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Combining process analysis method and four-pronged approach to integrate corporate sustainability metrics for assessing international construction joint ventures performance

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Abstract

While the number of publications on international construction joint ventures (ICJVs) performance assessment has gained attention, yet it suffers from the lack of complete and standardized appraisal. The incomplete ICJV performance metrics and the neglection of corporate sustainability (CS) performance indicators in the ICJVs performance assessment are the prime reasons for its inadequacy. This paper systematically reviews the literature on ICJVs performance measurement and integrates CS indicators into ICJV performance assessment using a hybrid technique, fusing process analysis method and four-pronged approach. Based on 86 articles retrieved from Scopus and the Web of Science, the results point out that while traditional economic indicators account for more than half of the extracted indicators, environmental and social indicators have been partially considered in ICJVs performance measurement. Moving forward, organizations have embraced the CS agenda, and its integration into businesses has been intensively present. In this study, 36 performance indicators were identified and categorized into five major constructs, namely: project-based

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performance, company/partner performance, perceived satisfaction, performance of the ICJV management, and socio-environmental performance. The novel contributions include updating and aggregating the discrete ICJVs performance metrics and introducing a new dimension of performance assessment into ICJVs. This study offers potential avenues for future research by triggering a shift from the confined economic and incomplete ICJV performance appraisal to a more complete and standardized performance evaluation. Consequently, managers and practitioners can use the novel framework for assessing their performance and reporting purposes. This study can contribute to global sustainable development and corporate competitive advantage. Lastly, this study enriches both ICJV performance and sustainability literature by providing a systematic review of extant literature.

Keywords: International construction joint ventures; Corporate sustainability; Performance measures; Indicators; Literature review

1. Introduction

International construction joint ventures (ICJVs) have emerged as an effective approach to sustainable development given their socio-economic and environmental benefits (Shah, 2015). ICJV represents the hybridization of at least two legally distinct firms that engage in Architectural, Engineering, and Construction (AEC) projects; and where the headquarters of firms are dispersedly located (Hong and Chan, 2014). Existing research has underlined the unsatisfactory nature of this hybrid collaboration form (Ozorhon et al. 2007a; 2010b). Owing to company, industry, and environmental complexities, the task of establishing and maintaining ICJVs has become problematic to achieving pre-set objectives (Ozorhon et al. 2008a; Zhao et al. 2013).

ICJV performance evaluation has become a central theme of research yet confused and debated aspect in extant literature. In fact, there have been a number of seminal contributions

to the discussion of international joint ventures (IJVs) performance assessment, however, diverse and discrete measures exist. Such a divide originates from the hybrid structures and transitory nature of this collaboration form (Tetteh and Chan, accepted for publication)*. Assessing ICJVs performance have always been a challenging task for both practitioners and researchers. 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).

To broadly capture and standardize ICJVs performance measurement, although a limited number of studies have defined, evaluated and conceptualized ICJVs performance measurement constructs, yet they possess some common shortcomings. First, the literature remains dispersed and lack a complete assessment, as there still remains key indicators and variables to be added up due to the increasing global demands. For example, Ozorhon et al. (2010a; 2010b) provided a multidimensional framework that clustered ICJV performance into four major constructs with 17 underlying variables, however, key indicators including but not limited to safety performance, dispute resolution, environmental influence, and effective communication were not captured. These measures promote sustainable management practices

* The actual bibliographic information will be provided at revision stage wherein (Tetteh and Chan, accepted for publication) might have been published online

(Shah, 2015), and corporate competitive advantage. Second, studies have neglected the overall corporate sustainability (CS) indicators in ICJVs success and operational initiatives as Tetteh and Chan (accepted for publication) highlighted. This may prevent corporations from reaping the benefits of sustainability performance measurement in supporting internal decision-making (Marshall et al. 2015). Conversely, this could help in assessing operations impact on the ecological environment or on the stakeholder's well-being, which includes fulfilling stakeholder requirements and enhancing legitimacy (Kühnen and Hahn, 2018). The increasing pressure on AEC companies to expand their scope beyond economic performance, to an all-inclusive capturing social justice and environmental performance is an important agenda and must form part of overall ICJV goals (Sev, 2009; Jones et al. 2010; Afzal et al. 2017). By answering the question: what performance evaluation criteria reflect a more complete ICJVs success, this paper aims to systematically review the literature on ICJVs performance measurement and integrate CS indicators into ICJVs performance assessment using a hybrid technique, fusing process analysis method (PAM) and four-pronged approach.

The contributions of this paper are tripartite. First, this study is one of the first to conduct a systematic review of ICJVs performance assessment and integrates CS indicators into ICJVs performance appraisal. Hence, this study updates, extends and aggregate the discrete ICJVs performance measures and introduce a new dimension of performance assessment into ICJVs. Researchers can use the developed constructs as a complete and standardized set of ICJVs performance indicators in their research studies. Consequently, this research triggers a shift from the confined economic and incomplete ICJV performance appraisal to a more complete performance evaluation. Secondly, managers and practitioners can use the novel framework for assessing their performance and reporting purposes. This can contribute to sustainable development and value for society, ecosystems, and business. Lastly, this study enriches both ICJV and sustainability literature by providing a systematic review of extant literature. Other

strategic alliance models such as partnerships, relational contracting, etc. can use the performance indicators to assess their business success.

