain. As firms are repositors of knowledge, local knowledge in the planning of IJVs activities stands out as a major determinant of sustainable competitive advantage (Dimitratos et al., 2010). That is strengthening corporate competitiveness which enhances the overall performance of the venture. The local partner by providing support (intangible firm-specific resource) provides a direct link to the ICJV to maneuver around pitfalls or implement better for every success of the venture. Similarly, the venture can reduce transaction costs related to the "trial and error" behaviour in management. Based on these arguments, it is proposed that:

H1c. Foreign/local partner's SPPP positively relates to ICJV project performance.

H2c. Foreign/local partner's SPPP positively relates to company/partner performance in ICJV.

H3c. Foreign/local partner's SPPP positively relates to performance of ICJV management.

H4c. Foreign/local partner's SPPP positively relates to perceived satisfaction with the ICJV.

H5c. Foreign/local partner's SPPP positively relates to socio-environmental performance of ICJV.

9.2.2.2 Provision of training and learning opportunities (TLOs) and ICJV performance

Drawing on the tenets of the resource-based theory, organizations form ICJVs for efficient development and deployment of firm resources. Thus, the differences in partner skills and knowledge provide the catalyst for learning (Inkpen, 2000; Huang et al., 2015b). This allows for a common understanding to be built and enhances knowledge creation for members of ICJVs. Foreign partners apply this mechanism through the placement of norms and processes and the communication between partnering firms and employees (Ghuari et al., 2013). Le Nguyen et al. (2019) supported that TLOs provided by the foreign partner enhance the performance of partners and the overall performance of IJVs. Huang et al. (2015a) observed that it helps to lower both the cost of information sharing and the level of information asymmetry among partners as well as mitigate potential concerns of opportunism and reduce transaction cost to improve venture performance satisfaction.

Similarly, the TLOs provided by the local partner, which includes knowledge of the market – local business practice, governmental issues, and culture are important determinants of ICJVs success. Kim et al. (2011) mentioned that the knowledge provided by the local partner fosters cooperation for the smooth management and performance of IJVs. Without the TLOs provided by the local partner, ICJVs would be left to the creation of their norms and processes contrary to the institutional norms of the host country; thus, lessening its overall value and potentially

creating gaps and flaws in the ICJV operations (Zhang et al., 2010). Therefore, the propositions are stated as follows:

H1d. The provision of TLOs by foreign/local partners positively relates to ICJV project performance.

H2d. The provision of TLOs by foreign/local partners positively relates to company/partner performance in ICJV.

H3d. The provision of TLOs by foreign/local partners positively relates to performance of ICJV management.

H4d. The provision of TLOs by foreign/local partners positively relates to perceived satisfaction with the ICJV.

H5d. The provision of TLOs by foreign/local partners positively relates to socio-environmental performance of ICJV.

9.3 PLS-SEM RESULTS

9.3.1 Measurement Model Evaluation

The measurement model was assessed by checking convergent and discriminant validity. Three indices were used to examine the convergent validity, namely Cronbach alpha, composite reliability (CR), and average variance extracted (AVE). In this study, for both the local and foreign partners, the Cronbach alpha and CR score were above the cut-off value of 0.7, and AVE was above the threshold value of 0.5 (Fornell and Larcker, 1981). This was achieved after removing all measurement items with low loadings (< 0.5) (Zaman et al., 2019). Discriminant validity was also assessed in terms of the Heterotrait-monotrait (HTMT) criterion. The HTMT leaves behind classic approaches such as the Fornell-Larcker criterion and cross-loading. The

HTMT values were below the threshold of 0.85 (Henseler et al., 2015). Tables 9.2, 9.3, and 9.4 present the reliability and validity, and the HTMT results for both local and foreign partners.

Table 9. 2 Measurement model evaluation (reliability and validity analysis)

		Local partner				Foreign partner			
Construct	Code	FL	α	CR	AVE	FL	α	CR	AVE
MCM_TMS	MCM_TMS1	0.894	0.841	0.924	0.858	0.940	0.913	0.947	0.899
	MCM_TMS2	0.959	-	-	-	0.956	-	-	-
MCM_KFOA	MCM_KFOA1	0.941	0.914	0.946	0.898	1.000	1.000	1.000	1.000
	MCM_KFOA2*	0.953	-	-	-	-	-	-	-
MCM_SPPP	MCM_SPPP1	0.800	0.912	0.947	0.665	0.843	0.899	0.941	0.644
	MCM_SPPP2	0.814	-	-	-	0.796	-	-	-
	MCM_SPPP3	0.803	-	-	-	0.563	-	-	-
	MCM_SPPP4	0.819	-	-	-	0.615	-	-	-
	MCM_SPPP5	0.831	-	-	-	0.781	-	-	-
	MCM_SPPP6	0.788	-	-	-	0.876	-	-	-
	MCM_SPPP7	0.802	-	-	-	0.869	-	-	-
	MCM_SPPP8	0.835	-	-	-	0.901	-	-	-
	MCM_SPPP9	0.847	-	-	-	0.897	-	-	-
MCM_TLO	MCM_TLO2	0.836	0.801	0.893	0.736	0.829	0.877	0.929	0.814
	MCM_TLO3	0.914	-	-	-	0.654	-	-	-
	MCM_TLO4*	0.821	-	-	-	-	-	-	-
PERM_PP	PERM_PP1	0.578	0.896	0.928	0.720	0.857	0.885	0.933	0.610
	PERM_PP2	0.756	-	-	-	0.628	-	-	-
	PERM_PP3	0.820	-	-	-	0.706	-	-	-
	PERM_PP4	0.850	-	-	-	0.838	-	-	-
	PERM_PP5	0.871	-	-	-	0.783	-	-	-
	PERM_PP6	0.778	-	-	-	0.823	-	-	-
	PERM_PP7	0.878	-	-	-	0.782	-	-	-
	PERM_PP8*	-	-	-	-	0.742	-	-	-
PERM_CP	PERM_CP1	0.851	0.889	0.920	0.514	0.765	0.789	0.841	0.515
	PERM_CP2	0.671	-	-	-	0.790	-	-	-
	PERM_CP3	0.760	-	-	-	0.645	-	-	-
	PERM_CP4*	0.596	-	-	-	-	-	-	-
	PERM_CP6*	0.838	-	-	-	-	-	-	-
	PERM_CP7*	0.661	-	-	-	-	-	-	-
	PERM_CP8*	0.654	-	-	-	-	-	-	-
	PERM_CP9*	0.834	-	-	-	-	-	-	-
	PERM_CP10	0.717	-	-	-	0.744	-	-	-
	PERM_CP11	0.763	-	-	-	0.635	-	-	-
PERM_PM	PERM_PM1	0.780	0.786	0.842	0.729	0.858	0.904	0.947	0.856
	PERM_PM2	0.922	-	-	-	0.942	-	-	-
	PERM_PM3	0.784	-	-	-	0.972	-	-	-
PERM_PS	PERM_PS1	0.945	0.897	0.936	0.880	0.963	0.935	0.965	0.933
	PERM_PS2	0.931	-	-	-	0.969	-	-	-
PERM_SP	PERM_SP1	0.600	0.875	0.906	0.623	0.895	0.948	0.973	0.803
	PERM_SP2	0.611	-	-	-	0.921	-	-	-
	PERM_SP6	0.953	-	-	-	0.913	-	-	-
	PERM_SP8*	-	-	-	-	0.853	-	-	-
	PERM_SP9	0.718	-	-	-	0.963	-	-	-

Note: MCM_TMS = Management control mechanism_top management staffing; MCM_KFOA = Management control mechanism_ Key functional and operational areas; MCM_SPPP = Management control mechanism_ support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities; PERM_PP =

Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_PM = Performance measure_performance of ICJV management; PERM_PS = Performance measure_perceived satisfaction with the ICJV; PERM_SP = Performance measure_socio-environmental performance; CR = Composite reliability; AVE = Average variance extracted; FL = Factor loading; α = Cronbach's alpha
*Items deleted as a result of scale purification

Table 9. 3 $HTMT_{.85}$ results (for local partner)

	Correlation matrix								
Constructs	PERM_PP	PERM_CP	PERM_PM	PERM_PS	PERM_SP	MCM_TMS	MCM_KFOA	MCM_SPPP	MCM_TLO
PERM_PP									
PERM_CP	0.120								
PERM_PM	0.244	0.146							
PERM_PS	0.098	0.337	0.104						
PERM_SP	0.159	0.194	0.303	0.122					
MCM_TMS	0.203	0.217	0.157	0.317	0.052				
MCM_KFOA	0.133	0.264	0.341	0.150	0.223	0.451			
MCM_SPPP	0.113	0.241	0.179	0.085	0.301	0.158	0.209		
MCM_TLO	0.121	0.573	0.373	0.212	0.092	0.121	0.265	0.097	

Note: PERM_PP = Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_PM = Performance measure_performance of ICJV management; PERM_PS = Performance measure_perceived satisfaction with the ICJV; PERM_SP = Performance measure_socio-environmental performance; MCM_TMS = Management control mechanism_top management staffing; MCM_KFOA = Management control mechanism_ Key functional and operational areas; MCM_SPPP = Management control mechanism_ support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities

Table 9. 4 $HTMT_{.85}$ test results (for foreign partner)

	Correlation matrix								
Constructs	PERM_PP	PERM_CP	PERM_PM	PERM_PS	PERM_SP	MCM_TMS	MCM_KFOA	MCM_SPPP	MCM_TLO
PERM_PP									
PERM_CP	0.208								
PERM_PM	0.228	0.205							
PERM_PS	0.134	0.229	0.476						
PERM_SP	0.246	0.203	0.133	0.596					
MCM_TMS	0.141	0.289	0.186	0.689	0.356				
MCM_KFOA	0.209	0.312	0.061	0.079	0.138	0.166			
MCM_SPPP	0.264	0.264	0.175	0.220	0.200	0.195	0.142		
MCM_TLO	0.219	0.276	0.254	0.086	0.133	0.253	0.056	0.491	

Note: PERM_PP = Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_PM = Performance measure_performance of ICJV management; PERM_PS = Performance measure_perceived satisfaction with the ICJV; PERM_SP = Performance measure_socio-environmental performance; MCM_TMS = Management control mechanism_top management staffing; MCM_KFOA = Management control mechanism_ Key functional and operational areas; MCM_SPPP = Management control mechanism_ support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities

9.3.2 Structural Model Evaluation

After the establishment of measurement model adequacy, the path coefficients of the constructs were assessed. The bootstrapping technique was applied to cross-validate the path coefficient values. The variance described (R^2) of the outcome variables (ICJV performance) and *p*-values of path estimates were used to determine the model predictive accuracy and statistical significance of the relationships, respectively. As respectively shown in Figs. 9.3 and 9.4 for local and foreign partners, the models being tested have a moderate level of predictive quality and accuracy as the R^2 for all the outcome variables was above 0.47 (Hair et al., 2011; Henseler, 2017). Table 9.5 presents the hypotheses test results for Local and Foreign partners. From the local partners' perspectives, for the TMS and ICJV performance as predicted, two of the hypotheses were supported. That is, H1a and H4a – TMS is significantly positively associated with project performance ($\beta = 0.398$, $p < .01$) and perceived satisfaction with ICJV ($\beta = 0.326$, $p < .01$), respectively. With regards to KFOAs, staffing local partners in KFOAs also correlated positively with project performance – H1b ($\beta = 0.334$, $p < .05$), company/partner performance – H2b ($\beta = 0.314$, $p < .05$), performance of ICJV management – H3b ($\beta = 0.265$, $p < .1$), and perceived satisfaction with ICJV – H4b ($\beta = 0.420$, $p < .01$).

In relation to policy control, a significantly positive relationship was observed between SPPP by local partners and project performance – H1c ($\beta = 0.514$, $p < .01$), company/partner performance – H2c ($\beta = 0.354$, $p < .01$), and performance of ICJV management – H3c ($\beta = 0.293$, $p < .05$). Likewise, TLO provided by the local partners is significantly associated with project performance – H1d ($\beta = 0.426$, $p < .01$), company/partner performance – H2d ($\beta = 0.276$, $p < .05$), performance of ICJV management – H3d ($\beta = 0.277$, $p < .05$), and socio-environmental

performance – H5d (β = 0.215, $p < .01$). Fig.3 shows the final MC mechanisms and ICJV performance model for local partners.

Interestingly, with regards to TMS control from the foreign partners perspective, H1a-H5a showed a strong support in improving the five different ICJV performance (Table 9.5). KFOAs displayed positive, significant effects on project performance – H1b (β = 0.384, $p < .01$), performance of ICJV management – H3b (β = 0.358, $p < .01$), and socio-environmental performance – H5b (β = 0.262, $p < .1$). The results also support the proposed conception of SPPP control and show significant relational effects on project performance – H1c (β = 0.227, $p < .01$), performance of ICJV management – H3c (β = 0.353, $p < .05$), and socio-environmental performance – H5c (β = 0.332, $p < .1$). TLO is significantly positively associated with project performance – H1d (β = 0.354, $p < .05$), and socio-environmental performance – H5d (β = 0.395, $p < .05$). Fig. 4 shows the final MC mechanisms and ICJV performance model for foreign partners.

Table 9. 5 Tests results (for local and foreign partner)

Hypothesis	Local partner				Foreign partner			
	Path coefficient	*t*-Value	*p*-Value	Inference	Path coefficient	*t*-Value	*p*-Value	Inference
H1a: TMS –> PP	0.398	2.964	0.003***	Supported	0.443	2.168	0.047**	Supported
H2a: TMS –> CP	-0.179	1.025	0.547	Not supported	0.336	1.894	0.078*	Supported
H3a: TMS –> PM	0.106	0.571	0.352	Not supported	0.501	3.284	0.000***	Supported
H4a: TMS –> PS	0.326	2.801	0.007***	Supported	0.635	4.456	0.006***	Supported
H5a: TMS –> SP	-0.088	0.800	0.410	Not supported	0.334	1.748	0.027*	Supported
H1b: KFOAs –> PP	0.334	2.503	0.024**	Supported	0.384	2.616	0.002***	Supported
H2b: KFOAs –> CP	0.314	2.466	0.013**	Supported	-0.241	1.118	0.253	Not supported
H3b: KFOAs –> PM	0.265	1.851	0.099*	Supported	0.469	3.348	0.009***	Supported
H4b: KFOAs –> PS	0.420	3.634	0.000***	Supported	0.358	2.627	0.000***	Supported
H5b: KFOAs –> SP	0.259	1.683	0.106	Not supported	0.262	1.677	0.011*	Supported
H1c: SPPP –> PP	0.514	4.123	0.000***	Supported	0.227	1.857	0.043*	Supported
H2c: SPPP –> CP	0.354	2.669	0.002***	Supported	0.209	0.762	0.443	Not supported
H3c: SPPP –> PM	0.293	2.095	0.044**	Supported	0.353	2.223	0.041**	Supported
H4c: SPPP –> PS	0.045	0.200	0.846	Not supported	0.256	1.821	0.393	Not supported
H5c: SPPP –> SP	-0.329	2.336	0.050**	Not supported	0.332	1.685	0.082*	Supported
H1d: TLO –> PP	0.426	3.655	0.000***	Supported	0.354	2.671	0.002**	Supported
H2d: TLO –> CP	-0.276	1.997	0.010**	Not supported	-0.191	0.609	0.540	Not supported
H3d: TLO –> PM	0.277	1.858	0.014*	Supported	0.231	0.921	0.334	Not supported
H4d: TLO –> PS	0.054	0.252	0.802	Not supported	-0.073	0.317	0.741	Not supported
H5d: TLO –> SP	0.215	2.095	0.000***	Supported	0.395	2.416	0.036**	Supported

Note: ***Indicates significance level at $p < 0.01$; **Indicates significance level at $p < 0.05$; *Indicates significance level at $p < 0.1$

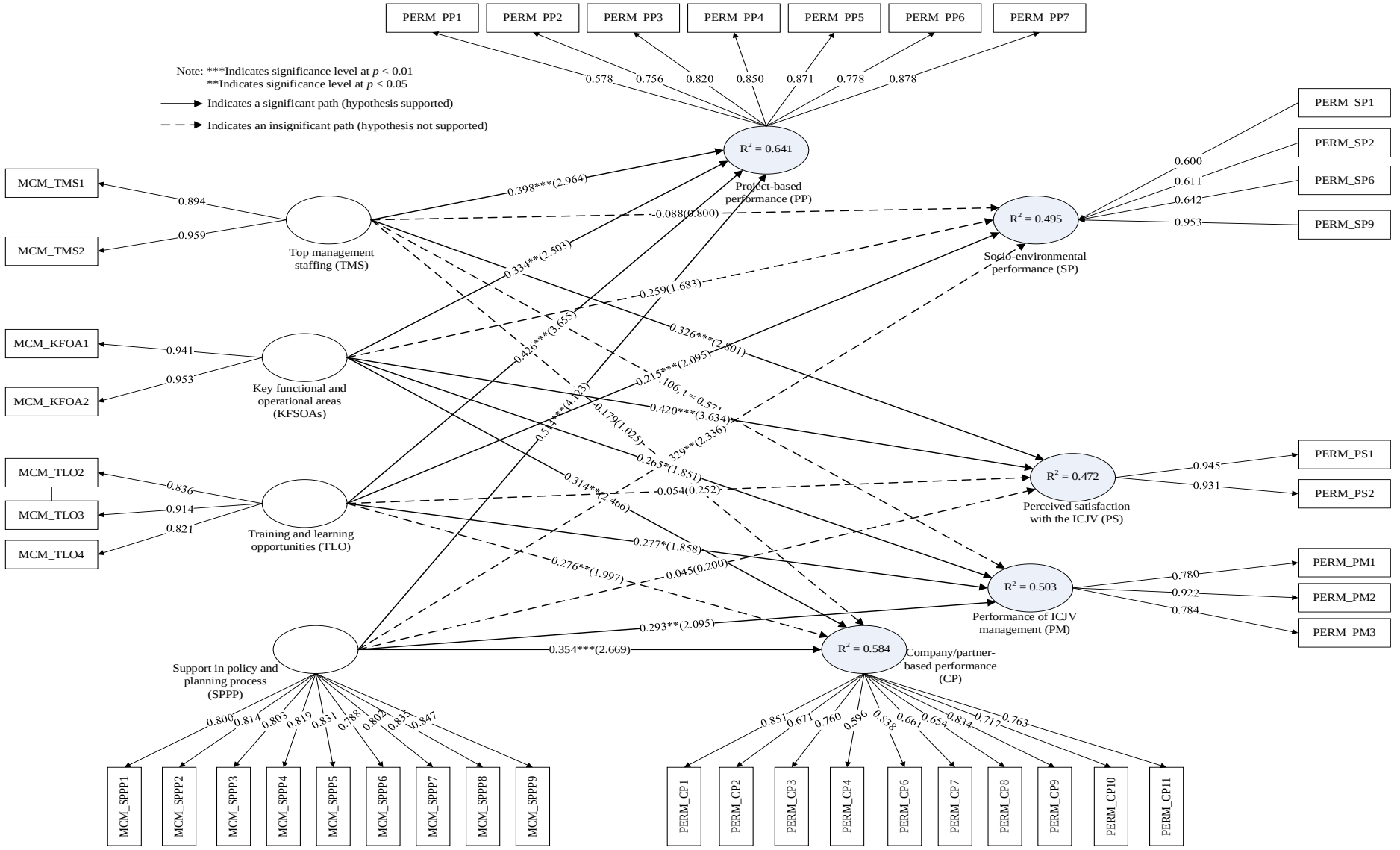

Fig. 9. 3 Final model of MC mechanisms and ICJV performance (local partner)

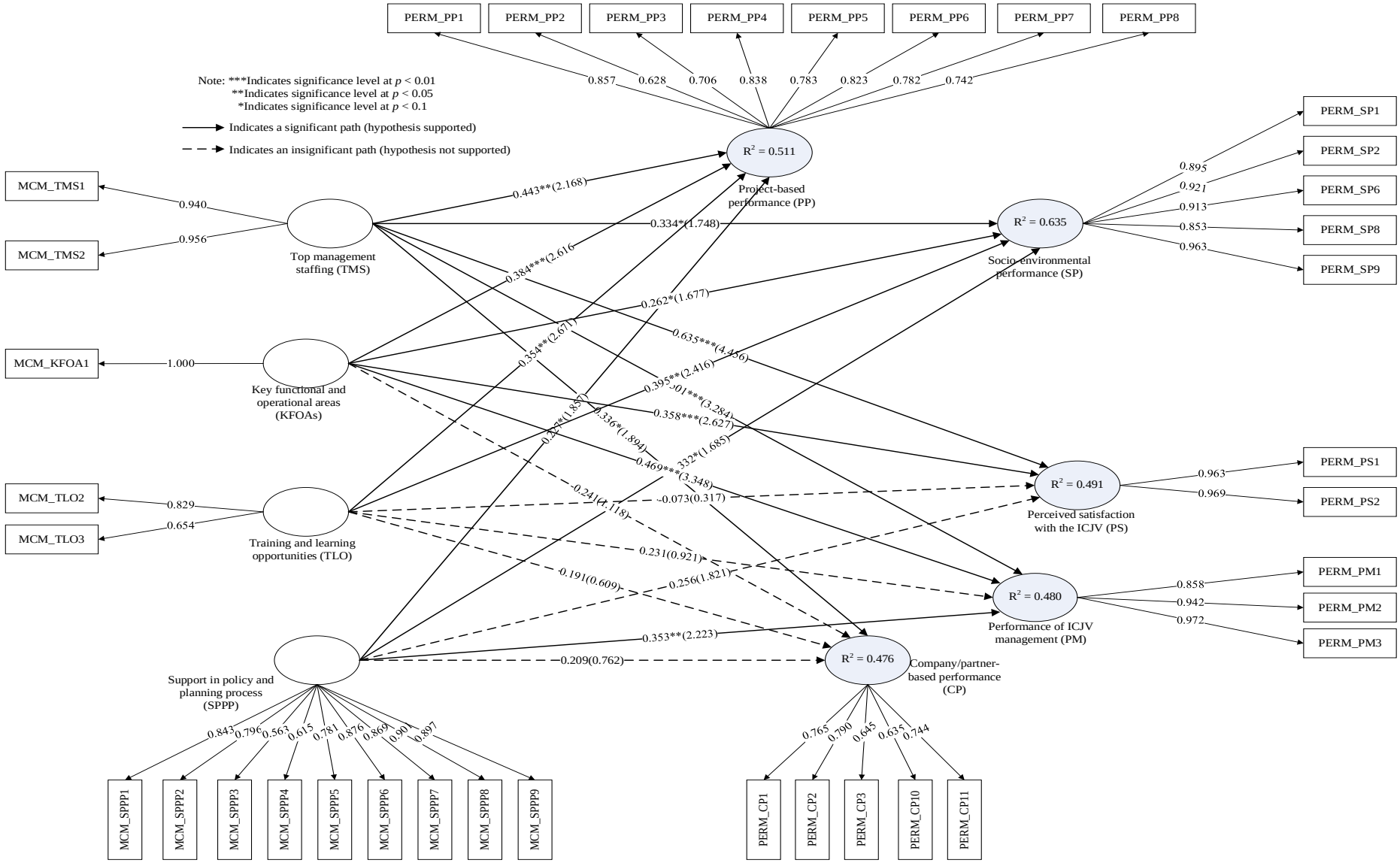

Fig. 9. 4 Final model of MC mechanisms and ICJV performance (foreign partner)

9.4 DISCUSSION OF RESULTS

While many factors may contribute to the success of ICJVs, existing literature underpins the importance of ICJV MC mechanisms in understanding the performance of ICJVs (Luo, 2001; Lin and Ho, 2013; Han et al., 2019). This study empirically investigates the performance implications of MC mechanisms of ICJVs in the developing country of Ghana and from both foreign and local partner's perspectives. This study demonstrates that both foreign and local partners attach varying degrees of importance to specific MC mechanisms in realizing both subjective and/or objective performance goals in ICJVs.