This paper is organized in six sections where Section 2 presents the main limitations in the existing literature. In Section 3, the overall research methodological framework and CS integration into ICJVs performance assessment are explained. Section 4 discusses the main results emerged from the literature and derives a conceptual framework of ICJV performance assessment. Section 5 suggests directions for future research. Finally, in section 6, conclusions and implications are drawn from the performed research.

2. ICJVs Performance Evaluation and CS Niche

To date, research has provided, at best, only a fragmented and incomplete picture of ICJV performance assessment and, at worst, no unanimous conclusion exists yet. Past studies have employed objective and subjective measures commonly employed in business research for assessing ICJVs performance (Mohamed, 2003; Lin and Ho, 2012). Whereas subjective measures reflect managers perception on success, objective measures focus on independent data such as profitability, cost position, longevity, and survival (Geringer and Herbert, 1991), which can be obtained from third parties. 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 neglection of CS indicators (Tetteh and Chan, accepted for publication).

By definition, CS means the degree to which an organization improves its performance with respect to its global sustainable development responsibilities (Dyllick and Hockerts, 2002). One common technique to realize CS advancement is using a suitable set of indicators to

measure performance (Tahir and Darton, 2010). Notwithstanding, a number of CS indicators and frameworks have been developed by government organizations, industrial and academic researchers, for example, Dow Jones Sustainability Index (DJSI), Global Reporting Initiative (GRI), ISO 26000, Sustainability Indicators at EPA, etc. Specifically adopting any of these indicators means adherence to its guidelines and protocols which present problems to corporations. In the construction industry, for example, Afzal et al. (2017) investigated the CS performance of top 50 construction firms listed by Engineering News Record (ENR) against the GRI and ISO 26000 indicators, however, out of 15 indicators, only 10 were realized by the firms. Therefore, many industries have developed sector-specific indicators for use. For instance, Sustainability Indicators for Mining and Minerals Industry (SIMMI) has been published for use by the mining and minerals industry (Azapagic, 2004), and which are consistent with the GRI approach but explicitly focused on industry operations. Conversely, the sector-specific nature of indicators can be a hindrance to generalizability as a result of factors like spatial conditions (socio-economic) at the location of operation, sustainability orientation, stakeholders' expectations, and salience as well as the industrial sector (Siebert et al. 2018).

In all, sector-specific and general sustainability indicators in previous studies present some limitations when applied to ICJVs. Most of which are suffering from the limitations of subjective weights, measurability in terms of data collection, and weak practical practicability. Therefore, CS indicators that are specific and applicable to ICJVs are identified and prioritized. Table 1 below summarizes the existing limitations in ICJV performance literature.

<Please Insert Table 1 here>

3. Research methodology

To address the unanswered question: what performance evaluation criteria reflect a more complete ICJV success, a three-staged methodological process was adopted following previous

review studies (Arroyo et al. 2014; Morioka and de Carvalho, 2016). First, an extensive literature search was conducted using Scopus and Web of Science (WoS). Second, relevant papers were identified following some codified and logical process. Third, a critical review was conducted to identify indicators and finally, experts and stakeholder's consultation was carried out following two combined rigorous approach to identify relevant indicators for the second search category rather than using hypothetical preferences. The whole research approach is depicted in figure 1.

<Please Insert Figure 1 here>

3.1 Documents identification

Articles capturing performance indicators in IJV and CS studies were obtained by querying the ISI Web of Knowledge –(WoS) and Scopus databases in March 2019. After the first search, a total of 1063 papers were obtained for further examination. It is important to acknowledge that due to the limited number of specifically ICJV performance studies, prior related studies in the international business field were also considered to give a strong theoretical underpinning for the study. Also, several search limitations such as keywords, document type, year of publications, etc. were applied to identify relevant publications due to the broad nature of IJV and CS concepts (see Figure 1). According to Darko and Chan (2016), search boundaries helps to overcome the challenge of obtaining a workable number of relevant papers for a literature review study.

3.2 Selection of relevant documents

Including only peer-reviewed articles, checking titles, and removing duplicates resulted in 746 journal articles. Note that sufficient article quality is expected by focusing on peer-reviewed journals (Silva et al. 2019). Furthermore, in the academic endeavor, it is specifically useful for firsthand researchers to investigate and understand research developments on a selected topic for exploration by focusing on papers published in academic journals (Hong et

al. 2012; Tsai and Wen, 2005). After this scrutiny, articles that fully discuss the phenomenon of interest and showing performance indicators in tables, figures, etc. were considered. This was achieved by individually conducting a full-text analysis of the retained articles with the help of a research assistant. In assessing the level of interrater agreement, Cohen's kappa statistics for each set of articles published in the same journal were calculated using the formula below:

$$K = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)} \quad (1)$$

Where, $\Pr(a)$ represents the relative observed agreement and $\Pr(e)$ represents the probability of agreement base on chance. Cohen's kappa statistics ranged from 0.82 to 1 (which indicates excellent agreement between the raters). This resulted in a focused sample of 78 articles. This approach was considered to improve the reliability and replicability of the synthesized findings by limiting the review to the definitional fit. Also, additional 8 papers were included by checking the list of references in the retained publications against the selection criteria. In total, 86 publications were used for the study. In addition, six sustainability frameworks were considered to guide the assessment of the indicators, namely: Dow Jones Sustainability Index (DJSI), Global Reporting Initiative (GRI), International Integrated Reporting Council (IIRC), United Nations Conference Trade and Development (UNCTAD), Sustainability Indicators for Mining and Minerals Industry (SIMMI), and Energy Technology Sustainability Index (ETSI). These frameworks are the most popularly used reporting frameworks adopted by engineering and construction organizations (Afzal et al. 2017), and include a set of measurable indicators, and addresses all dimensions of sustainability. Finally, they have a wide focus, i.e. at national, community or company level (Labuschagne et al. 2005).

<Please Insert Figure 2 here>

3.3 The PAM and Four-Pronged Approach

This hybrid technique, fusing PAM and four-pronged approach provided a systematic, hierarchical, logical and communicable process for developing sector-specific indicators. The method produced a set of CS indicators which are objective, comprehensive and relevant for ICJVs. Thus, the resultant indicators create considerable value for practitioners (reporting, performance measurement, compliance, etc) and academics (research and analysis). It also ensures that choices made are transparent, so that arguments can be presented, and any bias can be identified (Tahir and Darton, 2010). While the PAM approach covers an investigation of the corporate operation in question, and the "cause and effect" links in the business processes (Tahir and Darton, 2010), the four-pronged approach labels an exhaustive model of the indicator selection process (Rahdari and Rostamy, 2015). The whole approach has four major steps and figure 3 describes the process in brief.

<Please Insert Figure 3 here>

First, the method starts from a study of the business operation against an appropriate code, to give an all-inclusive appraisal of its sustainability. The business operations together with the stakeholders involved (i.e. both internal and external) are assessed considering the environment (business perspective) against well-defined CS criteria. Thus, the attainment of global sustainability development responsibilities (i.e. in terms of fairness in benefit and resource efficiency) should be considered critical in corporations' performance (Dyllick and Hockerts, 2002). To fully achieve this is by appropriate selection of the system boundary, which is governed by two factors: the spatial and temporary scale (Bell and Morse, 2008). While the spatial scale represents the physical size of the system, temporary scale measures the period over which the operational impact of the business are considered (Tahir and Darton, 2010).

Second, this is where generic CS indicators were identified from sustainability frameworks and literature contingent on the justifications provided in the methodology section. Here, the

best benchmarks were selected from each source for the purpose of analysis. In particular, indicators which have been widely cited for use, basically, in the industrial, manufacturing, and the engineering sector were considered.

Third, all the identified indicators are gathered and termed "the universal indicators". Next, all the indicators were subjected to a filtering process, where indicators that satisfy the inclusion criteria (see Table 2) were retained. Hence, indicators that pass the filtering process were further subjected to verification and modification.

Fourth, in ensuring that the indicators developed relate specifically to the sector of the business operation and that the concerns of stakeholders regarding a particular impact are resolved, Tahir and Darton (2010) mentioned that it is necessary to verify and revise the indicators through fieldwork reviews and reports, as well as consultation with experts and stakeholders. Note that this verification and modification process is repeated until a refined set of indicators is obtained which is both necessary and sufficient to monitor the CS performance of the business.

3.3.1 ICJV Case

Construction activities have long been recorded of several negative influences on the environment and society (Myers, 2005). Some of the negative influences include pollution, emission, and waste generation (Afzal et al. 2017). To broadly capture their operations under a well-defined CS performance for a complete assessment, CS definition by Dyllick and Hockerts (2002) was adopted, where priorities implicit in the definition were framed as the corporate (economic), natural (environmental), and societal (social) case. Further, with a clear definition of the system boundary, while Tahir and Darton, (2010) focused on the "gate-to-gate approach" (activities within a confined perimeter) and inter-generational time period, this study considered an unlimited space and duration precision approach since, ICJV's operations are

often free of spatial boundaries (e.g. sea bridges and road constructions) with time precision to capture a broad definition of CS.

Through a systematic review of the 36 CS publications and following the rationale expressed above, indicators which satisfied the pre-specified conditions were selected and entered the indicators pool universe (see figure 3). Appendix A includes the general lists of CS indicators. Due to the confusion in using the usability method to evaluate indicators as emphasized by Bauler (2012), Rahdari and Rostamy (2015) provided eight features to explain how suitable CS indicators were filtered following previous studies by Mascarenhas et al. (2015) and Darton (2015). Table 2 shows the indicator selection filter.