Overall, both personnel and policy MC mechanisms displayed different relationships with the five different performance measures of the ICJVs. With the local partners, it is surprising that TMS by local partners did not have an influence on company/partner performance, socio-environmental performance, and performance of ICJV management. Similarly, the relationship between KFOAs and socio-environmental performance was not supported. Despite the general expectations in the literature that having representatives in top positions and KFOAs should allow for an expansion in terms of growth and sustainability, the reverse is rather true in the local partners' context. Lately, ICJVs management and operations are more attuned to modernized systems, which the foreign partners' management framework conforms to (Shah, 2015). Thus, foreign partners enjoy autonomy at the top positions as the management structure used by local firms is unsuitable for the management of ICJVs (Luo, 2001). One of the local executives reported that:

"…The foreign partners exercise a higher level of control because they have the muscle and power that serves them the dependence to do so. In most cases, decisions on setting quality and technical standards were made by them."

While the local partners display a stronger sense of satisfaction in top management positions, the unsupported relationship between TMS and company/partner performance may be related to the small number of local partners in top positions to create a positive spillover of accumulated managerial expertise for their respective companies. Local partners lack the necessary advanced expertise, skills, or intrinsic motivation to prioritize or direct processes and responsibly manage environmental performance to stimulate corporate sustainability and similar reason above. This could also explain why the relationship between host partners' personnel control and socio-environmental performance was not supported. This is consistent with the findings of Shah (2015).

Concerning policy control, the insignificance of SPPP and perceived satisfaction with the ICJV may be due to the attitude of local partners in having to be involved in directing the ICJV yet their impact not much felt as mentioned. In general, the need to micro-manage does not often engender enhanced feelings of satisfaction (Ghuari et al., 2013). Similarly, the relatively diverse significant impact of SPPP on socio-environmental performance ($\beta = -0.329$, $p < .05$) confirms the limited environmental management efficiencies and regulatory regimes of local partners (Shah, 2015). While TLO positively affects company performance (Fryxell et al. 2002), the results showed a significant but negative relationship ($\beta = -0.276$, $p < .01$). TLO increases partners' knowledge progression through demonstration and hands-on support in processes and

operations. As local partners enjoy majority position via the local content regulation, it makes their learning-oriented objectives (e.g., learning the advanced building technology, organizational management, and project management skills, etc.) problematic (Luo, 2001). This is a result of the lack of involvement of foreign partners at the daily management level. As pinpointed by one of the foreign executives:

"…Although we provide directions, we rarely recruit foreign site personnel for the daily management and operations of ICJV projects due to host restrictions and the cost involved. That reduces our burden …"

From the foreign partners' perspective, personnel MC mechanisms displayed a statistically significant relationship with the five different ICJV performance, except with KFOAs and company/partner performance. Foreign partners have advanced resources and capabilities for the management of ICJV projects and when in direct control positions, can leverage these assets to manifest stronger management responsibilities. Similarly, these foreign partners possess experiences through international exposure, which help them overcome obstacles present in new markets especially in developing countries (Erramilli et al., 2002). Foreign partners in top positions and KFOAs provide the interaction that allows for a more seamless implementation of procedures or information to the ICJV and accelerates performance. Aside from the host regulations that limit foreign participation especially in KFOAs (e.g., site supervision, labourer works, etc.) and the host of issues that they must manage daily, KFOAs may be a lower priority designated to local partners. Foreign partners adopt ICJV primarily as a means of adhering to domestic policies and hedging potential uncertainties and challenges (Girmscheid and Brockmann, 2010). Thus, capacity building in terms of technology and managerial acquisition, a

core measure of company/partner performance, is a less critical determinant for them. This could be the main reason why H2b was not supported. Three of the foreign executives mentioned that:

"…We are more concerned about exporting our capabilities and expanding our overseas territories…"

Under policy MC mechanisms, both SPPP and TLO provided support for improving ICJV performance; however, there was no support for company/partner performance and perceived satisfaction with ICJV. Lastly, no relationship exists between TLO and performance of ICJV management. Within ICJVs, these MC mechanisms are core and become extremely important in terms of experience and/or knowledge and technology issues (Yan and Duan, 2003). As found in Ghuari et al. (2013) study, the more time invested in the daily provision of SPPP and TLO by the foreign partner lower the level of satisfaction. Thus, the overreliance on foreign partners in micromanagement normally results in their dissatisfaction. Certainly, ICJVs, serving as a conduit for organizational learning through SPPP and TLO and in a reciprocated manner is evidenced in literature (Martin and Emptage, 2019). The belief that foreign partners value assess to local markets more than technical capabilities reduces the need to completely mimicking the outdated local practice for their company's advancement.

9.5 CHAPTER SUMMARY

This chapter examined the impact of MC mechanisms on performance in ICJVs in Ghana. PLS-SEM was used to analyze the survey data. Follow-up interviews was also used to supplement the survey data. The overall results revealed varied positive and significant paths between MC mechanisms and the performance measures of ICJV from the dual perspectives. Personnel MC mechanisms employed by foreign and local partners play an important role in increasing ICJV project performance, and it suggests that this link is of considerable strength when there are fair representation and active commitments of corporate board members. However, the personnel MC mechanism did not support local partners' company growth, performance ICJV management, and socio-environmental performance of the ICJV; the reverse is rather true when foreign partners occupy top management positions and are involved in operational areas. Foreign and local partners in specific positions by providing SPPP and TLO lead to stronger ICJV project performance and performance of ICJV management. As noted, dominant SPPP control by local partners did not provide support for improving socio-environmental performance. Surprisingly, foreign partners' engagement in SPPP and TLO also did not yield support in either the company advancement or satisfaction enhancement. Based on the findings of this study, it is recommended that ICJVs organizational arrangements in relation to MC mechanisms have to be designed in such a way as to ensure alignment with legitimate and value attainment of the multidimensional performance measures. Notwithstanding, host/local parties especially in developing countries should actively involve foreign partners at the daily operational management level of the ICJV for positive organizational and societal outcomes.

This chapter has pioneered in introducing and empirically testing a novel hypothetical model of different dimensions of MC mechanisms and multiple performance criteria in ICJVs. It is also the first study to take the bipartite perspective rather than the unilateral view of studying the relationship between MC mechanisms and ICJV performance. This, therefore, contributes to and extends ICJV project management literature by stimulating future research and enhancing the debate on the performance implications of different MC mechanisms of ICJV. The approach for obtaining the desired performance goal in ICJV is a critical piece of knowledge that is needed in all stages and forms of business. More so, the chapter not only brings to light the key MC mechanisms influencing ICJV performance, but highly relevant for ICJV practitioners in making decisions about which ICJV activities to control, and the mechanisms to employ in order to promote the achievement of ICJV goals. Practitioners will benefit from not simply settling for personnel to be in a position of control, but to be actively involved in the development and deployment of policies and strategies. Given the multidimensional ICJV performance measures and their varying importance, partnering firms can settle on the aspect of MC mechanisms during the ICJV negotiation and creation period. Furthermore, given that both personnel and policy MC mechanisms provided by foreign partners contribute significantly to improving socio-environmental performance, this necessitates policymakers to contemplate regulations that will enhance the active involvement of foreign partners to support both individual organization's sustainability and corporate sustainability as a whole. Foreign or international firms seeking to implement and promote ICJVs in Ghana will possess prior practical knowledge of MC mechanisms and their respective performance implications for effective and efficient resource allocations.

Overall, effective management and performance of ICJVs require an informed approach via an implementation strategy based on the significant concepts relating to drivers, barriers, MC mechanisms and performance of ICJVs, and performance impacts of MC mechanisms established within Chapters 6, 7, 8, and 9, respectively. The following chapter applies PLS-SEM to model the impacts of the drivers, barriers, and MC mechanisms on the performance of ICJVs. The outcome of the conceptual model is used as a basis for providing an effective management framework to help ICJVs practitioners and policymakers in managing and enhancing ICJVs performance in Ghana.

CHAPTER 10 DATA ANALYSIS AND RESULTS – DEVELOPING AN EFFECTIVE MANAGEMENT FRAMEWORK FOR THE SUCCESSFUL MANAGEMENT AND PERFORMANCE OF ICJVs IN GHANA[10]

10.1 INTRODUCTION

Chapters 6, 7, 8, and 9 analyze the drivers, barriers, MC mechanisms, and performance of ICJVs, and performance implications of MC mechanisms in ICJVs, respectively. In this chapter, the findings of the PLS-SEM model on drivers, barriers, MC mechanisms, and performance of ICJVs are presented. The chapter aims to develop an effective management framework for the successful management and performance of ICJVs in Ghana. Specifically, PLS-SEM is applied to investigate and model the impacts of the drivers, barriers, and MC mechanisms on the performance ICJVs. As mentioned earlier (in Section 3.2.2.10 Modeling technique: PLS-SEM method), PLS-SEM was deemed more appropriate compared to normal regression analysis because more than two predictor and outcome variables are involved. It is worth mentioning that the data used for this chapter is based on only the significant factors identified from the previous analyses. That is to say that only the significant factors data were used for the analysis. Contingent on the PLS-SEM findings, this chapter provides an effective management framework to help manage and improve the performance of ICJVs. Last but not least, the chapter presents

[10] This chapter is largely based upon:

Tetteh, M. O., Chan, A. P., Ameyaw, E. E., Darko, A., Yevu, S. K., and Boateng, E. B. (2021a). Management control structures and performance implications in international construction joint ventures: critical survey and conceptual framework. *Engineering, Construction and Architectural Management*. ahead-of-print No. ahead-of-print. DOI: 10.1108/ECAM-07-2020-0579.

Tetteh, M. O., and Chan, A. P. (under review). Impacts of drivers, barriers, and management control mechanisms on the performance of international construction project joint ventures. ASCE's *Journal of Construction Engineering and Management*, Ref.: Ms. No. COENG-11174.

the validation of the proposed management framework to facilitate the successful management ICJVs and promote its adoption.

The present chapter contributes to the ICJV body of knowledge by uncovering the quantitative effects of various drivers, barriers, and MC mechanisms on the performance of ICJVs. Arguably, the first to combine and empirically test such interactions in ICJV research. The understanding of the interdependences of the constructs not only contributes to devising suitable strategies to enhance ICJVs performance but also useful for the successful application and advancement of ICJVs.

10.2 RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

10.2.1 Research Framework

The theoretical framework by Mohamed (2003), who established that the performance of ICJVs is influenced by the formation process (i.e. agreement) and operational dynamics, provided guidance in shaping the intent of this research. A research model depicting the relationships between the drivers, barriers, MC mechanisms, and performance of ICJVs was developed based on a comprehensive review of pertinent literature. In this study, reasons, or motives to form ICJVs are termed “drivers”; “barriers” represent challenges, difficulties, obstacles, problems, or issues that affect the performance of ICJVs; “MC” characterizes a process wherein an entity influences the performance outcome of the venture through personnel and/or policy mechanisms; and “performance of ICJVs” represents those predetermined goals that corporations intend to achieve as being tied together. Previous studies have partly highlighted the effects that drivers,

barriers, and MC mechanisms have on the performance of ICJVs, yet no empirical studies have developed quantitative models to explain and validate how drivers, barriers, MC mechanisms impact ICJVs performance (Kelly et al., 2002; Brockmann and Girmscheid, 2009; Girmscheid and Brockmann, 2010; Lin and Ho, 2013; Han et al., 2019). For example, Brockmann and Girmscheid (2009) concluded that it is the drivers that shape the performance goals of ICJVs. Thus, the choice of an ICJV as a means to reach the targets is based on the driving forces. Gale and Luo (2004) also mentioned that ICJVs are not free of barriers. And this is a result of their complex nature of operation and management (Lu et al., 2020). ICJVs are married with multiple barriers, which contribute to their poor performance or complete failure (Hwang et al., 2017). There is also a great deal of support in the literature that with MC mechanisms ICJVs partners could manage risks (Anderson and Dekker, 2005; Han et al., 2019), exploit competitive advantages (Ozorhon et al., 2010), achieve strategic goals (Luo, 2001) and promote the achievement of ICJVs performance (Lin and Ho, 2013). More so, MC is an important governance instrument to respond to most of the barriers affecting the success of ICJVs (Kelly et al., 2002; Han et al., 2019). Thus, a well-planned and strategically built MC mechanism can turn some barriers into opportunities (Kelly et al., 2002; Brockmann and Girmscheid, 2009). A research model (Fig. 10.1) is proposed to support the investigation of the impacts of various types of drivers, barriers, and MC mechanisms on the performance of ICJVs in this study. The hypothesized model is more helpful for deepening the understanding and knowledge of the myriad drivers, barriers, and MC mechanisms connected to ICJVs performance than analyzing them separately in separate research papers.

Given the above background, drivers and MC mechanisms are assigned (+), and barriers are assigned (–) in the hypothesized model. In addition, MC mechanisms adversely moderate the association between barriers and ICJVs performance, such that strategically build MC mechanisms by ICJVs partners weaken this relationship (–). This specifies the focus of this research and what it means is that while drivers and MC mechanisms shape and support ICJVs performance management, respectively, barriers work against the performance growth of ICJVs.

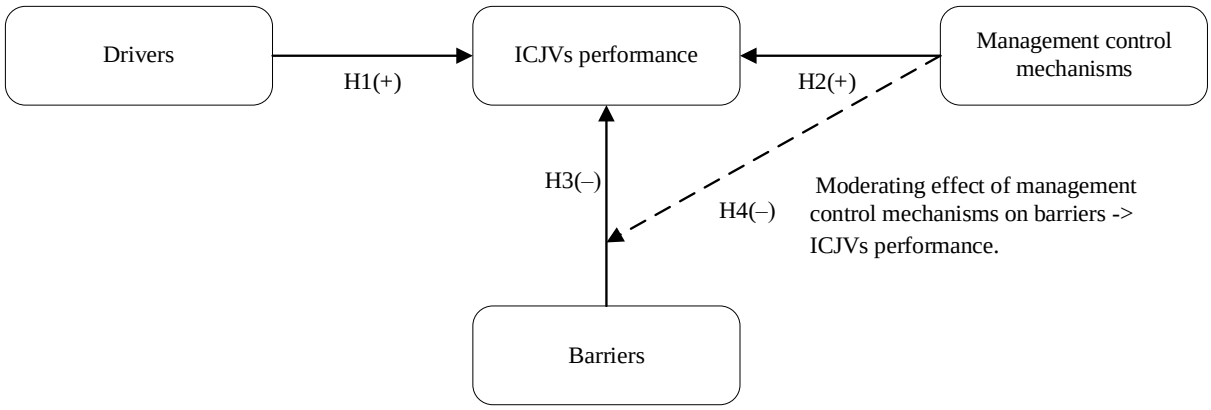

Fig. 10. 1 Research framework

10.2.2 Hypotheses Development

To investigate and model the impacts of the various drivers, barriers, and MC mechanisms on the performance of ICJVs, there is a need for developing research hypotheses about these key concepts. Thus, the comprehensive literature review presented in Chapters 4 and 5 provided the basis for the development of the research hypothesis and the research framework (Fig. 10.1). The outcomes of Chapters 6-8 are used in the present chapter to investigate and model the impacts of the drivers, barriers, and MC mechanisms on the performance of ICJVs. Table 10.1 lists all the constructs – drivers, barriers, MC mechanisms, and performance measures of ICJVs together with their respective measurement items. Given partners' different interests concerning drivers in

ICJVs, it was reasonable to identify the common and separate drivers for implementing ICJVs (Chapter 7). Therefore, drivers that are of interest to both partners were used. This is because the more they are aligned, the more they reinforce each other to improve the performance of ICJVs as well as eliminate potential biases (Brockmann and Girmscheid, 2009). The contribution of separate drivers to the explanatory power of the model would be insignificant, thus biasing the estimations of other measurement items.

Table 10. 1 Measurement items of respective constructs

Constructs	Code	Measurement items
	Drivers for implementing ICJVs	
Operational success drivers (DR_OSD)	DR_OSD1	Risk/resource sharing between partners
	DR_OSD2	Gain economics of scale
	DR_OSD3	Demand for value for money
	DR_OSD4	Better execution of a project
	DR_OSD5	Pre-qualification condition
	DR_OSD6	Growth in construction globalization
	DR_OSD7	Acquire new construction project
	DR_OSD8	Overcome environmental deficiencies
Organizational-driven drivers (DR_OD)	DR_OD1	Improve competitive position
	DR_OD2	Diversification
	DR_OD3	Improve company's image
	DR_OD4	Improve track records
	DR_OD5	Build reputation
	DR_OD6	Promote industrial integration
	Performance measures of ICJVs	
Project-based performance (PERM_PP)	PERM_PP1	Completing the project within budgeted cost
	PERM_PP2	Completing the project within schedule
	PERM_PP3	Achieving the required project quality
	PERM_PP4	Client satisfaction
	PERM_PP5	Good safety performance
	PERM_PP6	Dispute resolution
	PERM_PP7	Profitability
	PERM_PP8	Ethics in management
Company/partner-based performance (PERM_CP)	PERM_CP1	Sharing of risks equitably
	PERM_CP2	Resource sharing
	PERM_CP3	Costs reduction
	PERM_CP4	Technology acquisition
	PERM_CP6	Enhancing competitiveness
	PERM_CP7	Creating long-term relationships
	PERM_CP8	Acquisition of managerial skills
	PERM_CP9	Reputation
	PERM_CP10	Communication, learning, and development
	PERM_CP11	Market share
Socio-environmental performance	PERM_SP1	Sustainable job creation

(PERM_SP)		
	PERM_SP2	Stakeholder engagement
	PERM_SP6	Avoidance of material wastage
	PERM_SP8	Pollution reduction
	PERM_SP9	Environmental compliance
Performance of ICJV management (PERM_PM)	PERM_PM1	Effectiveness of the strategic control of the ICJV
	PERM_PM2	Effectiveness of the operational control of the ICJV
	PERM_PM3	Effectiveness of the organizational control of the ICJV
Perceived satisfaction with the ICJV (PERM_PS)	PERM_PS1	Overall satisfaction
	PERM_PS2	Stability of the ICJV
	Barriers to ICJVs success	
Organizational-related barriers (BR_OB)	BR_OB1	Lack of management control
	BR_OB2	Difficulty in measuring ICJV performance
	BR_OB3	Poorly formulated governance structure
	BR_OB4	Relationship management issues
	BR_OB5	Unstructured problems, issues, and risk management framework
	BR_OB6	Unfair power and responsibilities among entities
Cultural-related barriers (BR_CB)	BR_CB1	Competing objectives
	BR_CB2	Language barrier
	BR_CB3	Different organizational cultures
	BR_CB4	Lack of preparedness to accept company philosophy
	BR_CB5	Friction created between the ICJV, client organization and stakeholders
Logistics-related barriers (BR_LB)	BR_LB1	Incomplete contract terms with partners
	BR_LB2	Unstable agreement for a limited period
	BR_LB3	Poorly formulated decisions in assigning limited resources
	BR_LB4	Difficulty in selecting suitable partners
	BR_LB5	Lack of strategic planning for the ICJV operations
Individual-related barriers (BR_IB)	BR_IB1	Fear of legal action
	BR_IB2	Lack of corporation
	BR_IB3	Lack of confidence about experience and knowledge among parties
	BR_IB4	Opportunistic behaviour of parties
Knowledge-related barriers (BR_KB)	BR_KB1	Lack of clear understanding and knowledge of ICJV fundamentals
	BR_KB2	Lack of knowledge about host/local statutory requirement
	MC mechanisms in ICJVs	
Top Management Staffing (MCM_TMS)	MCM_TMS1	Staffing of corporate board members
	MCM_TMS2	Staffing of senior executive positions (e.g., Project managers)
Key Functional and Operational Areas (MCM_KFOA)	MCM_KFOA1	Key functional areas placement (e.g., Engineers, supervisors, etc.)
	MCM_KFOA2	Operational areas deployment (e.g., labourers)
Support in Policy and Planning Process (MCM_SPPP)	MCM_SPPP1	Human rights policies
	MCM_SPPP2	Making development plans
	MCM_SPPP3	Evaluating project feasibility considering environmental impacts

	MCM_SPPP4	Establishing codes of ethics for projects
	MCM_SPPP5	Health and safety issues
	MCM_SPPP6	Monitoring and reporting
	MCM_SPPP7	Laying down procedures and routines for the ICJV
	MCM_SPPP8	Support in a supervisory role
	MCM_SPPP9	Financial and resource allocation planning
Training and Learning Opportunities (MCM_TLO)	MCM_TLO2	Provision of market knowledge
	MCM_TLO3	Provision of cultural knowledge
	MCM_TLO4	Provision of managerial/technological knowledge

As mentioned earlier, the comprehensive literature review in Chapters 4 and 5 indicates that ICJVs performance goals are driven by the drivers; that is, drivers have a potentially positive impact on ICJVs performance. On the other hand, barriers make it difficult for ICJVs to realize their performance goals; that is, barriers have a potentially negative impact on ICJVs performance. It has also been argued that MC mechanisms represent an important instrument for ICJVs to achieve their performance targets and, to respond to barriers and achieve satisfying or predetermined objectives of ICJVs; thus, MC mechanisms have a potentially positive impact on ICJVs performance and adversely moderate the association between barriers and ICJVs performance. Therefore, MC mechanisms act as a predictor and moderating variable. In the light of the abovementioned insights, this reasoning brings forward the following hypotheses:

H1. Drivers have a significant positive impact on the performance goal of ICJV.

H2. MC mechanisms have a significant positive impact on ICJV performance.

H3. Barriers have a significant negative impact on ICJV performance.

H4. MC mechanisms have a significant negative moderating effect on the negative impact of barriers on the performance of ICJVs.

Fig. 10.2 shows the expanded research model. Empirically bringing to light the impacts of drivers, barriers, and MC mechanisms on the performance of ICPVs provide informed knowledge of ICJVs implementation dynamics, vital to assist industry practitioners and

policymakers devise and implement suitable management strategies to enhance the performance as well as advance the performance of ICJVs.

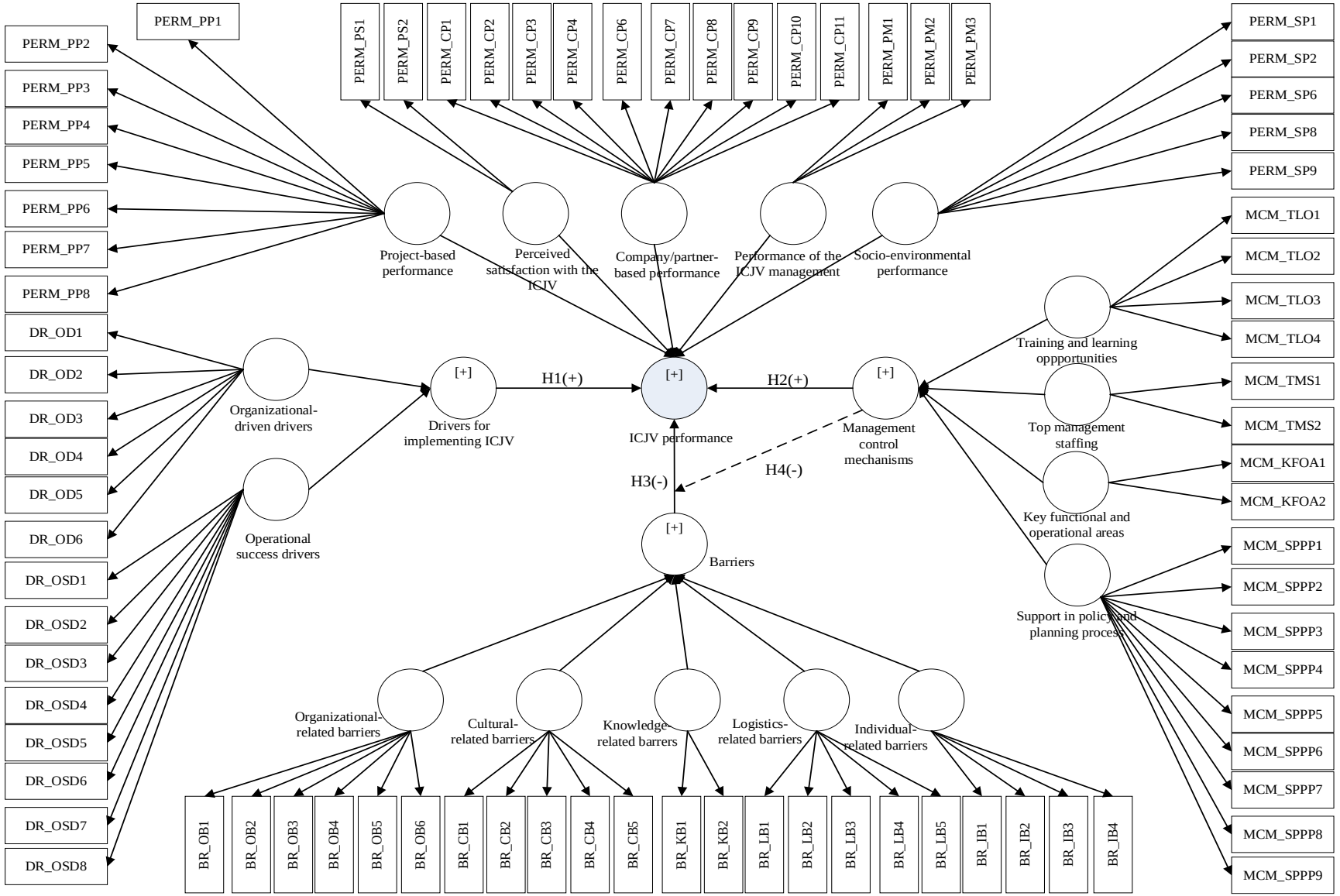

Fig. 10. 2 The expanded research framework of performance impacts of drivers, barriers, and MC mechanisms in ICJVs

10.3 PLS-SEM RESULTS

10.3.1 Measurement Model Evaluation

This was achieved by first establishing the latent variables/constructs of the significant factors (i.e., drivers, barriers, MC mechanisms, and ICJVs performance measures) in the SmartPLS environment. The measurement items of each latent variable were loaded accordingly. This approach was repeated for the second-order constructs where all the measurement items for all the first-order constructs were loaded on the second-order constructs. Afterwards, the first-order constructs, reflective measures, were first evaluated. This was achieved by evaluating the indicators' reliability. Also, to test the moderating effect, the two-stage approach suggested by Henseler and Fassott (2010) was employed. First, the baseline model without the moderator was tested. Second, the moderator variable (MC mechanisms) was introduced into the model. Lastly, the interaction effect was calculated using a bootstrap procedure with 5000 resamples. As presented in Table 10.2, all the indicator loadings are above 0.60, higher than the recommended threshold of 0.40 (Hair et al., 2016). This was achieved after removing measurement items lower than the acceptable level. Afterward, the convergent and discriminant validity of the first-order constructs was assessed. Three indices were used to examine the convergent validity, namely Cronbach alpha, composite reliability (CR), and average variance extracted (AVE). Table 10.2 shows that both the Cronbach alpha and CR scores were above the cut-off value of 0.70 and were above the threshold value of 0.5 (Fornell and Larcker, 1981). Evidence of discriminant validity is provided by examining the Heterotrait-monotrait (HTMT) values, which were below the threshold of 0.85 (Henseler et al., 2015). Tables 10.3 and 10.4 show the HTMT result for the first- and second-order constructs. The first-order constructs that have been modeled as

formative constructs at the second-order measurement level were evaluated based on indicators relevance and multicollinearity (Chin, 2010). For constructs relevance, bootstrapping was used to determine the estimated second-order weights' significance. The significance of outer weights of all the constructs forming the second-order constructs exceeded the critical threshold of $t > 1.96$. Finally, the degree of multicollinearity among the formative constructs was evaluated by calculating the variance inflation factor (VIF) for each construct (Henseler et al., 2015). As presented in Table 10.5, the VIF < 5 indicating that there is no potential multicollinearity between the constructs.

Table 10. 2 Model assessment of reflective constructs

Constructs	Measurement item codes	Factor loading (FL)	Cronbach's alpha (α)	Average variance extracted (AVE)	Composite reliability (CR)
DR_OSD	DR_OSD1	0.814	0.892	0.539	0.913
	DR_OSD2	0.789			
	DR_OSD3	0.766			
	DR_OSD4	0.641			
	DR_OSD5	0.733			
	DR_OSD6*				
	DR_OSD7*				
	DR_OSD8	0.740			
DR_OD	DR_OD1	0.836	0.929	0.777	0.946
	DR_OD2*				
	DR_OD3	0.893			
	DR_OD4	0.928			
	DR_OD5	0.887			
	DR_OD5	0.751			
PERM_PP	PERM_PP1	0.879	0.956	0.739	0.962
	PERM_PP2	0.874			
	PERM_PP3	0.860			
	PERM_PP4	0.865			
	PERM_PP5	0.813			
	PERM_PP6	0.878			
	PERM_PP7	0.884			
	PERM_PP8*				
PERM_CP	PERM_CP1	0.681	0.916	0.546	0.929
	PERM_CP2	0.640			
	PERM_CP3	0.703			
	PERM_CP4	0.679			
	PERM_CP6	0.838			

	PERM_CP7	0.701			
	PERM_CP8	0.768			
	PERM_CP9	0.796			
	PERM_CP10	0.796			
	PERM_CP11*				
PERM_SP	PERM_SP1	0.878	0.940	0.679	0.950
	PERM_SP2	0.805			
	PERM_SP6	0.899			
	PERM_SP8	0.862			
	PERM_SP9	0.866			
PERM_PS	PERM_PS1	0.941	0.840	0.860	0.925
	PERM_PS2	0.915			
PERM_PM	PERM_PM1	0.968	0.920	0.863	0.950
	PERM_PM2	0.874			
	PERM_PM3	0.943			
BR_OB	BR_OB1	0.867	0.924	0.724	0.940
	BR_OB2	0.844			
	BR_OB3	0.840			
	BR_OB4	0.845			
	BR_OB5	0.883			
	BR_OB6	0.829			
BR_CB	BR_CB1	0.907	0.911	0.732	0.932
	BR_CB2	0.816			
	BR_CB3	0.885			
	BR_CB4	0.837			
	BR_CB5	0.831			
BR_LB	BR_LB1	0.797	0.872	0.662	0.907
	BR_LB2*				
	BR_LB3*				
	BR_LB4	0.819			
	BR_LB5	0.868			
BR_IB	BR_IB1	0.912	0.877	0.731	0.916
	BR_IB2*				
	BR_IB3	0.861			
	BR_IB4	0.835			
BR_KB	BR_KB1	0.943	0.793	0.822	0.902
	BR_KB2	0.870			
MCM_TMS	MCM_TMS1	0.840	0.763	0.799	0.888
	MCM_TMS2	0.945			
MCM_KFOA	MCM_KFOA1	0.914	0.829	0.853	0.921
	MCM_KFOA2	0.934			
MCM_SPPP	MCM_SPPP1	0.850	0.931	0.646	0.942
	MCM_SPPP2	0.792			
	MCM_SPPP3	0.765			
	MCM_SPPP4	0.716			
	MCM_SPPP5	0.803			
	MCM_SPPP6	0.794			
	MCM_SPPP7	0.823			
	MCM_SPPP8	0.871			
	MCM_SPPP9	0.810			

MCM_TLO	MCM_TLO2	0.912	0.874	0.798	0.922
	MCM_TLO3	0.880			
	MCM_TLO4	0.687			

Note: DR_OSD = Driver_operational success drivers; DR_OD = Driver_organizational-driven drivers; PERM_PP = Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_SP = Performance measure_socio-environmental performance; PERM_PS = Performance measure_perceived satisfaction; BR_OB = Barrier_organizational-related barriers; BR_CB = Barrier_cultural-related barriers; BR_LB = Barrier_logistics-related barriers; BR_IB = Barrier_individual-related barriers; BR_KB = Barrier_knowledge-related barriers; MCM_TMS = Management control mechanism_top management staffing; PERM_PM = Performance measure_performance of ICJV management; MCM_KFOA = Management control mechanism_key functional and operational areas; MCM_SPPP = Management control mechanism_support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities
*Items deleted as a result of scale purification.

Table 10. 3 Heterotrait-monotrait ratio ($HTMT_{.85}$) assessment of all constructs

Constructs	Correlation matrix															
	DR_OSD	DR_OD	BR_OB	BR_CB	BR_LB	BR_IB	BR_KB	MCM_TMS	MCM_KFOA	MCM_SPPP	MCM_TLO	PERM_PP	PERM_SP	PERM_PS	PERM_CP	PERM_PM
DR_OSD																
DR_OD	0.120															
BR_OB	0.245	0.193														
BR_CB	0.146	0.175	0.108													
BR_LB	0.128	0.091	0.190	0.217												
BR_IB	0.130	0.105	0.307	0.119	0.373											
BR_KB	0.214	0.091	0.092	0.121	0.077	0.190										
MCM_TMS	0.145	0.142	0.130	0.078	0.137	0.102	0.122									
MCM_KFOA	0.348	0.068	0.204	0.122	0.139	0.162	0.057	0.134								
MCM_SPPP	0.217	0.154	0.205	0.121	0.127	0.090	0.063	0.100	0.163							
MCM_TLO	0.202	0.087	0.203	0.119	0.170	0.052	0.040	0.108	0.222	0.229						
PERM_PP	0.126	0.124	0.122	0.079	0.344	0.428	0.199	0.112	0.177	0.133	0.129					
PERM_SP	0.181	0.080	0.114	0.062	0.069	0.281	0.113	0.158	0.108	0.195	0.109	0.149				
PERM_PS	0.090	0.090	0.096	0.115	0.163	0.082	0.104	0.095	0.123	0.102	0.100	0.087	0.322			
PERM_CP	0.269	0.087	0.157	0.136	0.091	0.104	0.107	0.199	0.377	0.163	0.190	0.190	0.226	0.416		
PERM_PM	0.392	0.087	0.142	0.100	0.091	0.046	0.216	0.194	0.219	0.147	0.062	0.227	0.347	0.325	0.447	

Note: Note: DR_OSD = Driver_operational success drivers; DR_OD = Driver_organizational-driven drivers; PERM_PP = Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_SP = Performance measure_socio-environmental performance; PERM_PS = Performance measure_perceived satisfaction; BR_OB = Barrier_organizational-related barriers; BR_CB = Barrier_cultural-related barriers; BR_LB = Barrier_logistics-related barriers; BR_IB = Barrier_individual-related barriers; BR_KB = Barrier_knowledge-related barriers; MCM_TMS = Management control mechanism_top management staffing; PERM_PM = Performance measure_performance of ICJV management; MCM_KFOA = Management control mechanism_key functional and operational areas; MCM_SPPP = Management control mechanism_support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities; HTMT values should be below 0.85 to establish discriminant validity.

Table 10. 4 Heterotrait-monotrait ratio ($HTMT_{.85}$) assessment of key constructs

Constructs	Correlation matrix			
	Drivers	Barriers	Performance measures	Management control
Drivers				
Barriers	0.399			
ICJV Performance	0.172	0.389		
Management control mechanisms	0.378	0.354	0.377	

Note: HTMT values should be below 0.85 to establish discriminant validity.

Table 10. 5 Model assessment of formative constructs

2nd order constructs	Constructs	VIF (<5)	Average variance extracted	Composite reliability (CR)

			(AVE)	
Drivers	DR_OD	1.003	0.648	0.827
	DR_OSD	1.003		
Barriers	BR_OB	1.088	0.754	0.848
	BR_CB	1.041		
	BR_LB	1.141		
	BR_IB	1.213		
	BR_KB	1.030		
Management control mechanisms	MCM_TMS	1.016	0.771	0.884
	MCM_KFOA	1.052		
	MCM_SPPP	1.050		
	MCM_TLO	1.080		
ICJV Performance	PERM_PP	1.159	0.783	0.919
	PERM_SP	1.304		
	PERM_PS	1.292		
	PERM_CP	1.416		
	PERM_PM	1.541		

Note: DR_OSD = Driver_operational success drivers; DR_OD = Driver_organizational-driven drivers; PERM_PP = Performance measure_project-based performance; PERM_CP = Performance measure_company/partner-based performance; PERM_SP = Performance measure_socio-environmental performance; PERM_PS = Performance measure_perceived satisfaction; BR_OB = Barrier_organizational-related barriers; BR_CB = Barrier_cultural-related barriers; BR_LB = Barrier_logistics-related barriers; BR_IB = Barrier_individual-related barriers; BR_KB = Barrier_knowledge-related barriers; MCM_TMS = Management control mechanism_top management staffing; PERM_PM = Performance measure_performance of ICJV management; MCM_KFOA = Management control mechanism_key functional and operational areas; MCM_SPPP = Management control mechanism_support in policy and planning process; MCM_TLO = Management control mechanism_training and learning opportunities; VIF = Variance inflation factor.

10.3.2 Structural Model Evaluation

Table 10.6 shows the bootstrapping results for the model. In general, the model has a relatively high level of predictive accuracy, as the variance described (R^2) value is above 0.50 (Fig. 10.3) (Henseler, 2015). The results show that all the proposed hypotheses are statistically significant at 0.01, and 0.05 levels. For the first hypothesis (H1), as predicted, drivers showed a significant positive impact on ICJV performance ($\beta = 0.244$, $p < .000$). MC mechanisms also revealed a significant positive impact on ICJV performance (H2) ($\beta = 0.313$, $p < .000$). Barriers also showed a significant negative impact on ICJV performance (H3) ($\beta = -0.378$, $p < .000$). As indicated in Table 10.6, MC mechanisms negatively moderate the impact of barriers on ICJV performance ($\beta = -0.124$, $p < .021$). Simple slope analysis (Fig. 10.4) supports the argument that the negative impact of barriers on ICJV performance becomes weaker when MC mechanisms in ICJV are strategically built.

Table 10. 6 Hypothesis tests results

Hypothesis	Relationship	Std Beta	T Statistics	*p*-Value	95% CI (L, U)	Interpretation
H1	Drivers –> ICJV performance	0.244	3.042	0.000*	0.201, 0.312	Supported
H2	Barriers –> ICJV performance	-0.378	6.155	0.000*	0.339, 0.902	Supported
H3	Management control mechanisms –> ICJV performance	0.313	5.414	0.000*	0.206, 0.433	Supported
H4	Management control mechanisms * Barriers –> ICJV performance	-0.124	2.276	0.021**	0.078, 0.169	Supported

Note: *Indicates significance level at $p < 0.01$; **Indicates significance level at $p < 0.05$; CI = Confidence interval; L = Lower; U = Upper.