<Please Insert Table 2 here>

Using this approach, indicators that passed the indicator selection filter became the organization-specific indicators. Although the methods ensured some degree of reliability, Tahir and Darton (2010) mentioned that stakeholders could include future generations, whose interest will typically be vital when considering social and environmental issues. Therefore, to ensure that the indicators developed addresses the impacts, issues, and concerns of both the business and stakeholders, annual reports of the top 20 construction firms as listed by Engineering News Record (ENR) (ENR, 2018) were reviewed against the developed CS indicators, and later, experts' consultation. In all, seven experts were consulted. Among them were four academic experts who have published at least two papers on sustainability performance assessment, and three were JV managers on the Hong Kong-Zhuhai-Macau Bridge construction. This whole process was to verify and refine the CS indicators. The final list of obtained indicators along with their frequency count is presented in Table 3.

<Please Insert Table 3 here>

3.4 CS indicators Integration into ICJV Performance Assessment

Analyzing 50 IJV publications, 25 IJVs performance variables were identified. Table 4 presents a summary of the IJV performance indicators. To integrate the two perspectives of performance indicators, the present 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, which resulted in a consolidated list of 36 indicators 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); and (4) a focus group discussion was launched to finalize on the classification. Overall, the 36 indicators were clustered into five major constructs, namely: project-based performance, company/partner performance, perceived satisfaction, performance of the ICJV management, and socio-environmental performance. Figure 3 shows the conceptual framework of the ICJV performance assessment. Due to word and space limitations, more emphasis is placed on key constructs. To allow for a more comprehensive discussion as supported by previous studies such as Gou and Xie (2016) and Darko et al. (2017), other relevant books, reports, and articles were used.

<Please Insert Table 4 here>

4. Analysis and Discussion of Results

This section answers the research question that was discussed earlier. What performance evaluation criteria reflect a more complete ICJVs success? It provides an in-depth discussion

of the main results emerged from the literature and derives a conceptual framework of ICJV performance assessment (see figure 3).

<Please Insert Figure 3 here>

4.2.1 Project-Based Performance

Ozorhon et al. (2010b) defined project performance as the extent to which the pre-set objectives of the project are achieved. In the construction industry, as IJVs are normally launched on project-based contracts with duration precision (Girmscheid and Brockmann, 2010), their operational success can be defined in terms of project achievement (Ozorhon et al. 2007a). Sillars and Karagari (2004) adopted the construct of organizational returns (profitability), which was measured by the joint venture (JV) returns and company growth (market position) to assess the organizational success of JVs in construction. The most frequently cited project goals are related to time, budget, quality, and customer/client satisfaction (Ozorhon et al. 2010a). McLeod and MacDoneel (2012) argued that project success criteria should go beyond the conventional criteria of measuring project performance to include more strategic objectives measures like good management records, benefits, etc. In this sense, ensuring good safety performance, effectively managing risks and issues, and more strategically maintaining the financial growth (profitability) of the corporation are increasingly becoming important. Therefore, building on Ozorhon et al.'s (2010a) study for measuring this construct, good safety performance, risk and issue management, ethics in management, and profitability have been included to capture the contemporary view of project-based performance in ICJVs. Also, as an objective measure that cannot be influenced by human perception, the number and magnitude of dispute resolution in IJV operations represent a sustainable measure critical at the project level to be considered (Almohsen and Ruwanpura, 2016).

321 *4.2.2 Company/Partner Performance*

322 In ICJV relationships, the goal incongruence among partnering firms indicates that the
323 performance assessment of an ICJV is directly linked to the partnering firms (Han et al. 2018).
324 Thus, the company/partner performance is viewed as another perspective of measuring ICJVs
325 performance (Ozorhon et al. 2007a). In addition to fulfilling the traditional objectives like
326 financial or operational objectives of firms, companies combine forces to enhance
327 organizational learning, build a strong company reputation, remain competitive in the local
328 market, to participate in overseas projects, spreading of financial risk, acquire both technical
329 and managerial skills (Girmscheid and Brockmann, 2009; Panibratov, 2016), etc. Ozorhon et
330 al. (2010b) defined partner performance as a subjective construct of determining the extent to
331 which predetermined organizational objectives are realized contingent on the ICJV project
332 undertaken. Through an empirical survey and statistical validation of the performance
333 constructs as proposed by Ozorhon et al. (2010b), partner performance was ranked first among
334 the other constructs explaining the multidimensionality of ICJV performance. Although this
335 construct is a one-sided focus, Mohr (2006) argued that, of all the performance measures in as
336 far as can be assumed, partnering firms are involved in IJVs in order to increase their
337 performance. The key indicators measuring this construct are sharing of risks equitably,
338 resource sharing, cost reduction, technology acquisition, facilitating internationalization,
339 enhancing competitiveness, creating long-term relationships, acquisition of managerial skills,
340 reputation, communication, learning and development, corporate governance, and market
341 share.