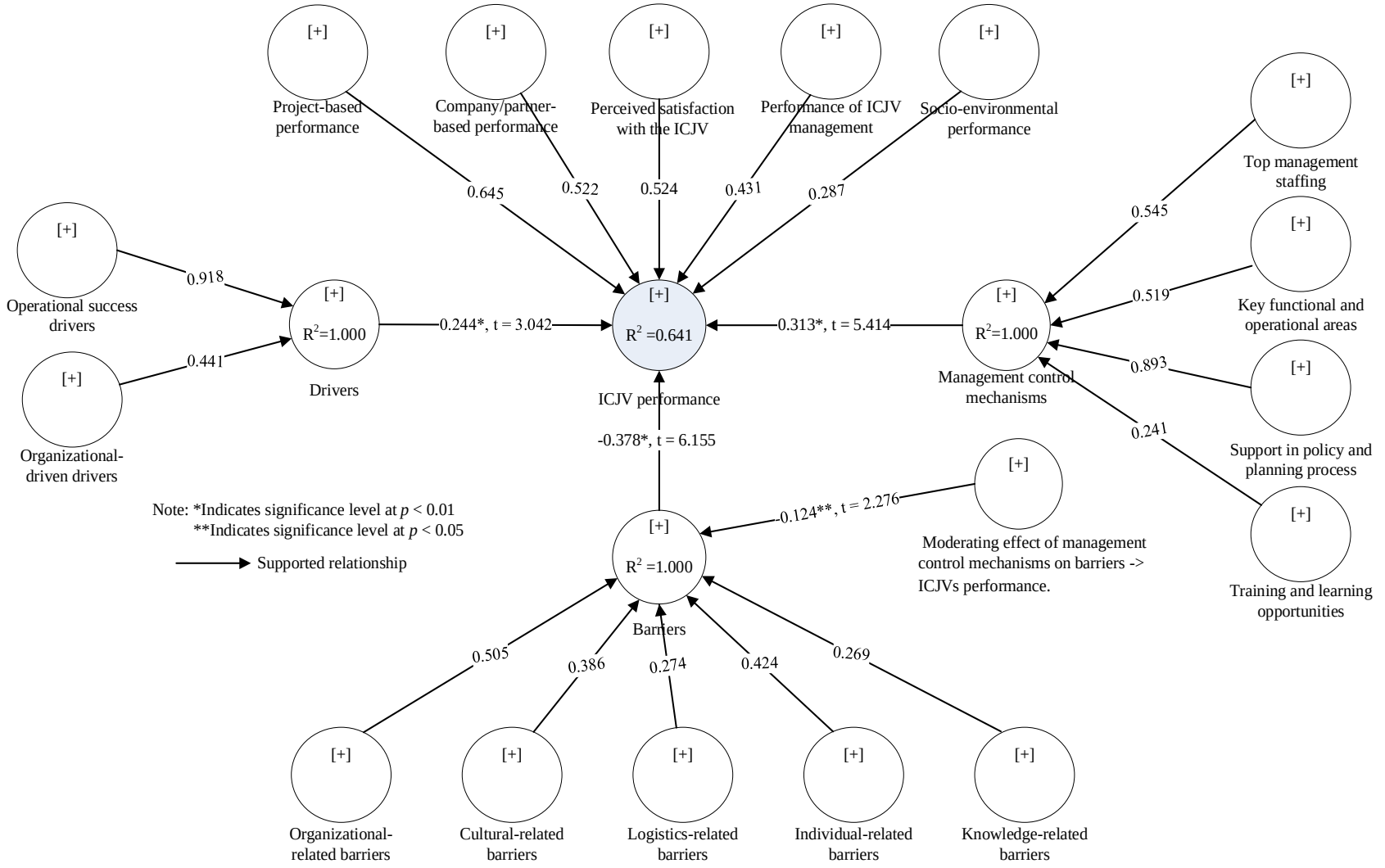

Fig. 10. 3 PLS-SEM model of performance impacts of drivers, barriers, and MC mechanisms in ICJVs

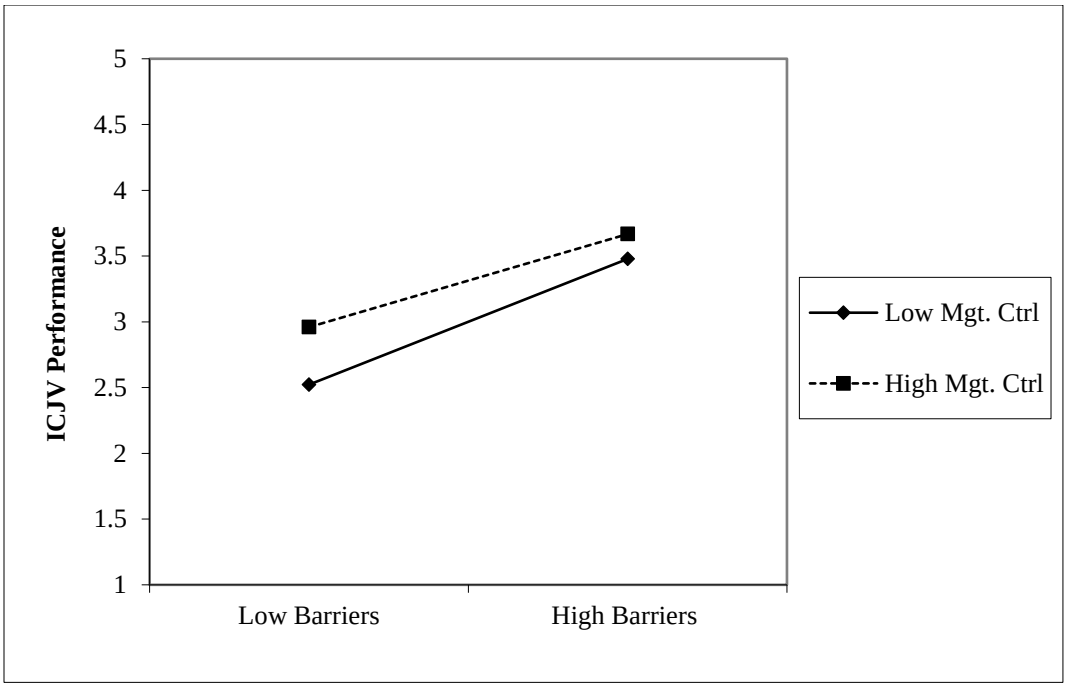

Fig. 10. 4 Moderating effect of MC mechanisms

10.4 DISCUSSION OF RESULTS

The broad hypotheses that drivers shape the performance goal of ICJVs which, in turn, is hindered by several barriers was empirically evident. In addition to this sequential effect, building well-structured and effective MC mechanisms also proved to improve the performance goal of ICJVs as well as adversely moderate the negative relationship between the barriers and the performance of ICJVs. As documented in the literature, the driving forces (i.e. objectives) behind ICJV formation show great diversity among partnering firms such as entering a new market, developing, and transferring technology, reducing risk, improving resource utilization, etc. (Girmscheid and Brockmann, 2010; Gunduz and Abdi, 2020), and firms pursue multiple objectives simultaneously. As single drivers become more important and this increased importance spreads over multiple drivers, it increases the strategic importance of the ICJV to the

firm. These drivers translate into key performance targets, which enable partners to monitor and evaluate whether performance targets and actions are achieved and effective, respectively (Brockmann and Girmscheid, 2009). Drivers not only increase ICJVs strategic importance but also complicate the management and performance of ICJVs. ICJVs are formed out of necessity as resources from partners are required. Hence, the conflicts in drivers show that the benefits of partnering in ICJVs are valued more highly. When partners have common interests, it generates a higher demand to coordinate partners' interests and actions (Dekker et al., 2016); the reverse is true for incompatible/divergent/separate drivers. Potential partners need to spend considerable time identifying their common compatible drivers within the venture to structure responsibilities well and improve performance. There are greater task interdependencies between partners as they become more intertwined in the set of drivers that they jointly pursue. For example, if the performance goal of the ICJV depends on the successful sharing of risks and overcome environmental deficiencies, then this will place greater demands on the integration and alignment of resources and contributions of partners. In this study, the constructs used to measure the drivers (*operational success drivers, and organizational-driven drivers*) are strongly linked to the performance goal of ICJVs, as perceived by the respondents. This supports the assertion that with aligned drivers, ICJVs are better aligned with relationship-specific investments to achieve improved competitiveness and performance.

The establishment of sound MC mechanisms is significant for both realizing the performance expectations of firms and the satisfactory performance of the ICJV as an independent entity (Lin and Ho, 2013). In this study, "top management staffing", "key functional and operational areas", "support in policy and planning process", and "training and learning opportunities" emerged as

significant mechanisms of MC to positively impact the performance of ICJVs. These MC mechanisms stand to alter the overall focus, design, and potentially the performance of the ICJVs, depending upon how they are strategically structured and the level of involvement by partnering firms. There is the argument that foreign partners' directives and control are less likely to make operational mistakes or losses, thereby improving joint venture's performance (Ravasi and Zattoni, 2006; Li et al., 2009), as mentioned earlier. Cuypers et al. (2017) argued that it is also important to involve the local partners at the board level management because solely relying on foreign partners may put the ICJV at risk due to information asymmetry. Thus, local partners have much more information in the local market as compared to foreign partners. Whereas participation in management in interfirm collaboration is reliant on technical superiority and management skill, Han et al. (2019) emphasized that a successful collaborative win-win relationship relies heavily on relational governance characterized by a shared understanding of situations, and a perception of fairness. Thus, ICJVs organizational arrangements concerning MC mechanisms must be cogently and systematically structured in a manner where there will be fairness and in terms of operational competencies to ensure value attainment of the multidimensional performance expectations.

The empirical results also proved that ICJVs are not free of barriers. Thus, barriers are significant in ICJVs, despite the myriad benefits. In this research, barriers affecting the performance of ICJVs with higher weights include *organizational-related barriers*, *cultural-related barriers,* and *individual-related barriers*. This finding is consistent with previous studies (Gunduz and Abdi, 2020; Lu et al., 2020; Liu et al., 2020). The underlying significant barriers were in the management of partners' relations, competing objectives, and opportunistic behaviour

of parties. The unequal management and organizational practices of partnering firms have been noted as a critical factor to ICJVs failure. The differences in cultures of partnering firms make it very difficult for firms to easily translate their organizational norms and values into the venture. ICJVs involve partners from different cultures with differences in working styles, language, employees, and requirements. This often results in conflicts, and the nonresolution of such conflicts will eventually affect the performance of ICJVs. It is important to mention that effective coordinating of ICJVs requires distinct organizational arrangements and work processes. The competing objectives and opportunistic behaviour of parties also produce serious collaboration problems. These two barriers are common in ICJVs, and extremely disadvantageous to ICJVs success. The competing objectives cover the ICJV goal setting, decision making, time orientation, competitive behaviour, etc. and opportunistic behaviour covers areas like avoiding contractual duties, not participating in decision-making, and exploiting the partners' dependency on the ICJVs. Overall, there are no barrier-free ICJVs, however, it is argued that effective and strategically built MC mechanisms could weaken the effect.

The results of the moderation analysis (Fig. 10.4) provide evidence to support H4 (i.e. MC mechanisms have a significant negative moderating effect on the negative relationship between barriers and performance of ICJVs). For example, barriers rooted in competing objectives, and opportunism would cause partners to decrease their commitment/efforts or claim more benefits as manifested in shirking, misappropriation, withholding valuable information, and holdups (Kang and Jindal, 2015). This issue is common especially in the local market by local partners (Laffont and Martimort, 2009). To deal with this situation, Han et al. (2019) mentioned that local

partners' behaviour needs to be revealed by specifying standard procedure and by monitoring, thus turning the situation into a complete information case. The other is to implement reward or punishment based on the local partner's performance outcome, thus aligning ICJV partners' interests. In the case of implementing reward, actively engaging the local partners in strategic decision making sends a signal to the local partners about their status as insiders, which then increases their job satisfaction as well as enhances the smooth operation of the ICJV.

10.5 MANAGEMENT FRAMEWORK FOR ICJVs

Based on the PLS-SEM results, a management framework for the successful management and performance of ICJVs is proposed and presented in Fig 10.5. The proposed framework is based on the findings from Ghana. While the choice of an ICJV as means to reach performance targets in most cases is based on a mix of common and separate drivers (Brockmann and Girmscheid, 2009), partner companies have to meticulously identify their collective (i.e. common/mutual) drivers for the ICJV. This could be achieved through a process of negotiation. Including separate drivers as part of this choice might result in conflict in the performance target set and realization. On the other hand, in ICJVs, as the pervasiveness of critical barriers is mostly noted after the venture formation, establishing a common base in terms of the drivers is crucial. Given that the overall performance goal of an ICJV is multidimensional, building structures based on appropriate MC mechanisms from top management placement to the training and learning opportunities is required for successful performance achievement. In particular, the capabilities of partner companies considering their scope of expertise and the number of members that need to be involved should be considered. More so, the interrelated critical barrier constructs that prevent partner companies from achieving their performance target could be minimized by

building stronger MC mechanisms. ICJVs practitioners and policymakers can apply this management framework in their efforts to facilitate the successful implementation and management of ICJVs in Ghana, and thus enhance their performance. Although this study is limited to the developing country of Ghana, many ICJVs, especially established in the developing countries, share generic characteristics despite the different levels of variations in cultures, socioeconomic, political, and environmental conditions. Thus, countries/jurisdictions that share similar conditions with Ghana can adopt and implement this proposed management framework. Besides, the approach used in this study could be adopted to investigate the impacts of the various drivers, barriers, and MC mechanisms on the performance of ICJVs in other countries/jurisdictions and the findings could be based upon to propose localized implementation and management framework for ICJVs to help to facilitate successful management of ICJVs within those countries/jurisdictions.

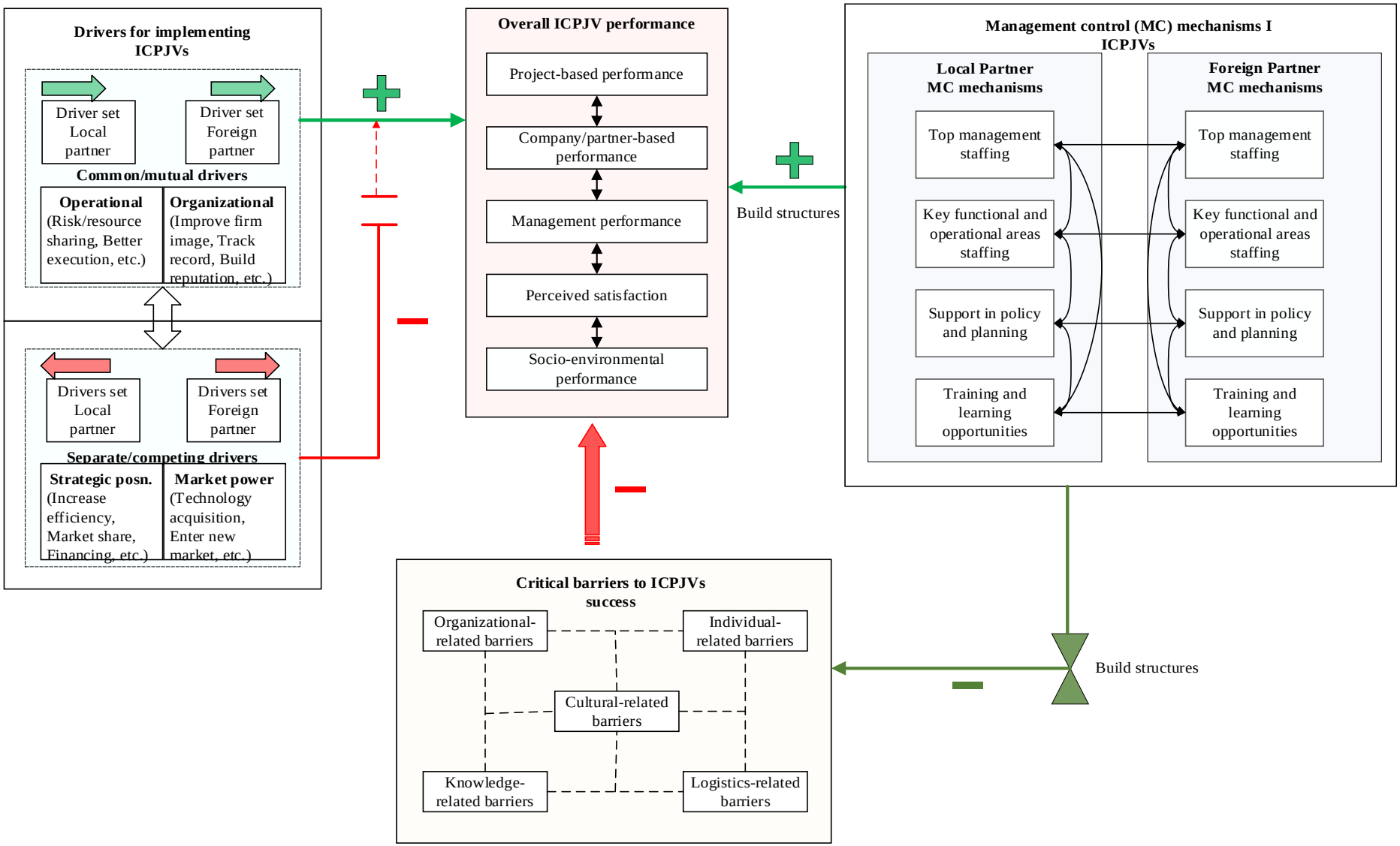

Fig. 10. 5 A management framework for successful management and performance of ICJVs

10.6 VALIDATION OF ICJVs MANAGEMENT FRAMEWORK

Research validation is considered as key and the final stage of a research process (Hu et al., 2016). Based primarily on logical induction and/or deduction approach, research validation is undertaken to evaluate the credibility and acceptability of knowledge claims (Pedersen et al., 2000). Simply put, research validation is conducted to measure the suitability, practicality, reliability, and appropriateness of the developed framework or system (Ameyaw, 2014; Osei-Kyei, 2018), to satisfy the need of the end-user (Yeung, 2007). Whereas the choice of research validation technique heavily relies on the research intent (Law, 2007), there is no formalized procedure for selecting a specific validation technique (Sargent, 1991).

Lucko and Rojas (2010) mentioned that research validation is simply "doing the right thing", which stands in contract to verification – "doing things right". Therefore, research validation ensures that each respective stage of the selected research methodology rigorously follows the highest quality standards to generate quality, reliable, and credible outputs acceptable to practitioners/users. Research validation approaches can be quantitative or qualitative (Yang et al., 2010). According to Ameyaw (2014), the quantitative approach uses objective and numerical-based data to test hypothesized relationships among measurement items. The qualitative approach adopts a non-statistical technique such as opinion or perception-based data. This study utilized a qualitative approach to validate the framework since the proposed ICJVs model and management framework are combined with constructs that are abstract and difficult to quantitively assess (Ameyaw, 2014; Hu et al., 2016). Thus, collecting opinion-based data for this kind of study is more reliable compared to prescribed assessment criteria (Darko, 2019). Lucko and Rojas (2010) highlighted and expounded six types of research validation in construction

management research, including content validity, construct validity, criterion validity, external validity, internal validity, and face validity. Similar to Darko (2019), this study developed a validation questionnaire considering external validity, internal validity, construct validity, and content validity. External validity focuses on the generalizability of the research outputs and models (Hu et al., 2016). In this study, external validity evaluates whether the proposed management framework for the successful management and performance of ICJVs in Ghana can be generalized. According to Lucko and Rojas (2010), internal validity relates to the concept of causality and is preoccupied with the derivability of relations within data. Thus, internal validity was used in this research to determine whether the abovementioned management framework is easily understandable for practice (Osei-Kyei, 2018; Darko, 2019). Construct validity focuses on the operationalizations of theoretical constructs in terms of their appropriateness. In particular, construct validity is concerned with ensuring that a research effort is measuring what it is supposed to measure in relation to its highlighted objectives (Lucko and Rojas, 2010; Hu et al., 2016). In this research, construct validity measures the suitability and comprehensiveness of the said management framework. Finally, content validity is a non-statistical approach that deals with determining whether the content of a study correctly represents reality (Lucko and Rojas, 2010). Babbie (1990) mentioned that content validity is simply the degree to which a measure covers the different meanings captured within the concept. Explicitly, content validity tests whether the aforesaid management framework could support successful management and performance of ICJVs in Ghana when correctly used (Ameyaw, 2014; Darko, 2019).

10.6.1 Validation Survey

As mentioned already, a validation questionnaire similar to Darko (2019) and Oppong (2020) was conducted to validate the credibility, suitability, and quality of the proposed management framework for the successful management and performance of ICJVs in Ghana. This approach was considered appropriate because an ICJV project could take over five years to complete, and thus, it was not feasible to validate the framework based on a real time project during the span of this research study. The validation was achieved through an email-based questionnaire survey. This allowed the researcher to easily reach and communicate with targeted respondents (Ameyaw, 2014; Darko, 2019). Besides, it costs less in terms of time and money. To have a better understanding of the validation questionnaire, a sample is provided in Appendix. The questionnaire involved seven statements that were modified from Darko (2019) and Oppong (2020). The 17 respondents who were considered in the ZBWM survey were involved in the validation questionnaire. Thus, respondents have had at least 10 years of experience in the construction industry and have been involved in more than two (2) ICJV projects. In all, nine out of the 17 respondents responded to the survey. Among them were five local partners and four foreign partners. This sample size relates positively with five, six, and seven respondents for the validation questionnaire survey by Darko (2019), Ameyaw (2014), and Osei-Kyei (2018), respectively. Hence, the sample size is reasonable making the validated framework more reliable, credible, and generalizable. The respondents were requested to rate their level of agreement using a seven-point rating scale (1 = strongly disagree, 2 = disagree, 3 = disagree somewhat, 4 = neither agree nor disagree, 5 = agree somewhat, 6 = agree, and 7 = strongly agree).

10.6.2 Results of the Validation Survey

Table 10.7 presents the results of the validation questionnaire survey. It is clear from the table that all the seven validation statements with respect to the proposed management framework obtained mean score values greater than the average of the ranking scale (i.e. 4.50). Thus, the lowest mean score value was 5.56. This generally implies that the respondents agreed that the four validation aspects (external validity, internal validity, construct validity, and content validity) of the management framework are adequate. Statement 1 and 7 were used to assess the external validity of the management framework. Statement 1 had a mean score value of 6.44, indicating that the significant drivers, barriers, MC mechanisms, and the performance measures of ICJVs identified are inclusive and cover all the key issues for managing ICJVs in Ghana. Statement 7 obtained a mean score value of 6.11, implying that the respondents hold a strong agreement of the management framework in terms of its suitability for the successful management and performance of ICJVs in Ghana. The internal validity was measured with the statement 3 and 4. Statement 3 had a mean score of 5.89, indicating that the management framework is easily understandable and could be useful for ICJVs. Also, statement 4 had a mean score value of 5.56, which means the respondents agreed that the management framework structure and relationships among all the constructs in the framework are organized appropriately. Statement 2 and 5 were meant for assessing the construct validity of the management framework. Statement 2 obtained a mean score value of 6.33, indicating that the concepts in the management framework are appropriately classified. More so, statement 5 obtained a mean score value of 6.44, which indicates that the management framework is objective and reasonable.

Table 10. 7 Validation results of the ICJVs management framework

No.	Validation questions	Responses of ICJV practitioners									
		R1	R2	R3	R4	R5	R6	R7	R8	R9	Mean
1	The framework captures all the relevant concepts for the management of ICJVs	6	5	6	7	6	7	7	7	7	6.44
2	The concepts in the framework are appropriately classified	6	7	6	5	6	7	7	7	6	6.33
3	The framework is easily understandable and could be useful for ICJVs	6	5	6	5	5	6	7	6	7	5.89
4	The structure and relationships among all the constructs in the framework are organized appropriately	5	6	5	6	5	7	5	6	5	5.56
5	The framework is objective (i.e. mutual satisfaction – local partners and their foreign counterparts of ICJVs) and reasonable	6	7	6	7	7	6	6	7	6	6.44
6	The appropriate use of the management framework would help to improve the performance of ICJVs	7	7	7	7	5	6	6	6	6	6.33
7	The overall framework is suitable for the successful management and performance of ICJVs	7	6	7	5	7	5	5	7	6	6.11

Note: The nine respondents are represented with R1 – R9.

Lastly, the content validity of the management framework was measured using statement 6. The statement obtained a mean score value of 6.33, implying that the performance of ICJVs would be improved if the management framework is correctly adopted in the industry.

Overall, the high scores achieved for the four validation aspects indicate that the management framework for the successful management and performance of ICJVs is credible, reliable, objective, and appropriate. It is worth mentioning that to facilitate the adoption and use of the management framework, the management framework is in the pipeline to be made available to users via publishing/reporting it in Tetteh et al. (under review). Second, it will be introduced to the GIPC and industry practitioners through professional bodies such as the Ghana Institute of Construction (GIOC), Ghana Institute of Surveyors (GhIS), and Ghana Institute of Engineers (GhIE). A comprehensive explanation of the value of and how to use the management framework to ICJV practitioners can play a significant role in facilitating the successful management and performance of ICJVs.

10.7 CHAPTER SUMMARY

Several influential factors including drivers, barriers, and MC mechanisms impact their performance expectations. However, the quantitative impacts of drivers, barriers, and MC mechanisms on the performance of ICJVs remain largely unknown. Building upon the findings of previous chapters (Chapter 6 to 10), this chapter investigated and modeled the quantitative impacts of different forms of drivers, barriers, and MC mechanisms on the performance of ICJVs in Ghana. PLS-SEM was used to analyze the survey data. The results showed that drivers have a significant positive impact on the performance of ICJVs. More so, the results indicated that

barriers have a significant negative impact on the performance of ICJVs. Furthermore, the results showed that MC mechanisms have a significant positive impact on the performance of ICJVs, and It was also found that MC mechanisms have a significant negative moderating effect on the negative relationship between barriers and performance of ICJVs. In conclusion, the results highlight the need for parties of ICJVs to align their drivers and strategically build their MC structures to promote the achievement of ICJV performance goals by weakening the impacts of barriers.

CHAPTER 11 CONCLUSION AND RECOMMENDATIONS

11.1 INTRODUCTION

The previous chapters, Chapters 1 to 10, have outlined different aspects of this research study. The background to this research is provided in Chapter 1; Chapters 2 provides the research methodology; Chapter 3 to 5 present comprehensive literature reviews on the various issues addressed in this study; and Chapters 6 to 10 report on the empirical findings of the various issues in this research. In the present chapter, the objectives are reviewed, and the research conclusions are presented. More so, the theoretical and practical significance and value of the research study are explicated. Lastly, the limitations of the present study are stated, and recommendations are offered for future research.

11.2 REVIEW OF RESEARCH OBJECTIVES AND CONCLUSIONS

The research study aimed to develop an effective management framework for the successful management and performance of ICJVs in Ghana. Six objectives were formulated to help realize the study's aim. The specific objectives are as follows:

1. To identify the key drivers for implementing ICJVs in Ghana;
2. To identify and evaluate the critical barriers impeding ICJVs success in Ghana;
3. To define and establish practical means for exercising MC in ICJVs in Ghana;
4. To develop a complete performance assessment framework for ICJVs in Ghana;

5. To examine the relationship between MC mechanisms and the performance of ICJVs in Ghana; and
6. To develop an effective management framework for ICJVs, contingent on the various issues outcome, to help in facilitating the successful management and performance of ICJVs in Ghana.

The research objectives were realized via a range of methods and techniques explained in Chapter 2. The methods include but are not limited to literature review, expert survey, ordinary questionnaire survey, two rounds Delphi survey, and ZBWM survey. The following sections highlight the major findings and conclusions of every specific objective.

Objective 1: To identify the key drivers for implementing ICJVs in Ghana

A comprehensive literature review was conducted to identify drivers for implementing ICJVs. Based on this comprehensive literature review, 47 drivers were identified, and 31 potential drivers were used for the final survey after modification to the questionnaire through a pilot study. A two-round Delphi survey and a general survey were conducted with ICJV practitioners. The results (Chapter 6) revealed 17 common/mutual drivers and 14 separate drivers for implementing ICJVs. The top five key drivers were: (1) risk/resource sharing, (2) improve company's image, (3) improve track records, (4) better execution of projects, and (5) gain economics of scale. A factor analysis was conducted on the data, and 14 drivers were finally considered under the common/mutual drivers and produced two underlying grouped drivers: (1) operational success drivers, and (2) organizational-driven drivers. More so, 10 drivers were retained under the separate drivers and produced two non-overlapping factors: (1) strategic

positioning drivers, and (2) market power drivers. The findings will enable ICJVs practitioners to better understand their partners' rationales for ICJV formation and how they are coupled with their own. Specifically, ICJV practitioners will have some exploratory evidence on how to structure a specific deal based on specific firm characteristics that are related to single or multiple drivers. The underlying group drivers, in particular, the common drivers formed a key part of the foundation on which the management framework for the successful management and performance of ICJVs in Ghana was developed in Chapter 10.

Objective 2: To identify and evaluate the critical barriers impeding ICJVs success in Ghana

To identify the barriers impeding ICJVs success, a comprehensive review of pertinent literature was conducted within Chapter 4, which allowed the identification of 37 potential barriers to ICJVs success. This 37-barrier list was improved through a pilot study with academics and industry practitioners. In the end, 34 barriers were identified and examined through a questionnaire survey with ICJV practitioners in Ghana. The results revealed the criticality of 22 barriers to ICJVs success in Ghana. The top five critical barriers were: (1) lack of preparedness to accept company philosophy, (2) competing objectives, (3) opportunistic behaviour of parties, (4) conflicts created between the partners of ICJV, client organization, and stakeholders, and (5) lack of management control. Confirmatory factor analysis results confirmed the significance of five underlying grouped barriers: (1) organizational-related barriers, (2) cultural-related barriers, (3) knowledge-related barriers, (4) individual-related barriers, and (5) logistics-related barriers. Analyzing the critical barriers to ICJVs success within the context of a developing country

provides invaluable insights into promoting broader, better implementation of ICJVs and contributing to their success. These categorized barriers were used in the final PLS-SEM model to aid the development of the management framework. Equipping ICJVs practitioners with a better understanding of the critical barriers invariably leads to efficient utilization of the limited resources, and important for developing suitable measures and policies to enhance the successful implementation of ICJVs.

Objective 3: To define and establish practical means for exercising MC in ICJVs in Ghana

Through a comprehensive review of relevant literature conducted within Chapter 5, 17 MC mechanisms were identified and grouped into personnel and policy-driven MC mechanisms. These 17 mechanisms were examined through a questionnaire survey. The results (Chapter 8) indicated that 16 out of the 17 mechanisms were significant in ICJVs. Among the significant mechanisms, (1) staffing of corporate board members, (2) staffing of senior executive positions (e.g., project managers), (3) key functional areas placement (e.g., engineers, supervisors, etc.), (4) provision of market knowledge, and (5) operational areas deployment (e.g., labourers) were the top five significant mechanisms. These 16 mechanisms have been grouped into four underlying constructs: (1) top management staffing, (2) key functional and operational areas, (3) support in policy and planning process, and (4) training and learning opportunities. The findings bring to light the key mechanisms that ICJV practitioners can employ to control and manage ICJVs operations. The outcome of this aspect was used in the PLS-SEM model to investigate the impact on the performance of ICJVs within Chapter 9.

Objective 4: To develop a complete performance assessment framework for ICJVs in Ghana

Thirty-five ICJVs performance measures were identified via a comprehensive literature review done within Chapter 5. The results (Chapter 8) from a general questionnaire survey indicate that 28 out of the 35 performance measures are significant in terms of their realization in ICJVs. A confirmatory factor analysis validated the significance of five first-order performance dimensions, measured using (1) project-based performance, (2) company/partner-based performance, (3) performance of ICJV management, (4) perceived satisfaction with the ICJV, and (5) socio-environmental performance. The top most significant performance measures within each respective performance dimension were: (1) achieving the required project quality, (2) communication, learning, and development, (3) effectiveness of operational control, (4) overall satisfaction, and (5) sustainable job creation, respectively. The results also revealed that not much was realized about the socio-environmental performance, which calls for further investigation to find a point of convergence between the practice of, and research into the socio-environmental performance of ICJVs. The outcome of this research provides guidance for practitioners to assess multiple aspects of the ICJV performance, and to reflect on how they operate and enhance their performance. Also, the finding of this aspect was used in the PLS-SEM model to investigate the impact of MC mechanisms on the performance of ICJVs within Chapter 9.

Objective 5: To examine the relationship between MC mechanisms and the performance of ICJVs in Ghana

Based upon the results regarding the MC mechanisms and the performance measures for ICJVs, PLS-SEM was applied to investigate and model the impact of MC mechanisms on the performance of ICJVs. The results showed that personnel and policy driven mechanisms have a significant positive impact on project and socio-environmental performance of ICJVs when foreign partners are involved, while both mechanisms highly displayed a positive and significant impact on project performance for local partners. The findings indicated that through the use of multiple performance measures there is a greater understanding of the impacts of mechanisms of an ICJV. The study concluded that host/local countries should actively involve foreign partners at the daily operational management level of the ICJV for positive organizational and societal outcomes. The outcome of this research is relevant for supporting ICJV practitioners to strategically build their control structures for improving the overall performance of ICJVs. Given that both personnel and policy driven mechanisms provided by foreign partners contribute significantly to improving socio-environmental performance, this requires policymakers to contemplate regulations that will enhance the active involvement of foreign partners to support both individual organization's sustainability.

Objective 6: To develop an effective management framework for ICJVs, contingent on the various issues outcome, to help in facilitating the successful management and performance of ICJVs in Ghana

PLS-SEM model was developed to investigate the impacts of various forms of drivers, barriers, and MC mechanisms on the performance measures of ICJVs. The significant outcomes from

these specific issues were used in the PLS-SEM model. Based on the PLS-SEM results that (1) drivers have a significant positive impact on ICJVs performance, (2) barriers have a significant negative impact on the performance of ICJVs, and (3) MC mechanisms have a strong and positive impact on the performance of ICJVs, and adversely moderate the negative relationship between barriers and performance of ICJVs; an effective management framework for the successful management and performance of ICJVs was developed. The management framework was further validated with nine ICJV practitioners. This helped to ensure the effectiveness of the developed management framework. The validation results demonstrated that the management framework is comprehensive, credible, and reliable, and if progressively adopted and use can significantly facilitate the successful management and performance of ICJVs.

11.3 SIGNIFICANCE AND VALUE OF THE STUDY

This research makes significant contributions to the ICJV body of knowledge and industrial practice for developing countries, especially for Ghana, and the world at large.

With regards to the drivers, while the existing literature gives a little empirical account of drivers for implementing ICJVs, theoretically, the exploration of common/mutual and separate drivers via a developing country view contributes enormously to ICJV and strategic alliance literature in general. Bringing to light the common/mutual and separate drivers for ICJVs implementation in the developing country of Ghana reinvigorates theoretical development by shedding light on the understanding of multiple rationales behind ICJVs formation from two different groups of partner firms. Consequently, future studies that accommodate these findings to study multiple ICJVs within a specific country/jurisdiction would significantly advance the field and hold more

explanatory power. More so, giving the varying degrees of significance and agreement levels on the drivers for implementing ICJVs provides a complete basis for future scholars to conduct additional insights within different countries for complete theory development. Practically, it provides an exhaustive list of key drivers that gives a significant statute to practitioners and policymakers to determine the operational dynamics and success of ICJVs. Specifically, it will enable ICJVs' practitioners to better understand their partner's rationales for ICJV formation and how they are coupled with their own. Therefore, practitioners will have some exploratory evidence on how to structure a specific deal based on specific firm characteristics that are related to single or multiple drivers. Consequently, practitioners and policymakers can customize their ICJVs to reap the expected benefits. The findings could also enable the establishment of guidelines by the government to promote the adoption of ICJVs. The findings showed that these drivers, as benefits to be gained from implementing ICJVs are multidimensional (i.e., benefiting organizations, practitioners, and countries/jurisdictions at large). Therefore, it is recommended that governments including public policymakers should enact suitable and more effective policies and regulations that would form regulatory pressure for both public and private companies and stakeholders to adopt ICJVs. More so, it is important for companies to fully support and promote the implementation of ICJVs because that would help them build their capacities and gain some other benefits.

With regards to the barriers, different from previous studies that analyzed the barriers to CJVs success, this study comprehensively analyzes the barriers impeding the success of ICJVs, which contributes to ICJV literature by undertaking a comprehensive review of the barriers and empirically examining their criticality from a developing country perspective. More so, by

analyzing the individual levels of the barriers criticalities, this study brings to light the critical barriers, informing ICJVs practitioners, policymakers, and researchers on the barriers to focus attention on when implementing ICJVs in, especially a developing country. As academic and industrial researchers continue to develop frameworks and strategies for ICJV implementation, this study provides a frame of reference for more applied measures to be developed. It could also direct researchers toward examining the influences of these barriers on ICJVs overall performance goals to devise clear-cut frameworks, seeking their successful implementation in the future. Practically, this study not only contributes to deepening the understanding of barriers; it could also help ICJVs practitioners and policymakers identify specific problems in ICJV implementation and develop appropriate strategies to overcome the barriers and strive for the ultimate success of ICJVs. While the findings are useful to the developing country of Ghana and beyond, foreign/international firms seeking to implement and promote ICJVs in Ghana could possess prior practical knowledge of these critical issues, especially concerning the barriers, and prepare for them. Thus, this research benefits the world at large.

With regards to the MC mechanisms, although previous studies explained MC mechanisms and its acquisition from the management literature, which is not wrong, they failed to establish how these MC mechanisms should be measured. Drawing on the transaction-cost-economizing, institutional and relational characteristics, this study adds up to knowledge by revealing that the exercise of management control does not solely depend on transaction cost and relational characteristics; but, also rooted in the societal or institutional custom of corporations. Thus, it increases the understanding of how different mechanisms of management control can be established by drawing on these theoretical grounds. Researchers would be able to critically

evaluate the current management practices and policies of ICJVs and develop alternatives for improving overall performance and increasing the chances of success. Alternatively, this will stimulate future research and potentially help reconcile the controversy related to the MC and performance relationship in ICJVs. This study complements the current ICJV literature by defining and empirically testing the measurement items of MC mechanisms, allowing ICJV practitioners to better understand how MC mechanisms are acquired and exercised. More so, the findings of this study may help ICJV practitioners in making decisions about which ICJV activities to control, and the mechanisms to employ to efficiently and effectively manage ICJV. A better understanding of the MC mechanisms not only enables ICJV practitioners and policymakers to better enhance their control structures and the ICJVs performance but also provides support for ICJVs during the creation and negotiation process.

With regards to the performance measures, a more standardized and complete set of performance measures that have been validated not only assist future researchers in selecting key performance measures that are most relevant to their study but also provide guidance for ICJV practitioners to assess multiple aspects of the ICJV performance and to reflect on how they operate and enhance their performance. While an adequate combination of the measures allows addressing the multidimensionality of ICJVs performance, the ranking of the measures would help practitioners to focus more on the significant measures when launching ICJVs. Finally, the measures can be used by ICJVs practitioners as a postproject appraisal tool after the completion and evaluation stage of ICJVs lifecycle.

Overall, the findings of this research are of great value and benefit to researchers, policymakers, and industry practitioners seeking empirical quantitative clarifications and explanations of the cause-effect relationships of the drivers, barriers, and MC mechanisms on the performance of ICJVs. Based on the findings of this study, researchers, industry practitioners, policymakers and stakeholders can develop efficient and effective management and implementation strategy to achieve superior performance in ICJVs. Finally, the developed management framework serves as a frame of reference for practitioners and policymakers to benefit in facilitating efficiency and effectiveness in the management of ICJVs as well as improving their performance.

11.4 LIMITATIONS OF THE STUDY

Although the aim and objectives of this research study was achieved, this research has some limitations that are worth mentioning. First, the present research was limited in scope to one country, Ghana, and its assessment was based on the perception which can be misleading depending on the standpoint of the respondents. There might be some generalizability limitation, a country-specific studies problem. Besides, the number of responses received from the two groups of partners were relatively low and given that the local partners constitute the majority of the respondents could have some influence on the results. Thus, this must be considered when interpreting the results of the study. Moreover, although the simple random sampling technique adopted was intended to obtain unbiased data, considering the small sample frame and the poor response rate in the construction industry given the limitation of direct access to targeted respondents and their reluctance to spent time to answer questionnaire; the representation of the full population was skewed and requires additional sampling techniques. However, given the varied global experience of involved foreign partners and discussion via literature review, the

insights appear to contain some generic features that could be transferable to enhance the successful implementation and management of ICJVs. More so, this study considered only the common/mutual drivers in the final model as separate drivers may lead to conflict in the goal set or performance of the ICJVs. Finally, the results of the study are basically based on surveys.

11.5 RECOMMENDATION FOR FUTURE RESEARCH

First, as the number of responses received from the two partners was relatively low, despite the acceptable response rate, future studies may employ larger samples from both partners to validate the findings. This could be achieved through a multiple-case design by using secondary data from literature could also be adapted to increase both the internal and external research validity. This opportunity can support the collection of a greater volume of evidence, which can drive to better triangulation of the results. Future studies could focus on other developing countries, aside from Ghana. In doing so, findings, models, and management frameworks that can facilitate more effectively and efficiently enhance successful management within specific countries would be developed. This is reasonable because different countries and regions may have different levels of variations in cultures and traditions, socioeconomic, political, and environmental priorities that shape their ICJV implementation approach (Tetteh et al., 2020).

Second, in relation to the MC mechanisms, future research should expand the scope by exploring additional mechanisms that would be of interest in exerting MC in ICJVs. Lastly, acknowledging that the measurement items for both MC mechanisms and performance measures are not generic, collecting data from multiple partners in the same ICJV represents a reasonable approach to

standardize the results for wider adoption and implementation. Because of these limitations, future studies should be aimed at developing more complete MC mechanisms and performance measures for ICJVs. This could be achieved by collecting different experts' opinions through an international survey. This would no doubt enhance the unification and standardization of the factors.

Third, the dynamic evolution of ICJVs equally means that different stages may have different barriers, MC mechanisms, performance measures, etc. (Prasitsom and Likhitruangsilp, 2015; Tetteh and Chan, 2019). Future studies should consider exploring and categorizing these critical concepts in stages of ICJVs lifecycle. This will aid the development of a more dynamic management process that integrates the stagewise progression of the ICJV lifecycle. This would assist practitioners to plan even before and after ICJVs formation.

Forth, although critical constructs impacting the performance measures of ICJVs were those having more weight, future studies should investigate the direct impact of individual constructs on individual performance constructs to specifically determine the significant paths to enhance the understanding.