342 *4.2.3 Perceived Satisfaction*

343 The perceptual measure of a partner's satisfaction with ICJV performance in an effort to
344 provide information regarding the extent to which the ICJV has achieved its overall objectives
345 (including financial, survival, or expansion objectives or any objectives as the case may be)

(Ozorhon et al. 2007a), is one of the most frequently adopted measure of ICJV performance (Ozorhon et al. 2010b; Ghuari et al. 2013). This construct has been treated as an omnibus measure of IJV performance in a number of studies (Boateng and Glaister, 2002; Larimo et al. 2016). Nonetheless, Ren et al. (2009) highlighted that this approach of determining how an IJV as a stand-alone entity achieve its goal raises the threat of validity because satisfaction might be differently perceived by different respondents. Therefore, to reflect firms' representative perception about the IJVs, Ozorhon et al. (2010b) proposed that "overall satisfaction" can define the degree of satisfaction of firms with the IJV. Hence, it provides a general idea about the success of the collaboration beyond all financial and objective criteria. Besides the overall satisfaction as a measure of perceived satisfaction, Almohsen and Ruwanpura (2016) emphasized that stability in IJV represent the perceptual structural changes in its operation. Therefore, overall satisfaction and stability have been used to measure the perceived satisfaction construct in this study.

4.2.4 Performance of the ICJV Management

As project performance focuses on the success of IJV operation at the project level and partner performance at the company level, performance of the IJV management measures the success of the IJV operation at the centralized level (Ozorhon et al. 2007a). This construct represents the effectiveness of control over the IJV operation (Ozorhon et al. 2010b). Thus, the extent of having control power in IJV operation. In a more narrowed perspective view, as defined by Geringer and Herbert (1989), the power of participating in managerial duties that is reliant on technical superiority and management skills denote management control in JV literature. Yan and Gray (2001) defined the scope of JV management control as strategic, structural and operational, however, Ozorhon et al. (2010b) employed the measure of strategic control to reflect the control at board of directors' level; operational control at general management level; and organizational control in the daily processes and operating routines.

Unlike the strategic control as many studies have presented to be influenced by dominant ownership (Fryxell et al. 2002; Lee et al. 2011), the operational and organizational control do not certainly require or relate to the majority of ownership within the IJV. However, it's based on more specific process area control to be managed and influenced by the partners (Ghuari et al. 2013).

4.2.5 Socio-environmental Performance

This construct measures the extent to which the IJV organization has achieved its social and environmental performance. Whereas the social aspect considers the engagement of stakeholders, community cohesion/customer satisfaction, health and safety performance, labour practice/relation, capacity development, sustainable job creation, and so on, environmental focus relates to environmental performance, pollution, environmental compliance, environmental reporting, etc. The increasing call for organizations to move beyond economic performance, towards an all-inclusive capturing social and environmental development necessitate great attention to benchmark organizations performance against these measures (Tetteh and Chan, accepted for publication). Almohsen and Ruwanpura (2016) made an attempt to benchmark the sustainable performance of JVs in the oil and gas industry, however, they provided an incomplete picture of sustainable measures because they failed to define and establish the indicators for measuring sustainability performance. Shah (2015) also investigated the relationship between control structures and performance of IJVs in the oil and gas industry. His study neglected the social dimension of sustainability, and with a partial focus on corporate environmental performance. Moving forward, it appears that none of these studies has embraced CS measures in its entirely. In this study, 10 indicators have been introduced to measure the socio-environmental performance of IJVs in the construction industry.

5. Future Research Directions

This paper has been motivated by the incomplete ICJV performance metrics and neglect of CS indicators in ICJV performance assessment. There are more future avenues following the findings of this study. It is important to note that ICJVs undergo growth cycle (pre-inception stage, formation and organization stage, implementation and adjustment stage, and completion and evaluation stage) as shown in figure 4. The project-based nature coupled with duration precision of this hybrid collaboration position their activities against a project timeline. Also, the conceptually framed performance assessment (overall performance metrics) is located at the center.

First, owing to the lack of standardized approaches, ICJV performance measurement suffers from problems of validity, reliability, and generalizability. While the conceptual framework captures their overall performance assessment, it leaves the prioritization of key metrics to the decision-makers in the focal firms. Therefore, a unified set of scientifically-sound indicators that have been tested practically would provide a useful reference point for ICJV firms seeking to measure their operational efforts. Suitably, interviews with managers in these corporations, as well as in-depth case studies with a selected number of ICJV firms could permit the move towards the unification and standardization of the measures. Further, this would provide the opportunity to explore questions related to the key challenges in assessing the performance of ICJVs. In this sense, more specific weighing systems for both objective and subjective indicators should be developed to provide a robust control system for evaluating these metrics.

Second, ICJV performance assessment has failed to consider the stagewise progression of its life cycle development. Extant literature has placed much emphasis on the ICJV as a whole when measuring their performance instead of considering or categorizing their performance in stages. Moving forward, future research should answer these two research questions: 2) do newly established ICJV firms share similar objectives as existing ones? and 2) what success

criteria should be adopted by a newly formed ICJVs from inception to completion? As Tetteh and Chan (accepted for publication) proposed, an integrated performance assessment model that considers the transitional dynamics of ICJV life cycle is a promising research domain.

Third, it is important to acknowledge that, gathering performance evaluation from all parties' perspective is highly supported (Mohr, 2006), however, extant studies have neglected the perspective of the local partner. This neglect of two-sided view is problematic if one accepts that the performance evaluation of an IJV depends on which partner is asked. Consequently, little attention has been given to inter-partner differences in the assessment of IJV performance. Future studies should investigate this performance assessment perspective differences to sensitize partnering firms, managers and researchers.

The last interesting avenue worthy of future research is the application of innovative artificial intelligence (AI) technologies like artificial neural networks (ANN) to predict the performance of ICJVs contingent on key factors.

<Please Insert Figure 4 here>

6. Conclusions and Implications

While the number of publications on ICJVs performance assessment has gained attention, yet it suffers from the lack of complete and standardized appraisal. The incomplete ICJV performance metrics and the neglection of CS indicators in the ICJVs performance assessment offer a solid explanation for their inadequacy. This paper systematically reviews the literature on ICJVs performance measurement and integrates CS indicators into ICJV performance assessment using a hybrid technique, fusing process analysis method and four-pronged approach.

Based on 86 publications, the results point out that while traditional economic indicators account for more than half of the extracted indicators, environmental and social indicators have been partially considered in the construction environment. Also, organizations have embraced

the CS agenda, and its integration into businesses has been intensively present. In this study, 36 performance indicators were identified and categorized into five major constructs, namely: performance measures: project-based performance, company/partner performance, perceived satisfaction, performance of the ICJV management, and socio-environmental performance. This study updates, extends and aggregate the discrete ICJVs performance measures and introducing a new dimension of performance criteria into ICJVs, following scientifically-robust approaches.

Generally, this study had three major contributions. First, this study helps to integrate and bring closer the distinct ICJV performance measurement criteria in extant literature with the aim of advancing towards a more complete ICJVs performance assessment. Therefore, researchers can use the developed constructs as a complete and standardized set of ICJVs performance indicators in their research studies. Consequently, this research triggers a shift from the confined economic and incomplete ICJV performance appraisal to a more complete performance evaluation. Therefore, it provides the building blocks for future studies that could explore the value of these new indicators to companies and stakeholders in various context. In this sense, we expect to promote academic research and practical solutions, aiming at contributing to global sustainable development and also to corporate competitive advantage. Secondly, managers and practitioners can use the novel framework for assessing their performance and reporting purposes. This perspective can lead to sustainability improvement and value for society, ecosystems, and business. Lastly, this study creates value for both ICJV and sustainability literature by providing a systematic review of extant literature. Other strategic alliance models such as partnerships, relational contracting, etc. can use the performance indicators to assess their business success.

In spite of these contributions, this study has limitations. While the sampling method may be considered a limitation, the cross-systematic mapping method ensured broad coverage of

the relevant literature. Also, it is necessary to point out that, there is no complete set of CS indicators, however, based on the methodological approach and the criteria for selecting indicators, the initial indicators selected through to the final indicators retained highly stands in a better position to reflect the CS agenda of the industry. Yet, it is necessary to empirically test the indicators, to enhance the unification and standardization of the measures

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Appendix A.

List of CS indicators

Sustainability dimension	Performance indicators	Organizations dealing with CS performance indicators	References
Economic	E1 – Economic performance (e.g. cost, expenses, etc.)	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,2,4,5,6,7,13,22,23,26,27,28,29,35]
	E2 – Profit and profitability	IIRC, UNCTAD, SIMMI, ETSI	[2,10,11,15,18,25,26,27,28,33,34]
	E3 – Ethics in management	DJSI	[10,13,14,16,19,22,30,31,34,36]
	E4 – Corporate governance	DJSI	[1,6,12,18,20,29,30,35,36]
	E5 – Quality management	SIMMI	[10,11,14,16,21,25,27,28]
	E6 – Relationship management	DJSI	[1,6,10,20,26,27,28]
	E7 – Risk and issue management	DJSI	[1,10,14,17,18,34]
	E8 – Innovation management	DJSI	[6,10,13,17,18]
	E9 – Market presence	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,13,25]
Social	S10 – Stakeholder engagement	DJSI, GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,6,7,9,10,11,12,16,18,23,24,26,27,28]
	S11 – Community cohesion/customer satisfaction	IIRC, UNCTAD, SIMMI, ETSI	[1,2,6,10,13,14,16,18,19,26,30,32,36]
	S12 – Health and safety performance	DJSI, IIRC, UNCTAD, SIMMI, ETSI	[1,6,11,15,17,18,22,26,27,28,30,31]
	S13 – Human rights	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,10,13,15,17,18,19,20,26,29,35]
	S14 – Labour practice/relation	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,5,6,10,15,17,18,19,20,26,29]
	S15 – Capacity development	DJSI, IIRC, UNCTAD, SIMMI, ETSI	[1,5,15,16,18,29,31,32,35]
	S16 – Sustainable job creation		[1,5,10,14,15,18,27,32,35]
	S17 – Philanthropy (contributions to charity)	IIRC, UNCTAD, SIMMI, ETSI	[2,10,15,19,28,35]
	S18 – Social reporting	DJSI	[11,18,20,21,31]
Environmental	E19 – Materials management	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,2,3,4,5,6,10,11,15,18,19,20,21,22,25,26,31,32,34]
	E20 – Emission	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,2,5,10,11,15,18,19,20,21,22,25,26,31,32,34]
	E21 – Energy conservation	GRI, IIRC, UNCTAD, SIMMI, ETSI	[2,10,13,15,18,19,20,25,26,29,31,32,34,35]
	EN22 – Environmental performance (e.g. reduce environmental accidents)	DJSI, GRI, IIRC, UNCTAD, SIMMI	[1,3,6,7,10,12,13,16,18,19,20,22,24,26]
	EN23 – Environmental management system	DJSI, SIMMI	[1,6,10,16,17,20,21,22,25,26,34,36]
	E24 – Water issue	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,2,10,11,15,17,18,19,20,25,32]
	E25 – Pollution	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,5,6,10,11,18,22,26,27,28,32]
	E26 – Environmental compliance	DJSI, GRI, IIRC, UNCTAD, SIMMI, ETSI	[5,13,16,17,18,27,28,34]
	E27 – Biodiversity	DJSI, GRI, IIRC, UNCTAD, SIMMI, ETSI	[5,10,11,18,26,30]