Fifth, according to Luo et al. (2001), the relationship between MC mechanisms and ICJV performance is moderated by other variables such as organizational competence, cultural distance, etc. Thus, it is in the remit of future studies to explore their moderating roles and refine the understanding of the linkage between MC mechanisms and ICJV performance.

Lastly, while the study confirmed the adverse moderating impact of MC mechanism on the barriers and performance measures relationship, the study did not specifically determine the MC mechanisms that effectively moderate that relationship. Thus, as moderating variables could also be regarded as separate variables to influence dependent variables, future studies should investigate and model the impact of the MC mechanisms on the barriers to ICJVs success. This will bring out those significant mechanisms that can be used to minimize the barriers and improve the overall ICJVs performance. More so, this study considered only the common/mutual drivers in the final model as separate drivers may lead to conflict in the goal set or performance of the ICJVs (Brockmann and Girmscheid, 2009). Hence, future studies should empirically verify by testing the impact of the separate drivers on the performance of ICJVs. This will significantly contribute to the ICJV body of knowledge. To conclude, although a satisfactory validation based on questionnaire surveys was achieved, future studies should validate the framework using a real time ICJVs project to enhance the understanding and provide support for ICJVs implementation.

11.6 CHAPTER SUMMARY

This chapter presented the conclusions and recommendations of this research study. The conclusions of all the objectives were presented. Moreover, the significance of this study was summarized, followed by the research study limitations and recommendations for future research. This chapter closes this research study. The following pages contain the appendices and references for this study.

APPENDIX A

QUESTIONNAIRE FOR GENERAL SURVEY

Dear Sir/Madam,

Invitation to Participate in a Ph.D. Research Study

I write to humbly invite you to take part in an ongoing Ph.D. study entitled ***"Determinants of Project Success for International Construction Joint Ventures in Ghana"*** under the supervision of Professor Albert P. C. Chan. This Ph.D. study is funded by the Department of Building and Real Estate of the Hong Kong Polytechnic University. The primary aim of this study is to develop an effective management framework for the successful control and performance of ICJVs in Ghana. This survey is core to achieving the research aim and objectives.

As an experienced practitioner in the construction management sector, you are genially invited to give your views on this hybrid collaboration contracting method by completing this questionnaire survey. The survey will take approximately 15 – 20 minutes to complete. Be assured that all the information and data you provide will be treated with strict confidentiality and only used for academic purposes. My advisor and I are ready to share the summarized findings with you upon request.

Thank you for your immeasurable contribution and valuable time in making this survey a success. If you have queries, please contact Mershack Opoku Tetteh (Tel: 024423 & email address: mershack-opoku.tetteh@) or Professor Albert P. C. Chan at albert.chan@

Yours sincerely,

……

Mershack Opoku Tetteh, Ph.D. Student
Ir Professor Albert P.C. Chan, Head of Department of Building and Real Estate
Chair Professor of Construction Engineering and Management
The Hong Kong Polytechnic University, Hong Kong

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF BUILDING & REAL ESTATE 建築及房地產學系

Project Title: Determinants of Project Success for international Construction Joint Ventures in Ghana

Questionnaire Survey

Important Instructions

1. **International construction joint ventures (ICJVs)** refer to the short-term marriage between at least two firms who join forces together in pursuit of architectural, engineering, and construction projects with the headquarters of at least one partner is situated outside the venture operation country with at least one partner headquartered outside the country of operation.
2. Note that for simplicity, **"ICJV"** is used in the questionnaire.
3. Please duly fill this questionnaire with reference to your experience and knowledge in ICJVs.
4. Please answer the questions by ticking (such as "✓"} or checking (such as "☒").
5. Please your participation is expected to last about **15 minutes** in this round. Kindly fill the questionnaire within **Two weeks** upon receipt, and the completed questionnaire will be collected in person by the researcher or his assistant where appropriate.
6. If you wish to have a copy of the report on research findings, please provide your contact and email address: Click or tap here to enter text.

Section A: Background of Respondents

Q1. Please indicate the type of your firm.

☐ Foreign/overseas firm (please specify your country Click or tap here to enter text.)

☐ Local/domestic/host country firm

Q2. Please state your position in your firm.

☐ Project manager ☐ Quantity surveyor

☐ Architect Other(s) (specify):Click or tap here to enter text.

☐ Contractor

Q3. Years of working experience in the construction industry:

☐ Less than 5 years ☐ 11 – 15 years ☐ More than 20 years

☐ 5 – 10 years ☐ 16 – 20 years

Q4. Number of ICJV project(s) involved (including on-going projects):

☐ 1 ☐ 3 ☐ 5 or more

☐ 2 ☐ 4

Section B: Drivers for implementing ICJVs

Please indicate your level of agreement on each of the following drivers for implementing ICJVs in Ghana.

Use the following scale: **1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 = agree somewhat; 6 = agree; 7 = strongly agree**

No.	Drivers for implementing ICJVs	Level of agreement Low <<<----------->>>High
1	Risk/resource sharing	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Acquisition of advanced technology and managerial skills	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Improve quality level of construction projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Prevention of wholly own foreign companies	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Gain economies of scale	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Promote economic growth	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Demand for value for money	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Better execution of projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Overcome cultural and political barriers	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Enter new construction market	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Pre-qualification condition	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Increase market share	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Increase productivity	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Diversification	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Opportunity to work on large and complex projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Ensure stability	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Improve company's image	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Secure financing	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Growth in construction globalization	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Competing interest of national development	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Improve competitive position	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
22	Improve track records	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
23	Overcome the lack of local knowledge of international firms	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	Build reputation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
25	Increase credibility	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
26	Promote industrial integration	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Increase efficiency	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
28	Acquire new construction project	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Overcome environmental deficiencies	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Improve existing imperfect mechanism of the construction industry	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
31	Stimulate export-orienting contracting	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any drivers omitted by this questionnaire, please list and rate them		
1	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

Section C: Barriers Impeding ICJV Success

Q1: Please rate the criticality of each barrier factor to ICJVs success using the following scale: **1 = Very low; 2 = Low; 3 = Medium low; 4 = Medium; 5 = Medium high; 6 = High; 7 = Very high.**

Q2: Please rate your confidence/reliability level on the decision made using the following scale: **1 = Very low; 2 = Low; 3 = Medium low; 4 = Medium; 5 = Medium high; 6 = High; 7 = Very high.**

No.	Barriers	Level of criticality [Q1]	Level confidence/reliability[Q2]
		Very Low <<<--->>>Very High	Very Low <<<--->>>Very High
1	Lack of management control	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Competing objectives	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Language barrier	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Incompetence of host/local management team	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Different organizational cultures	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Difficulty in measuring ICJV performance	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Incomplete contract terms with partners	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Poorly formulated governance structure	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Lack of clear understanding and knowledge of ICJV fundamentals	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Relationship management issues	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Unstable agreement for a limited period	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Lack of mutual commitment of partners	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Poorly formulated decisions in assigning limited resources	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Difficulty in selecting suitable partners	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Lack of proper project planning and budgeting	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Fear of legal action	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Lack of corporation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Lack of confidence about experience and knowledge among parties	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Lack of strategic planning for the ICJV operations	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Fear of exposure of strength and weakness	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Blaming habits	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
22	Unstructured problems, issues, and risk management framework	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
23	Lack of continuous improvement	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	High sense of superiority	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
25	Lack of preparedness to accept company philosophy	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
26	Poor problem-solving culture	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Lack of proper organizational structure to create and share knowledge	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
28	Human resource management issues	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Technological deficiency of co-partners	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Friction created between the ICJV, client organization and stakeholders	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

No.	Barriers	Level of criticality [Q1]	Level confidence/reliability[Q2]
		Very Low <<<--->>>Very High	Very Low <<<--->>>Very High
31	Unfair power and responsibilities among entities	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
32	Unfair distribution of salary package among entities	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
33	Lack of knowledge about host/local statutory requirement	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
34	Opportunistic behaviour of parties	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any barrier factors omitted in this questionnaire, please list and rate them			
1		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

Section D: Management Control Mechanisms used by Corporate Firms in ICJVs

How **significant** do the following management control mechanisms provide means by which control is exercised in ICJVs in Ghana? Please, rate the importance of each factor using the following scale: **1 = not important; 2 = least important; 3 = fairly important; 4 = moderate; 5 = important; 6 = very important; 7 = most important.**

No.	**Management Control Mechanisms**	**Level of significance [Q1]**
		Low <<<---------->>>High
Personnel Driven mechanisms		
	Top management staffing	
1	Staffing of corporate board members	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Staffing of senior executive positions (e.g. Project managers)	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Key functional and operational areas	
3	Key functional areas placement (e.g. Engineers, supervisors, etc)	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Operational areas deployment (e.g. labourers)	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
Policy Driven Mechanisms		
	Support in policy and planning process	
5	Human rights policies	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Making development plans	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Evaluating project feasibility considering environmental impacts	☐1; ☐2; ☐3; ☐4; ☐5; ☐6;☐7
8	Establishing codes of ethics for projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Health and safety issues	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Monitoring and reporting	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Laying down procedures and routines for the ICJV	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Support in supervisory role	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Financial and resource allocation planning	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Training and learning opportunities	
14	Provision of technological knowledge	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Provision of market knowledge	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Provision of cultural knowledge	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Provision of knowledge on governmental issues	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any control mechanisms omitted by this questionnaire, please list and rate them		
1	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

No.	Management Control Mechanisms	Level of significance [Q1]
		Low <<<----------->>>High
2	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

Section E: Performance Measures of ICJVs

Q1: Please, rate the **level of importance** on the following **performance indicators** for ICJV using the following scale: **1 = not important; 2 = least important; 3 = fairly important; 4 = moderate; 5 = important; 6 = very important; 7 = most important.**

Q2: Please, also rate the extent to which the following key performance indicators are achieved using the following scale: **1 = not realized; 2 = least realized; 3 = fairly realized; 4 = moderate; 5 = realized; 6 = highly realized; 7 = most realized.**

No.	Performance Criteria	Level of importance [Q1]	Level of realization [Q2]
		Low <<<----------->>>High	Low<<<----------->>>High
	Project-based Performance		
1	Completing the project within budgeted cost	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Completing the project within schedule	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Achieving required project quality	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Client satisfaction	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Good safety performance	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Dispute resolution	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Profitability	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Ethics in management	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Risk and issue management	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Company/Partner-based Performance		
10	Sharing of risks equitably	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Resource sharing	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Cost's reduction	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Technology acquisition	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Facilitating internationalization form your partner	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Enhancing competitiveness	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Creating long-term relationships	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Acquisition of managerial skills	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Reputation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Communication, learning and development	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Market share	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Corporate governance	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Performance of ICJV Management		
22	Effectiveness of the strategic (upper management) control of the ICJV	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

No.	Performance Criteria	Level of importance [Q1]	Level of realization [Q2]
		Low <<<----------->>>High	Low<<<----------->>>High
23	Effectiveness of the operational (daily activities) control of the ICJV	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	Effectiveness of the organizational control of the ICJV	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Perceived Satisfaction with the ICJV		
26	Overall satisfaction	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Stability of the ICJV	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	Socio-environmental Performance		
28	Stakeholder engagement	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Labour practice/relation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Sustainable job creation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
31	Philanthropy	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
32	Social reporting	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
33	Avoidance of material wastage	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
34	Environmental performance	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
35	Pollution reduction	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
36	Environmental compliance	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
	If there are any performance measures omitted by this questionnaire, please list and rate them		
1	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

--This is the end of the survey---Thank you for your time

Section G - ***Definition of key terms***

(Please, if necessary, refer to the following definitions when answering the questions)

Keywords	Definition
Management control mechanism	The channel of influence implanted by both local and foreign partners to control the ICJV. It also represents the physical or administrative steps that a partner use to provide more direction
Project performance	Measures the extent to which the pre-set objectives of the ICJV project are achieved
Company/Partner performance	Measures the extent to which the predetermined organizational objectives are realized contingent on the ICJV project undertaken
Performance of the ICJV management	Measures the extent to which activities are effectively controlled
Perceived satisfaction with the ICJV	Measures the extent to which the partners are satisfied with the ICJV
Socio-environmental performance	Measures the extent to which the ICJV achieve its social and environmental performance

APPENDIX B

DELPHI SURVEY QUESTIONNAIRE: ROUND ONE

Dear Sir/Madam,

Invitation to Participate in a Ph.D. research study into Determinants of Success for International Joint Ventures in Ghana

I write to humbly seek your help as an experienced practitioner with substantial knowledge in international construction project joint ventures (ICJVs) in Ghana to participate in this Delphi Survey. I am presently undertaking a funded Ph.D. study in the Department of Building and Real Estate of the Hong Kong Polytechnic University under the supervision of Ir. Professor Albert P. C. Chan. My research is entitled ***"Determinants of Project Success for International Construction Project Joint Ventures in Ghana."*** The primary aim of this study is to develop an effective management framework for the successful management and performance of ICJVs in Ghana.

This Delphi survey is core to achieving the research objective concerning the key drivers for implementing ICJVs in Ghana. As an experienced ICJV practitioner, your views will be useful for this research in advancing the successful management and performance of ICJVs in Ghana. This stage of the study uses a maximum of three rounds of Delphi survey so you can share your views and practical experience with us. The Delphi technique is a structured interaction and consensus-building process among a collection of experts to investigate phenomena or solve problems. Here, a consensus is attained through iterative rounds of experts' opinions on a specific phenomenon interspersed with group feedback. Unlike the general questionnaire survey, the Delphi survey uses both collective wisdom of experts and statistical analysis to reach improved decisions through many rounds of questionnaire survey. This is **Round 1**, and in Round 2, and 3, will receive the feedback of all participating practitioners from Round 1 and additionally be asked to review your initial perception based on the combined experts' opinions. I will appreciate it if you could participate by completing the questionnaire in each round to ensure convergence in the outcome. The questionnaires are designed very simple to take about **15 minutes** of your time in each round, and thus, the entire process should take about **45 minutes** of your valuable time.

The entire duration of your participation is expected to be within **three months (from mid-January to mid-March 2020)**. You will be asked to complete and return each Delphi questionnaire within **Two weeks** from the issue date. The researcher will have one week between successive rounds of questionnaire survey to compile and evaluate experts' opinions and reissue subsequent questionnaires to all the experts.

Be assured that all the information and data you provide will be treated with strict confidentiality and only used for academic purposes. I appreciate that you partaking in the survey will significantly contribute to the study's result which is intended to improve research and practice ICJV in Ghana. Thank you for your immeasurable contribution and valuable time in making this survey a success.

If you have queries, please contact Mershack Opoku Tetteh (Tel: +852 9296 /024423 ; Email address: mershack-opoku.tetteh@) or Professor Albert P. C. Chan at albert.chan@

Yours sincerely,

……

Mershack Opoku Tetteh, Ph.D. Research Student
Ir. Professor Albert P.C. Chan, Head of Department of Building and Real Estate
Chair Professor of Construction Engineering and Management
The Hong Kong Polytechnic University, Hong Kong

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF BUILDING & REAL ESTATE 建築及房地產學系

DELPHI SURVEY: ROUND ONE (1)

Guidance on completion

Thank you very much for your participation in helping to identify the key drivers for implementing ICJVs. Thirty-one (31) driving factors have been consolidated from germane literature and received significant attention from experts worldwide. You are encouraged to add more drivers where deemed appropriate in the last rows.

Important Instructions

7. **International construction joint ventures (ICJVs)** refer to the short-term marriage between at least two firms who join forces together in pursuit of architectural, engineering, and construction projects with the headquarters of at least one partner is situated outside the venture operation country with at least one partner headquartered outside the country of operation.
8. Note that for simplicity, **"ICJV"** is used in the questionnaire.
9. Please duly fill this questionnaire with reference to your experience and knowledge in ICJVs.
10. Please answer the questions by ticking (such as "✓"} or checking (such as "☒").
11. Please your participation is expected to last about **15 minutes** in this round. Kindly fill the questionnaire within **Two weeks** upon receipt, and the completed questionnaire will be collected in person by the researcher or his assistant where appropriate.
12. If you wish to have a copy of the report on research findings, please provide your contact and email address: Click or tap here to enter text.

Section A: Background of Respondents

Q1. Please indicate the type of your firm.

☐ Foreign/overseas firm (please specify your country Click or tap here to enter text.)

☐ Local/domestic/host country firm

Q2. Please state your position in your firm.

☐ Project manager ☐ Contractor

☐ Architect ☐ Quantity surveyor

Other(s) (specify): Click or tap here to enter text.

Q3. Years of working experience in the construction industry:

☐ Less than 5 years ☐ 11 – 15 years ☐ More than 20 years

☐ 5 – 10 years ☐ 16 – 20 years

Q4. The number of ICJV project(s) involved (including ongoing projects):

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5 or more

Q5. Contact: …….. Email: …….

Section B: Drivers for implementing ICJVs

Please indicate your level of agreement on each of the following drivers for implementing ICJVs in Ghana.

Use the following scale: **1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 = agree somewhat; 6 = agree; 7 = strongly agree**

No.	Drivers for implementing ICJVs	Level of agreement Low <<<----------->>>High
1	Risk/resource sharing	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Acquisition of advanced technology and managerial skills	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Improve quality level of construction projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Prevention of wholly own foreign companies	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Gain economies of scale	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Promote economic growth	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Demand for value for money	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Better execution of projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Overcome cultural and political barriers	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Enter new construction market	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Pre-qualification condition	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Increase market share	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Increase productivity	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Diversification	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Opportunity to work on large and complex projects	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Ensure stability	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Improve company's image	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Secure financing	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Growth in construction globalization	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Competing interest of national development	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Improve competitive position	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
22	Improve track records	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
23	Overcome the lack of local knowledge of international firms	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	Build reputation	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
25	Increase credibility	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
26	Promote industrial integration	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Increase efficiency	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
28	Acquire new construction project	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Overcome environmental deficiencies	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Improve existing imperfect mechanism of the construction industry	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
31	Stimulate export-orienting contracting	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any drivers omitted by this questionnaire, please list and rate them		
1	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

Thanks for participating

APPENDIX C

DELPHI SURVEY QUESTIONNAIRE: ROUND TWO

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF BUILDING & REAL ESTATE 建築及房地產學系

Doctor of Philosophy (PhD) Research Topic: Determinants of Project Success for International Project Joint Ventures in Ghana

DELPHI SURVEY – FOREIGN PARTNER: ROUND TWO (2)

A survey of identifying the key drivers for implementing ICJVs in Ghana

Guidance on completion

I would like to thank you for participating in the 1st round of the survey which forms a very important foundation for this round (**Round 2**). The results from all participants in the 1st round is presented below. The mean scores of drivers are shown in Column 3. Please it is necessary to know whether, with further considerations, you would like to make any changes to your ratings in the first round. Please you may refer to the important instructions below where necessary.

Important Instructions

1. **International construction joint ventures (ICJVs)** refer to the short-term marriage between at least two firms who join forces together in pursuit of architectural, engineering, and construction projects with the headquarters of at least one partner is situated outside the venture operation country with at least one partner headquartered outside the country of operation.
2. Note that for simplicity, **"ICJV"** is used in the questionnaire.
3. Please duly fill this questionnaire with reference to your experience and knowledge in ICJVs.
4. Please answer the questions by ticking (such as "✓"} or checking (such as "☒").
5. Please your participation is expected to last about **15 minutes** in this round. Kindly fill the questionnaire within **Two weeks** upon receipt, and the completed questionnaire will be collected in person by the researcher or his assistant where appropriate.
6. If you wish to have a copy of the report on research findings, please provide your contact and email address: Click or tap here to enter text.

Section A: Background of Respondents

Q1. Please indicate the type of your firm.

☐ Foreign/overseas firm (please specify your country Click or tap here to enter text.)

☐ Local/domestic/host country firm

Q2. Contact: …….. Email: …….

Section B: Drivers for implementing ICJVs

Upon considering your ratings in the previous round, please indicate your level of agreement on each of the drivers for implementing ICJVs in Ghana.

Use the following scale: **1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 = agree somewhat; 6 = agree; 7 = strongly agree**

No.	Drivers for implementing ICJVs	Mean Score 1st Round	Level of agreement Low <<<----------->>>High
1	Risk/resource sharing	6.23	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

2	Acquisition of advanced technology and managerial skills	3.22	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Improve quality level of construction projects	5.68	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Prevention of wholly own foreign companies	4.21	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Gain economies of scale	5.77	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Promote economic growth	4.89	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Demand for value for money	4.23	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Better execution of projects	5.37	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Overcome cultural and political barriers	5.35	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Enter new construction market	5.52	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Pre-qualification condition	5.83	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Increase market share	5.21	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Increase productivity	4.41	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Diversification	5.34	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Opportunity to work on large and complex projects	4.94	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Ensure stability	5.36	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Improve company's image	5.75	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Secure financing	4.05	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Growth in construction globalization	5.32	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Competing interest of national development	3.46	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Improve competitive position	5.18	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
22	Improve track records	5.28	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
23	Overcome the lack of local knowledge of international firms	4.17	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	Build reputation	4.99	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
25	Increase credibility	5.17	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
26	Promote industrial integration	5.01	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Increase efficiency	4.00	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
28	Acquire new construction project	5.61	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Overcome environmental deficiencies	5.33	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Improve existing imperfect mechanism of the construction industry	3.50	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
31	Stimulate export-orienting contracting	4.82	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any drivers omitted by this questionnaire, please list and rate them			
1	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

End of questionnaire. Thanks for your valuable contribution

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF BUILDING & REAL ESTATE 建築及房地產學系

Doctor of Philosophy (Ph.D.) Research Topic: Determinants of Project Success for International Joint Ventures in Ghana

DELPHI SURVEY – LOCAL PARTNER: ROUND TWO (2)

A survey of identifying the key drivers for implementing ICJVs in Ghana

Guidance on completion

I would like to thank you for participating in the 1st round of the survey which forms a very important foundation for this round (**Round 2**). The results from all participants in the 1st round is presented below. The mean scores of drivers are shown in Column 3. Please it is necessary to know whether, with further considerations, you would like to make any changes to your ratings in the first round. Please you may refer to the important instructions below where necessary.

Important Instructions

7. **International construction joint ventures (ICJVs)** refer to the short-term marriage between at least two firms who join forces together in pursuit of architectural, engineering, and construction projects with the headquarters of at least one partner is situated outside the venture operation country with at least one partner headquartered outside the country of operation.
8. Note that for simplicity, **"ICJV"** is used in the questionnaire.
9. Please duly fill this questionnaire with reference to your experience and knowledge in ICJVs.
10. Please answer the questions by ticking (such as "✓"} or checking (such as "☒").
11. Please your participation is expected to last about **15 minutes** in this round. Kindly fill the questionnaire within **Two weeks** upon receipt, and the completed questionnaire will be collected in person by the researcher or his assistant where appropriate.
12. If you wish to have a copy of the report on research findings, please provide your contact and email address: Click or tap here to enter text.

Section A: Background of Respondents

Q1. Please indicate the type of your firm.

☐ Foreign/overseas firm (please specify your country Click or tap here to enter text.)

☐ Local/domestic/host country firm

Q2. Contact: …….. Email: …….

Section B: Drivers for implementing ICJVs

Upon considering your ratings in the previous round, please indicate your level of agreement on each of the drivers for implementing ICJVs in Ghana.

Use the following scale: **1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 = agree somewhat; 6 = agree; 7 = strongly agree**

No.	Drivers for implementing ICJVs	Mean Score 1st Round	Level of agreement Low <<<----------->>>High

1	Risk/resource sharing	6.10	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Acquisition of advanced technology and managerial skills	6.41	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Improve quality level of construction projects	5.43	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	Prevention of wholly own foreign companies	5.71	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	Gain economies of scale	5.73	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	Promote economic growth	5.92	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	Demand for value for money	5.18	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
8	Better execution of projects	5.57	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
9	Overcome cultural and political barriers	4.71	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
10	Enter new construction market	3.59	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
11	Pre-qualification condition	5.71	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
12	Increase market share	6.02	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
13	Increase productivity	5.08	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
14	Diversification	5.33	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
15	Opportunity to work on large and complex projects	5.98	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
16	Ensure stability	5.24	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
17	Improve company's image	6.22	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
18	Secure financing	5.59	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
19	Growth in construction globalization	5.67	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
20	Competing interest of national development	4.45	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
21	Improve competitive position	5.39	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
22	Improve track records	5.51	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
23	Overcome the lack of local knowledge of international firms	5.00	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
24	Build reputation	5.22	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
25	Increase credibility	5.20	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
26	Promote industrial integration	5.12	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
27	Increase efficiency	5.41	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
28	Acquire new construction project	5.57	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
29	Overcome environmental deficiencies	5.06	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
30	Improve existing imperfect mechanism of the construction industry	5.41	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
31	Stimulate export-orienting contracting	4.98	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
If there are any drivers omitted by this questionnaire, please list and rate them			
1	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	Click or tap here to enter text.		☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

End of questionnaire. Thanks for your valuable contribution

APPENDIX D

QUESTIONNAIRE FOR ZBWM SURVEY

Dear Sir/madam,

We are highly thankful for your kind assistance and contribution to our previous questionnaire survey about the barriers to ICJVs success. Contingent on the valuable feedback you provided in the previous survey, we have been able to identify the significant barriers to ICJVs success in Ghana. Based on your background information you provided in the previous survey, we found that you are one of the most experience practitioners in terms of ICJVs in Ghana and across the world. Hence, you are among the forty-three ICJVs practitioners selected to participate in this second round, final round of the survey.

We kindly request your assistance in evaluating the comparability of the important barriers to ICJVs success using Z-numbers-based Best Worst Method (ZBWM). This will help us to identify the criticalities of the barriers to ICJVs success and, as a result, develop an effective management framework for the successful management and performance of ICJVs in Ghana. Please see below the guidelines for undertaking the ZBWM evaluation.

Considering the calculation of the importance weights of the retained barriers, select the MOST IMPORTANT barrier among all the listed factors, and insert it in the corresponding cell (highlighted in blue). Then, rate its level of importance and reliability as against the other factors using the following linguistic terms:

Level of importance	**Reliability**
Equally important (EI)	Very low (VL)
Weakly important (WI)	Low (L)
Fairly important (FI)	Medium (M)
Very important (VI)	High (H)
Absolutely important (AI)	Very high (VH)

Legend
OB – Organizational-related barriers
KB – knowledge-related barriers
CB – cultural-related barriers
IB – individual-related barriers
LB – logistics-related barriers
OB1 – Lack of management control
OB2 – Difficulty in measuring ICJV performance
OB3 – Poorly formulated governance structure
OB4 – Relationship management issues
OB5 – Unstructured problems, issues, and risk management framework
OB6 – Unfair power and responsibilities among entities
KB1 – Lack of clear understanding and knowledge of ICJV fundamentals
KB2 – Lack of knowledge about host/local statutory requirement
CB1 – Competing objectives
CB2 – Language barrier
CB3 – Different organizational cultures
CB4 – Lack of preparedness to accept company philosophy
CB5 – Friction created between the ICJV, client organization and stakeholders
IB1 – Fear of legal action
IB2 – Lack of corporation
IB3 – Lack of confidence about experience and knowledge among parties
IB4 – Opportunistic behaviour of parties
LB1 – Incomplete contract terms with partners

LB2 – Unstable agreement for a limited period
LB3 – Poorly formulated decisions in assigning limited resources
LB4 – Difficulty in selecting suitable partners
LB5 – Lack of strategic planning for the ICJV operations

The MOST IMPORTANT factor	OB		KTB		CB		IB		LB	

The MOST IMPORTANT factor	OB1		OB2		OB3		OB4		OB5		OB6	

The MOST IMPORTANT factor	KTB1		KTB2	

The MOST IMPORTANT factor	CB1		CB2		CB3		CB4		CB5	

The MOST IMPORTANT factor	IB1		IB2		IB3		IB4	

The MOST IMPORTANT factor	LB1		LB2		LB3		LB4		LB5	

Considering the calculation of the importance weights of the retained barriers, select the LEAST IMPORTANT barrier among all the listed factors, and insert it in the corresponding cell (highlighted in blue). Following this, similar to the previous section, rate the level of importance and reliability of all the barriers against the least important factors.

The LEAST IMPORTANT factor		
OB		
KTB		
CB		
IB		
LB		

The LEAST IMPORTANT factor		
OB1		
OB2		
OB3		
OB4		
OB5		
OB6		

The LEAST IMPORTANT factor		
KTB1		
KTB2		

The LEAST IMPORTANT factor		
CB1		
CB2		

CB3		
CB4		
CB5		

The LEAST IMPORTANT factor		
IB1		
IB2		
IB3		
IB4		

The LEAST IMPORTANT factor		
LB1		
LB2		
LB3		
LB4		
LB5		

APPENDIX E

VALIDATION QUESTIONNAIRE

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF BUILDING & REAL ESTATE
建築及房地產學系

Questionnaire for Validating the Management Framework for the Successful Management and Performance of ICJVs in Ghana

Purpose of this study

To validate that the management framework for successful management and performance within Ghana is credible, reliable, objective, and appropriate.

Background

The management framework was developed as part of the deliverables of a Ph.D. research study carried out at The Hong Kong Polytechnic University in Hong Kong by Mr. Mershack Opoku Tetteh, under the supervision of Ir. Professor Albert P. C. Chan. The study aimed at developing an effective management framework for the successful management and performance of ICJVs in Ghana. The framework was developed as a result of a general questionnaire survey, Delphi survey, and Z-numbers-based Best Worst Method (ZBWM) survey with ICJVs practitioners in Ghana and conducted from January to July 2017.

Instructions

This document has 8 pages (1 page of background and instructions, and 7pages that describe the management framework). You are kindly requested to indicate your level of agreement with statements aimed at validating the management framework, at the end of this document.

All of your contributions towards this Ph.D. research study, from the general survey until now, are highly appreciated. Please kindly return the completed questionnaire (this document) to Mr. Mershack Opoku Tetteh by (mershack-opoku.tetteh@) within Two Weeks from today, 15 May 2020.

Thank you very much in advance for your kind contribution.

Yours sincerely,

……

Mershack Opoku Tetteh, Ph.D. Research Student
Ir. Professor Albert P.C. Chan, Head of Department of Building and Real Estate
Chair Professor of Construction Engineering and Management
The Hong Kong Polytechnic University, Hong Kong

The management framework for the successful management and performance of ICJVs in Ghana

The development of the management framework for the successful management and performance of ICJVs (Fig. 4) involved several activities including a partial least squares structural equation modeling (PLS-SEM) of the drivers, barriers, management control (MC) mechanisms and performance measures of ICJVs. Before the PLS-SEM, the drivers for, barriers to, MC mechanisms and measures for assessing the performance of ICJVs were identified (see the measurement items in Table1), factors analysis, and confirmatory factor analysis was utilized to establish and validate the significance constructs underlying these drivers, barriers, MC mechanisms, and performance measures (see the measurement items in Table1). Afterward, PLS-SEM was used to investigate the impacts of the drivers, barriers, and MC mechanisms on the performance measures of ICJVs (see Fig. 3). The results from the PLS-SEM are summarized in Figs. 2 and 3. The PLS-SEM results showed that: (1) drivers have a significant positive impact on ICJVs performance; (2) barriers have a significant negative impact on the performance of ICJVs; and (3) MC mechanisms have a strong and positive impact on the performance of ICJVs, and adversely moderate the negative relationship between barriers and performance of ICJVs. Based on the PLS-SEM results, a management framework for the successful management and performance of ICJVs is proposed and presented in Fig. 4. The proposed framework is based on the findings from Ghana. While the choice of an ICJV as means to reach performance targets in most cases is based on a mix of common and separate drivers (Brockmann and Girmscheid, 2009), partner companies have to meticulously identify their collective (i.e. common/mutual) drivers for the ICJV. This could be achieved through a process of negotiation. Including separate drivers as part of this choice might result in conflict in the performance target set and realization. On the other hand, in ICJVs, as the pervasiveness of critical barriers is mostly noted after the venture formation, establishing a common base in terms of the drivers is crucial. As the overall performance goal of an ICJV is multidimensional, building structures based on appropriate MC mechanisms from top management placement to the training and learning opportunities is required for success performance realization. In particular, the capabilities of partner companies considering their scope of expertise and the number of members that need to be involved should be a consideration. More so, the interrelated critical barrier constructs that prevent partner companies from achieving their performance target could be minimized by building stronger MC mechanisms. ICJVs practitioners and policymakers can apply this management framework in their efforts to facilitate the successful management and performance of ICJVs in Ghana.

Please go through Table 1 and Figs. 1-3, and then kindly indicate your level of agreement with the statements at the end of this document aimed at validating the management framework (Fig. 4).

Table1 Measurement items of respective constructs

Constructs	Code	Measurement items
	Drivers for implementing ICJVs	
Operational success drivers (DR_OSD)	DR_OSD1	Risk/resource sharing between partners
	DR_OSD2	Gain economies of scale
	DR_OSD3	Demand for value for money
	DR_OSD4	Better execution of a project
	DR_OSD5	Pre-qualification condition
	DR_OSD6	Growth in construction globalization
	DR_OSD7	Acquire new construction project
	DR_OSD8	Overcome environmental deficiencies
Organizational-driven drivers (DR_OD)	DR_OD1	Improve competitive position
	DR_OD2	Diversification

	DR_OD3	Improve company's image
	DR_OD4	Improve track records
	DR_OD5	Build reputation
	DR_OD6	Promote industrial integration
	Performance measures of ICJVs	
Project-based performance (PERM_PP)	PERM_PP1	Completing the project within budgeted cost
	PERM_PP2	Completing the project within schedule
	PERM_PP3	Achieving the required project quality
	PERM_PP4	Client satisfaction
	PERM_PP5	Good safety performance
	PERM_PP6	Dispute resolution
	PERM_PP7	Profitability
	PERM_PP8	Ethics in management
Company/partner-based performance (PERM_CP)	PERM_CP1	Sharing of risks equitably
	PERM_CP2	Resource sharing
	PERM_CP3	Costs reduction
	PERM_CP4	Technology acquisition
	PERM_CP6	Enhancing competitiveness
	PERM_CP7	Creating long-term relationships
	PERM_CP8	Acquisition of managerial skills
	PERM_CP9	Reputation
	PERM_CP10	Communication, learning, and development
	PERM_CP11	Market share
Socio-environmental performance (PERM_SP)	PERM_SP1	Sustainable job creation
	PERM_SP2	Stakeholder engagement
	PERM_SP6	Avoidance of material wastage
	PERM_SP8	Pollution reduction
	PERM_SP9	Environmental compliance
Performance of ICJV management (PERM_PM)	PERM_PM1	Effectiveness of the strategic control of the ICJV
	PERM_PM2	Effectiveness of the operational control of the ICJV
	PERM_PM3	Effectiveness of the organizational control of the ICJV
Perceived satisfaction with the ICJV (PERM_PS)	PERM_PS1	Overall satisfaction
	PERM_PS2	Stability of the ICJV
	Barriers to ICJVs success	
Organizational-related barriers (BR_OB)	BR_OB1	Lack of management control
	BR_OB2	Difficulty in measuring ICJV performance
	BR_OB3	Poorly formulated governance structure
	BR_OB4	Relationship management issues
	BR_OB5	Unstructured problems, issues, and risk management framework
	BR_OB6	Unfair power and responsibilities among entities
Cultural-related barriers (BR_CB)	BR_CB1	Competing objectives
	BR_CB2	Language barrier
	BR_CB3	Different organizational cultures
	BR_CB4	Lack of preparedness to accept company philosophy
	BR_CB5	Friction created between the ICJV, client organization and stakeholders
Logistics-related barriers (BR_LB)	BR_LB1	Incomplete contract terms with partners

	BR_LB2	Unstable agreement for a limited period
	BR_LB3	Poorly formulated decisions in assigning limited resources
	BR_LB4	Difficulty in selecting suitable partners
	BR_LB5	Lack of strategic planning for the ICJV operations
Individual-related barriers (BR_IB)	BR_IB1	Fear of legal action
	BR_IB2	Lack of corporation
	BR_IB3	Lack of confidence about experience and knowledge among parties
	BR_IB4	Opportunistic behaviour of parties
Knowledge-related barriers (BR_KB)	BR_KB1	Lack of clear understanding and knowledge of ICJV fundamentals
	BR_KB2	Lack of knowledge about host/local statutory requirement
	MC mechanisms in ICJVs	
Top Management Staffing (MCM_TMS)	MCM_TMS1	Staffing of corporate board members
	MCM_TMS2	Staffing of senior executive positions (e.g., Project managers)
Key Functional and Operational Areas (MCM_KFOA)	MCM_KFOA1	Key functional areas placement (e.g., Engineers, supervisors, etc.)
	MCM_KFOA2	Operational areas deployment (e.g., labourers)
Support in Policy and Planning Process (MCM_SPPP)	MCM_SPPP1	Human rights policies
	MCM_SPPP2	Making development plans
	MCM_SPPP3	Evaluating project feasibility considering environmental impacts
	MCM_SPPP4	Establishing codes of ethics for projects
	MCM_SPPP5	Health and safety issues
	MCM_SPPP6	Monitoring and reporting
	MCM_SPPP7	Laying down procedures and routines for the ICJV
	MCM_SPPP8	Support in supervisory role
	MCM_SPPP9	Financial and resource allocation planning
Training and Learning Opportunities (MCM_TLO)	MCM_TLO2	Provision of market knowledge
	MCM_TLO3	Provision of cultural knowledge
	MCM_TLO4	Provision of managerial/technological knowledge

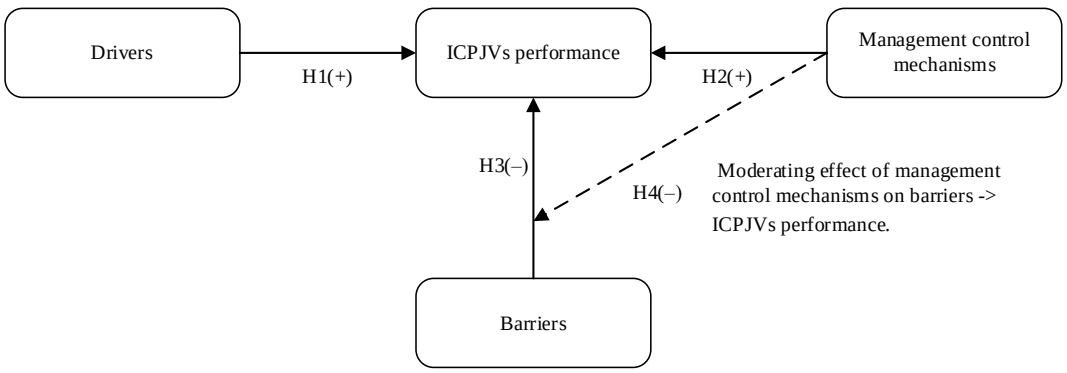

Fig. 1 Research framework

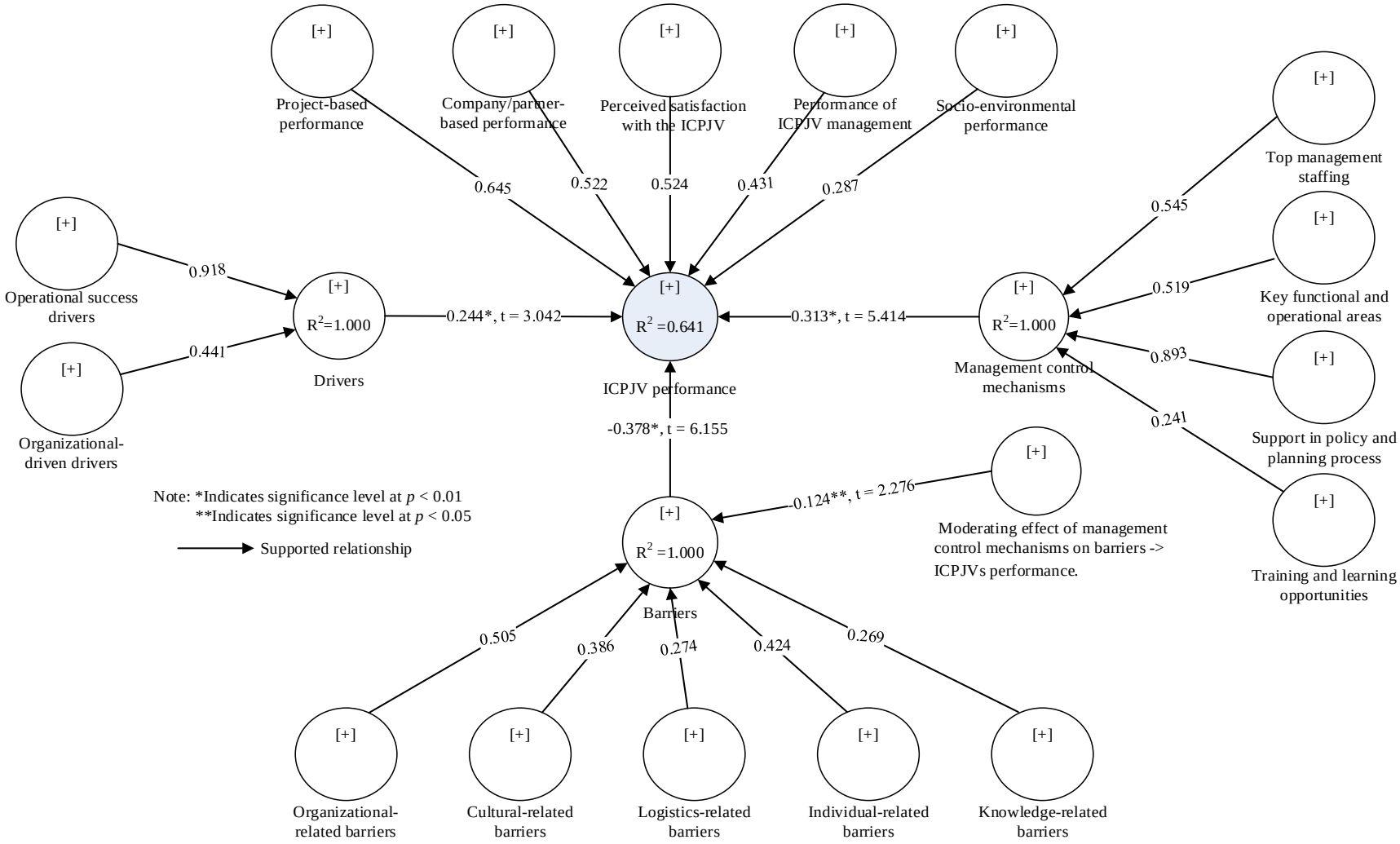

Fig. 2 PLS-SEM model performance impacts of drivers, barriers, and MC mechanisms in ICJVs