E28 – Environmental reporting	IIRC, UNCTAD, SIMMI, ETSI	[10,17,21,27,28]
E29 – Climate change	DJSI, GRI, IIRC, UNCTAD, SIMMI, ETSI	[10,17,25,30]
E30 – Distribution and transport	GRI, IIRC, UNCTAD, SIMMI, ETSI	[1,10,26,35]

Note: **DJSI** = Dow Jones Sustainability Index; **GRI** = Global Reporting Initiative; **IIRC** = International Integrated Reporting Council; **UNCTAD** = United Nations Conference Trade and Development; **SIMMI** = Sustainability Indicators for Mining and Minerals Industry; **ETSI** = Energy Technology Sustainability Index
1 = Labuschagne et al. (2005); **2** = Hubbard (2009); **3** = Epstein and Roy (2007); **4** = Dutta et al. (2013); **5** = Christofi et al. (2012); **6** = Bansal (2005); **7** = George et al. (2016); **8** = Searcy (2012); **9** = Silva et al. (2019); **10** = Antolín-López et al. (2016); **11** = Ugwu and Haupt (2007); **12** = Morioka and de Carvalho (2016); **13** = Linnenluecke and Griffiths (2010); **14** = Montiel and Delgado-Ceballos (2014); **15** = Jiang et al. (2018); **16** = Engert et al (2016); **17** = Rahdari and Rostamy (2015); **18** = Keeble et al. (2003); **19** = Harik et al. (2015); **20** = Chang et al. (2013); **21** = Lozano (2012); **22** = Witjes et al. (2017); **23** = Atkinson (2000); **24** = Ramos and Caeiro (2010); **25** = Ahi and Searcy (2015); **26** = Tahir and Darton (2010); **27** = Dočekalová and Kocmanova (2016); **28** = Staben et al.(2010); **29** = Schaltegger and Wagner (2006); **30** = Morioka and Carvalho (2016); **31** = Formentini and Taticchi (2016); **32** = Lodhia and Martin (2014); **33** = Lourenço and Branco (2013); **34** = Schrippe and Ribeiro (2018); **35** = Aras et al. (2018); **36** = Engida et al. (2018);

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826 **Table 1**

827 Summary of the existing limitations in ICJV performance literature

No.	The limitations in existing literature
1	While studies on ICJV performance remains fragmented and incomplete, no unanimous conclusion exist yet
2	ICJVs performance evaluation have failed to incorporate CS indicators
3	The use of general/sector-specific CS indicators present challenges to corporations
4	A study that presents a systematic literature review on ICJVs performance assessment and incorporate CS indicators, has yet to be conducted

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830 **Table 2**

831 Indicator selection filter

Property	Definition
Exhaustive	All-inclusive indicators that cover the defined scope of CS
Minimal	Systematic exclusion of unrelated indicators based on their definition, whether they fall within the established boundary, and consistent with the review focus
Eligible	The criteria are specificity, credibility, and availability of data. By specificity, indicators published in the industrial, manufacturing and engineering sectors were considered. Credibility measures the accuracy and reliability level of indicators. Data availability relates to the availability of specific weighing systems for specific indicators as provided by corporations
Measurable	An indicator should be either quantitatively measurable or be operationally used to represent a value quantitatively. Solely measurable, whether qualitatively or quantitatively, indicators are qualified as sector-specific indicators
Monotonic	Consistency in partial and universal predilection indicating consistency of the indicators between alternatives
Cumulative	Legitimate to compare alternatives on a subset of the indicators on a single criterion.
Autonomous	The chosen indicator should not be functionally related
Communal	The chosen indicator should have the highest references or be relevant comparing related parameter from different sources (e.g. minimum references of at least two)