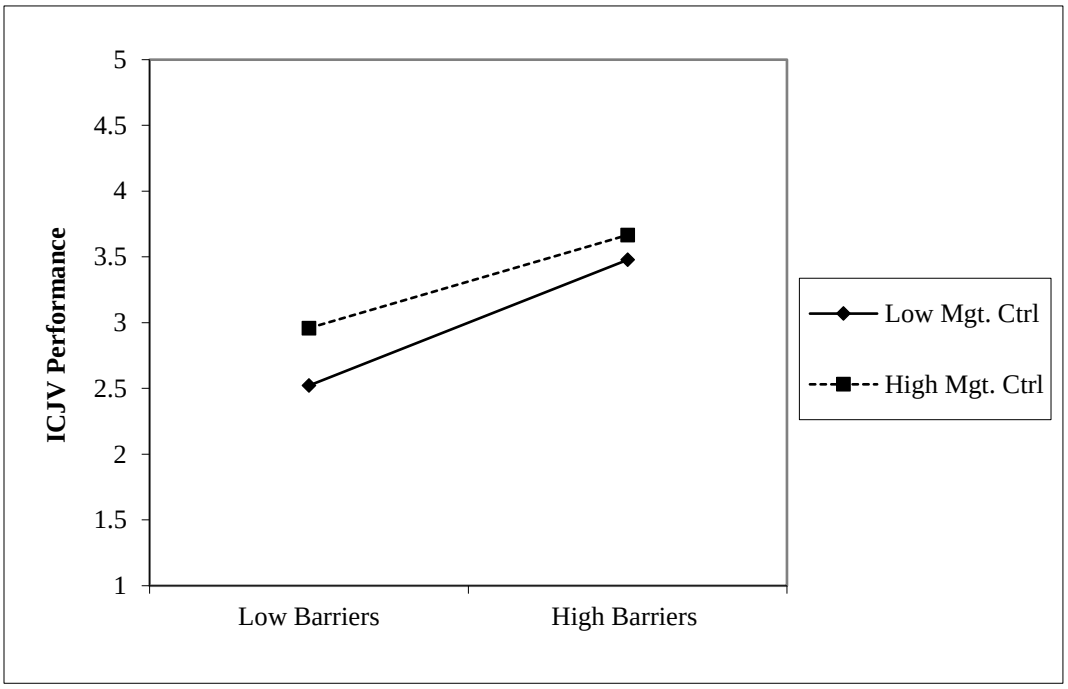

Fig. 3 Moderating effect of MC mechanisms

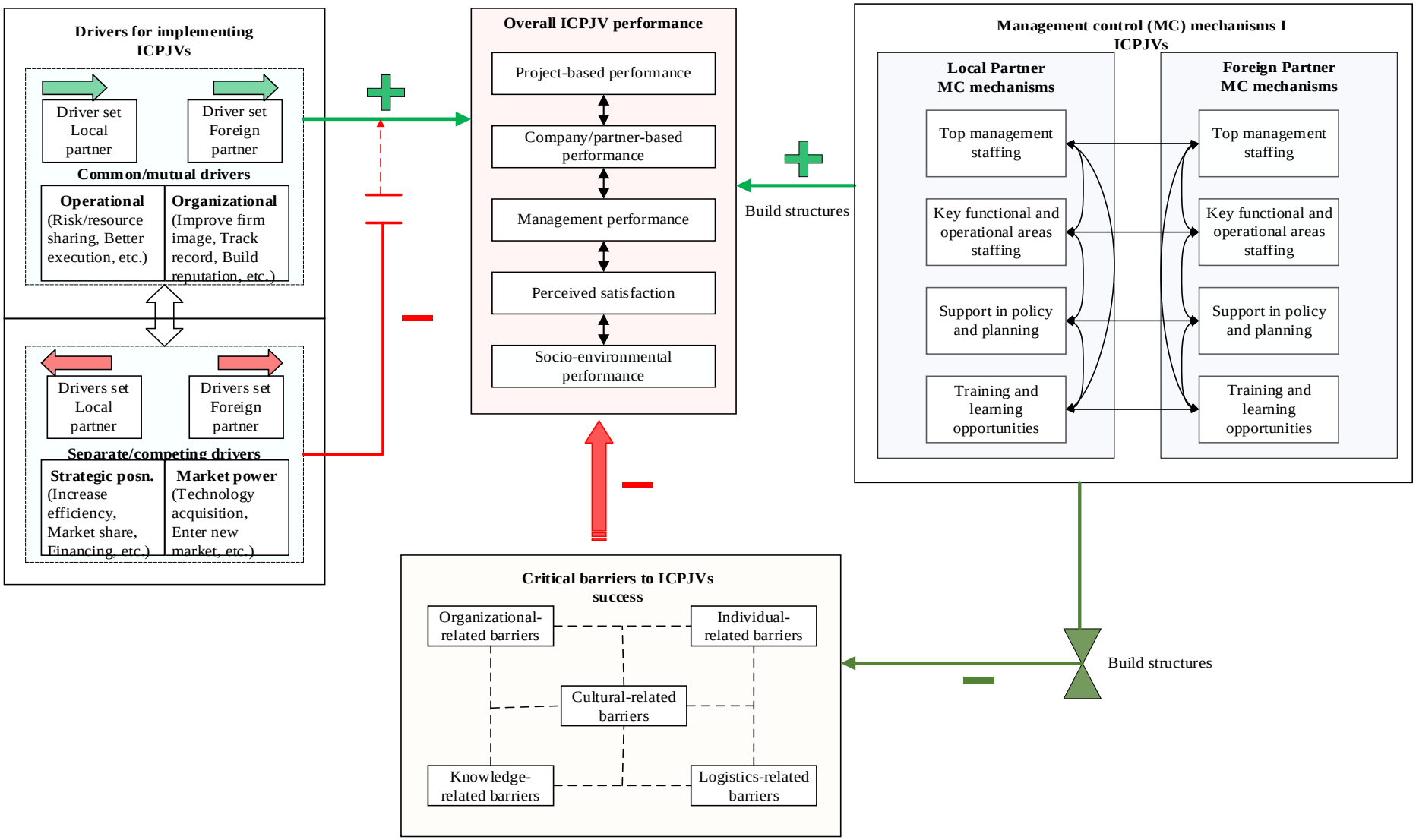

Fig. 4 A management framework for successful management and performance of ICJVs

Validation Questionnaire for the management framework to help facilitate the successful management and performance of ICJVs

Please indicate your level of agreement with the following statements about the management framework for the successful management and performance of ICJVs in Ghana (Fig. 4). Use the following scale: **1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 = agree somewhat; 6 = agree; 7 = strongly agree**

No.	Statements	Level of agreement Low <<<----------->>>High
1	The framework captures all the relevant concepts for the management of ICJVs	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
2	The concepts in the framework are appropriately classified	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
3	The framework is easily understandable and could be useful for ICJVs	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
4	The structure and relationships among all the constructs in the framework are organized appropriately	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
5	The framework is objective (i.e. mutual satisfaction – local partners and their foreign counterparts of ICJVs) and reasonable	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
6	The appropriate use of the management framework would help to improve the performance of ICJVs	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7
7	The overall framework is suitable for the successful management and performance of ICJVs	☐1; ☐2; ☐3; ☐4; ☐5; ☐6; ☐7

Please, if any, give other general comments on the management framework in the box below. You may also provide comments that could help facilitate the successful management and performance of ICJVs

-The End-
Thank you for your valuable time and participation

APPENDIX F

HOW TO COMPUTE THE RELATIVE WEIGHTS USING THE ZBWM WITH AN EXAMPLE

How to compute the relative weights using the ZBWM

To obtain the optimal fuzzy weights of the main barriers and sub-factors, when for each pair of w_B/w_j and w_j/w_L, we have $w_B/w_j = a_{Bj}$ and $w_j/w_L = a_{BL}$, then it could be claimed that the optimal weights of the criteria are accomplished. In satisfying the above conditions for all j, it is imperative to determine a solution where the maximum absolute divergence $\left|\frac{w_B}{w_j} - a_{Bj}\right|$ and $\left|\frac{w_j}{w_L} - a_{Bj}\right|$ is minimized. Note that w_B, w_j, and w_L are TFNs, thus the fuzzy weights of barriers denoted by TFN $\widetilde{w}_j = (l_j^w, u_j^w, m_j^w)$ requires to be transformed to a crisp value. To achieve this, the graded mean integration representation (GMIR) of fuzzy sets is used. Therefore, to compute the relative weights, the following constrained optimization problem needs to be solved.

$$\min \max_j \left\{ \left| \frac{\widetilde{w}_B}{\widetilde{w}_j} - \tilde{a}_{Bj} \right|, \ \left| \frac{\widetilde{w}_j}{\widetilde{w}_L} - \tilde{a}_{BL} \right| \right\}$$

$$s.t \begin{cases} \sum_{j=1}^{n} R(\widetilde{w}_j) = 1 \\ l_j^w \le m_j^w \le u_j^w \\ l_j^w \ge 0 \\ j=1,2,3,\ldots n \end{cases} \quad \text{(B-1)}$$

where $\widetilde{w}_B = (l_B^w, m_B^w, u_B^w)$, $\widetilde{w}_j = (l_j^w, m_j^w, u_j^w)$, $\widetilde{w}_L = (l_L^w, m_L^w, u_L^w)$, $\tilde{a}_{Bj} = (l_{Bj}, m_{Bj}, u_{Bj})$, and $\tilde{a}_{BL} = (l_{jL}, m_{jL}, u_{jL})$.

The above problem can be transferred to the following nonlinear constrained optimization model:

$$\min \tilde{\xi}$$

$$s.t \begin{cases} \left| \frac{\widetilde{w}_B}{\widetilde{w}_j} - \tilde{a}_{Bj} \right| \le \tilde{\xi} \\ \left| \frac{\widetilde{w}_j}{\widetilde{w}_L} - \tilde{a}_{BL} \right| \le \tilde{\xi} \\ \sum_{j=1}^{n} R(\widetilde{w}_j) = 1 \\ l_j^w \le m_j^w \le u_j^w \\ l_j^w \ge 0 \\ j=1,2,3,\ldots n \end{cases} \quad \text{(B-2)}$$

where $\tilde{\xi} = (l^{\tilde{\xi}}, m^{\tilde{\xi}}, u^{\tilde{\xi}})$.

Considering $l^{\tilde{\xi}} \le m^{\tilde{\xi}} \le u^{\tilde{\xi}}$, it is presumed that $\tilde{\xi}^* = (k^*, k^*, k^*)$, $k^* \le l^{\tilde{\xi}}$, then Eq. (B – 2) can be transferred as

$$\min \tilde{\xi} \begin{cases} \left| \frac{(l_B^w, m_B^w, u_B^w)}{(l_j^w, m_j^w, u_j^w)} - (l_{Bj}, m_{Bj}, u_{Bj}) \right| \le (k^*, k^*, k^*) \\ \left| \frac{(l_j^w, m_j^w, u_j^w)}{(l_L^w, m_L^w, u_L^w)} - l_{jL}, m_{jL}, u_{jL}) \right| \le (k^*, k^*, k^*) \\ \sum_{j=1}^{n} R(\widetilde{w}_j) = 1 \\ l_j^w \le m_j^w \le u_j^w \\ l_j^w \ge 0 \\ j=1,2,3,\ldots n \end{cases} \quad \text{(B-3)}$$

Moving forward, contingent on the operational laws of TFNs, Eq. (B – 3) can be commutated as below.

$$\min k^*$$

$$s.t\begin{cases}\left|\frac{(l_B^w)}{(l_j^w)}-(l_{Bj})\right|\le(k^*)\\ \left|\frac{(m_B^w)}{(m_B^w)}-(m_{Bj})\right|\le(k^*)\\ \left|\frac{(u_B^w)}{(l_j^w)}-(u_{Bj})\right|\le(k^*)\\ \left|\frac{(l_j^w)}{(u_{jL})}-(l_{jL})\right|\le(k^*)\\ \left|\frac{(m_j^w)}{(m_L^w)}-(m_{jL})\right|\le(k^*)\\ \left|\frac{(u_j^w)}{(l_L^w)}-(u_{jL})\right|\le(k^*)\\ \sum_{j=1}^{n}R(\widetilde{w}_j)=1\\ l_j^w\le m_j^w\le u_j^w\\ l_j^w\ge 0\\ j=1,2,3,\ldots n\end{cases}\quad\text{(B-4)}$$

To solve the above nonlinear inequality constrained optimization, Eq. (B – 4) can be computed as:

$$\min k^*$$

$$s.t\begin{cases}\left|(l_B^w)-(l_{Bj})*(u_j^w)\right|\le(k^*)*(u_j^w)\\ \left|(m_B^w)-(m_{Bj})*(m_j^w)\right|\le(k^*)*(m_j^w)\\ \left|(u_B^w)-(u_{Bj})*(l_j^w)\right|\le(k^*)*(l_j^w)\\ \left|(l_j^w)-(l_{jL})*(u_L^w)\right|\le(k^*)*(u_L^w)\\ \left|(m_j^w)-(m_{jL})*(m_L^w)\right|\le(k^*)*(m_L^w)\\ \left|(u_j^w)-(u_{jL})*(l_L^w)\right|\le(k^*)*(l_L^w)\\ \sum_{j=1}^{n}R(\widetilde{w}_j)=1\\ l_j^w\le m_j^w\le u_j^w\\ l_j^w\ge 0\\ j=1,2,3,\ldots n\end{cases}\quad\text{(B-5)}$$

Solving the problem, the relative optimal fuzzy weights ($\widetilde{w}_1^*$, $\widetilde{w}_2^*$, …,$\widetilde{w}_n^*$) and $\tilde{\xi}$ can be obtained.

The computational steps of ZBWM execution (example case)

The execution of ZBWM to obtain the critical barriers weights based on one of the experts' responses as shown in Appendix C is explicated hereafter.

According to the expert, for cultural-related barriers (CB), "different organizational cultures (CB3)" is selected as the most important barrier among all the listed barriers and "Friction created between the ICJV, client organization and stakeholders (CB5)" is regarded as the least important barrier among all the listed barriers. The tables below show the linguistic terms preference of the most important and least important barrier among all the listed barriers.

The MOST IMPORTANT factor	CB1	CB2	CB3	CB4	CB5
CB3	VI,H	AI,H	EI,VL	AI,VH	AI,H

The LEAST IMPORTANT factor	CB5
CB1	AI,H
CB2	VI,H
CB3	AI,VH
CB4	VI,H
CB5	EI,M

According to Table 5, Z-based pairwise comparison of most important barrier (A_B) and the least important barrier (A_L) can be obtained as follows.

A_B = [(2.10,2.52,2.49), (2.94,3.36,3.78), (1,1,1), (3.33,3.80,4.28), (2.94,3.36,3.78)]

A_L = [(2.94,3.36,3.78), (2.10,2.52,2.49), (3.33,3.80,4.28), (2.10,2.52,2.49), (1,1,1)]

The below-mentioned non-linear inequality constrained optimization could be built.

$\min \tilde{\xi}$

$$
s.t.\begin{cases}
\left|\frac{(l_3^w, m_3^w, u_3^w)}{(l_1^w, m_1^w, u_1^w)} - (l_{31}, m_{31}, u_{31})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_3^w, m_3^w, u_3^w)}{(l_2^w, m_2^w, u_2^w)} - (l_{32}, m_{32}, u_{32})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_3^w, m_3^w, u_3^w)}{(l_4^w, m_4^w, u_4^w)} - (l_{34}, m_{34}, u_{34})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_3^w, m_3^w, u_3^w)}{(l_5^w, m_5^w, u_5^w)} - (l_{35}, m_{35}, u_{35})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_3^w, m_3^w, u_3^w)}{(l_1^w, m_1^w, u_1^w)} - (l_{31}, m_{31}, u_{31})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_1^w, m_1^w, u_1^w)}{(l_5^w, m_5^w, u_5^w)} - (l_{15}, m_{15}, u_{15})\right| \le (k^*, k^*, k^*) \\
\left|\frac{(l_2^w, m_2^w, u_2^w)}{(l_5^w, m_5^w, u_5^w)} - (l_{25}, m_{25}, u_{25})\right| \le (k^*, k^*, k^*) \\
\sum_{j=1}^{5} R(\tilde{w}_j) = 1 \\
l_j^w \le m_j^w \le u_j^w \\
l_j^w \ge 0 \\
j=1,2,3,\ldots n
\end{cases}
$$

Then, the following nonlinear constrained optimization problem (i.e. based on Eqs. (B-4) and (B-5)) need to be solved.

$$\min k^*$$

$$s.t.\begin{cases} -k^*u_1 \le l_3 - 2.10^*u_1 \le k^*u_1; -k^*u_1 \le m_3 - 2.52^*m_1 \le k^*m_1;\ -k^*l_1 \le u_3 - 2.49^*l_1 \le k^*l_1; \\ -k^*u_2 \le l_3 - 2.94^*u_2 \le k^*u_2;\ -k^*m_2 \le m_3 - 3.36^*m_2 \le k^*m_2;\ -k^*l_2 \le u_3 - 3.78^*l_2 \le k^*l_2; \\ -k^*u_4 \le l_3 - 3.33^*u_4 \le k^*u_4; -k^*m_4 \le m_3 - 3.80^*m_4 \le k^*m_4; -k^*l_4 \le u_3 - 4.28^*l_4 \le k^*l_4; \\ -k^*u_5 \le l_3 - 2.94^*u_5 \le k^*u_5; -k^*m_5 \le m_3 - 3.36^*m_5 \le k^*m_5; -k^*l_5 \le u_3 - 3.78^*l_5 \le k^*l_5; \\ -k^*u_5 \le l_1 - 2.94^*u_5 \le k^*u_5; -k^*m_5 \le m_1 - 3.36^*m_5 \le k^*m_5; -k^*l_5 \le u_1 - 3.78^*l_5 \le k^*l_5; \\ -k^*u_5 \le l_2 - 2.10^*u_5 \le k^*u_5;\ -k^*m_5 \le m_2 - 2.52^*m_5 \le k^*m_5;\ -k^*l_5 \le u_2 - 2.49^*l_5 \le k^*l_5; \\ -k^*u_5 \le l_4 - 2.10^*u_5 \le k^*u_5;\ -k^*m_5 \le m_4 - 2.52^*m_5 \le k^*m_5;\ -k^*l_5 \le u_4 - 2.49^*l_5 \le k^*l_5; \\ \frac{1}{6}*l_1+\frac{1}{6}*4*m_1+\frac{1}{6}*u_1+\frac{1}{6}*l_2+\frac{1}{6}*4*m_2+\frac{1}{6}*u_2+\frac{1}{6}*l_3+\frac{1}{6}*4*m_3+\frac{1}{6}*u_3+\frac{1}{6}*l_4+ \\ \frac{1}{6}*4*m_4+\frac{1}{6}*u_4+\frac{1}{6}*l_5+\frac{1}{6}*4*m_5+\frac{1}{6}*u_5=1; \\ l_1 \le m_1 \le u_1; \\ l_2 \le m_2 \le u_2; \\ l_3 \le m_3 \le u_3; \\ l_4 \le m_4 \le u_4; \\ l_5 \le m_5 \le u_5; \\ l_1 \ge 0;\ l_2 \ge 0;\ l_3 \ge 0;\ l_4 \ge 0;\ l_5 \ge 0; \\ k \ge 0 \end{cases}$$

Solving this problem, the optimal fuzzy weights of the related critical barriers are as follows.

w_1^* = (0.10828, 0.11955, 0.13461); w_2^* = (0.15319, 0.18049, 0.22589);

w_3^* = (0.11899, 0.12804, 0.14392); w_4^* = (0.18891, 0.22196, 0.2846);

w_5^* = (0.32802, 0.33942, 0.35576)

$\tilde{\xi}$ = (0.32095, 0.32095, 0.32095)

Based on GMIR, the pertinent weights of these critical barriers can be obtained as follows. w_1^* = 0.1202; w_2^* = 0.1835; w_3^* = 0.1292; w_4^* = 0.2269; w_5^* = 0.3406. The consistency of the relative expert's responses relating to the pertinent weights of the barriers need to be checked. The consistency index for this case is 7.74 (see, Table 6). Therefore, the consistency ratio (CR) is computed as 0.32095/7.74 = 0.0415, indicating an excellent consistency as it is very close to zero. Thus, the responses of the relative experts are accepted.

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