832 Source: adapted from (Rahdari and Rostamy, 2015)

833 **Table 3**

834 List of final retained CS indicators

Sustainability dimension	Performance indicators	References
Economic	E1 – Economic performance (e.g. cost, expenses, etc.)	[1,2,4,5,6,7,13,22,23,26,27,28,29,35]
	E2 – Profit and profitability	[2,10,11,15,18,25,26,27,28,33,34]
	E3 – Ethics in management	[10,13,14,16,19,22,30,31,34,36]
	E4 – Corporate governance	[1,6,12,18,20,29,30,35,36]
	E5 – Quality management	[10,11,14,16,21,25,27,28]
	E6 – Relationship management	[1,6,10,20,26,27,28]
	E7 – Risk and issue management	[1,10,14,17,18,34]
Social	S8 – Stakeholder engagement	[1,6,7,9,10,11,12,16,18,23,24,26,27,28]
	S9 – Community cohesion/customer satisfaction	[1,2,6,10,13,14,16,18,19,26,30,32,36]
	S10 – Health and safety performance	[1,6,11,15,17,18,22,26,27,28,30,31]
	S11 – Labour practice/relation	[1,5,6,10,15,17,18,19,20,26,29]

	S12 – Capacity development	[1,5,15,16,18,29,31,32,35]
	S13 – Sustainable job creation	[1,5,10,14,15,18,27,32,35]
	S14 – Philanthropy (contributions to charity)	[2,10,15,19,28,35]
	S15 – Social reporting	[11,18,20,21,31]
Environmental	E16 – Materials management	[1,2,3,4,5,6,10,11,15,18,19,20,21,22,25,26,31,32,34]
	EN17 – Environmental performance (e.g. reduce environmental accidents)	[1,3,6,7,10,12,13,16,18,19,20,22,24,26]
	E18 – Pollution	[1,5,6,10,11,18,22,26,27,28,32]
	E19 – Environmental compliance (e.g. emissions, etc.)	[5,13,16,17,18,27,28,34]
	E20 – Environmental reporting	[10,17,21,27,28]

Note: **1** = Labuschagne et al. (2005); **2** = Hubbard (2009); **3** = Epstein and Roy (2007); **4** = Dutta et al. (2013); **5** = Christofi et al. (2012); **6** = Bansal (2005); **7** = George et al. (2016); **8** = Searcy (2012); **9** = Silva et al. (2019); **10** = Antolín-López et al. (2016); **11** = Ugwu and Haupt (2007); **12** = Morioka and de Carvalho (2016); **13** = Linnenluecke and Griffiths (2010); **14** = Montiel and Delgado-Ceballos (2014); **15** = Jiang et al. (2018); **16** = Engert et al (2016); **17** = Rahdari and Rostamy (2015); **18** = Keeble et al. (2003); **19** = Harik et al. (2015); **20** = Chang et al. (2013); **21** = Lozano (2012); **22** = Witjes et al. (2017); **23** = Atkinson (2000); **24** = Ramos and Caeiro (2010); **25** = Ahi and Searcy (2015); **26** = Tahir and Darton (2010); **27** = Dočekalová and Kocmanova (2016); **28** = Staben et al.(2010); **29** = Schaltegger and Wagner (2006); **30** = Morioka and Carvalho (2016); **31** = Formentini and Taticchi (2016); **32** = Lodhia and Martin (2014); **33** = Lourenço and Branco (2013); **34** = Schrippe and Ribeiro (2018); **35** = Aras et al. (2018); **36** = Engida et al. (2018)

852 **Table 4**

853 IJVs performance indicators

Code	ICJV performance indicators	References	Sum
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]	32
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]	26
P3	Client satisfaction	[3,8,12,13,14,15,26,27,29,30,32,33,34,35,36,40]	16
P4	Stability of firm	[2,3,8,11,13,14,23,27,28,31,39,40,41,44,46,48]	16
P5	Technology acquisition	[3,6,7,8,10,13,15,18,20,25,31,32,35,36,40]	15
P6	Market share	[3,5,7,8,10,13,15,16,18,27,31,39,40,44]	14
P7	Achieving required project quality	[3,6,8,16,27,32,33,34,35,36,40]	11
P8	Completing the project within budgeted cost	[6,8,24,27,32,33,34,35,36,40]	10
P9	Acquisition of managerial skills	[1,6,7,8,25,27,32,35,36,40]	10
P10	Reputation	[2,3,5,8,13,15,16,27,40,44]	10
P11	Creating long-term relationships	[2,17,21,31,32,35,36,44,45]	9
P12	Strategic control	[3,13,15,16,32,33,35,36]	8
P13	Operational control	[3,13,15,16,32,33,35,36]	8
P14	Organizational control	[3,13,15,16,32,33,35,36]	8
P15	Dispute resolution	[8,27,40,41,44,46,48,49]	8
P16	Facilitating internationalization	[3,14,27,32,35,36,44]	7
P17	Enhancing competitiveness	[8,27,32,35,36,40,49]	7
P18	Completing the project within schedule	[6,27,32,33,34,35,36]	7
P19	Communication, learning and development	[8,17,19,25,27,40]	6
P20	Cost reduction	[3,32,35,36]	4
P21	Community alignment	[3,16,44,48]	4
P22	Sharing of risks equitably	[32,35,36]	3
P23	Resource sharing	[32,35,36]	3
P24	Good safety performance	[6,43]	2
P25	Environmental influence	[43,44]	2

References are as follows: 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 (2012); **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)

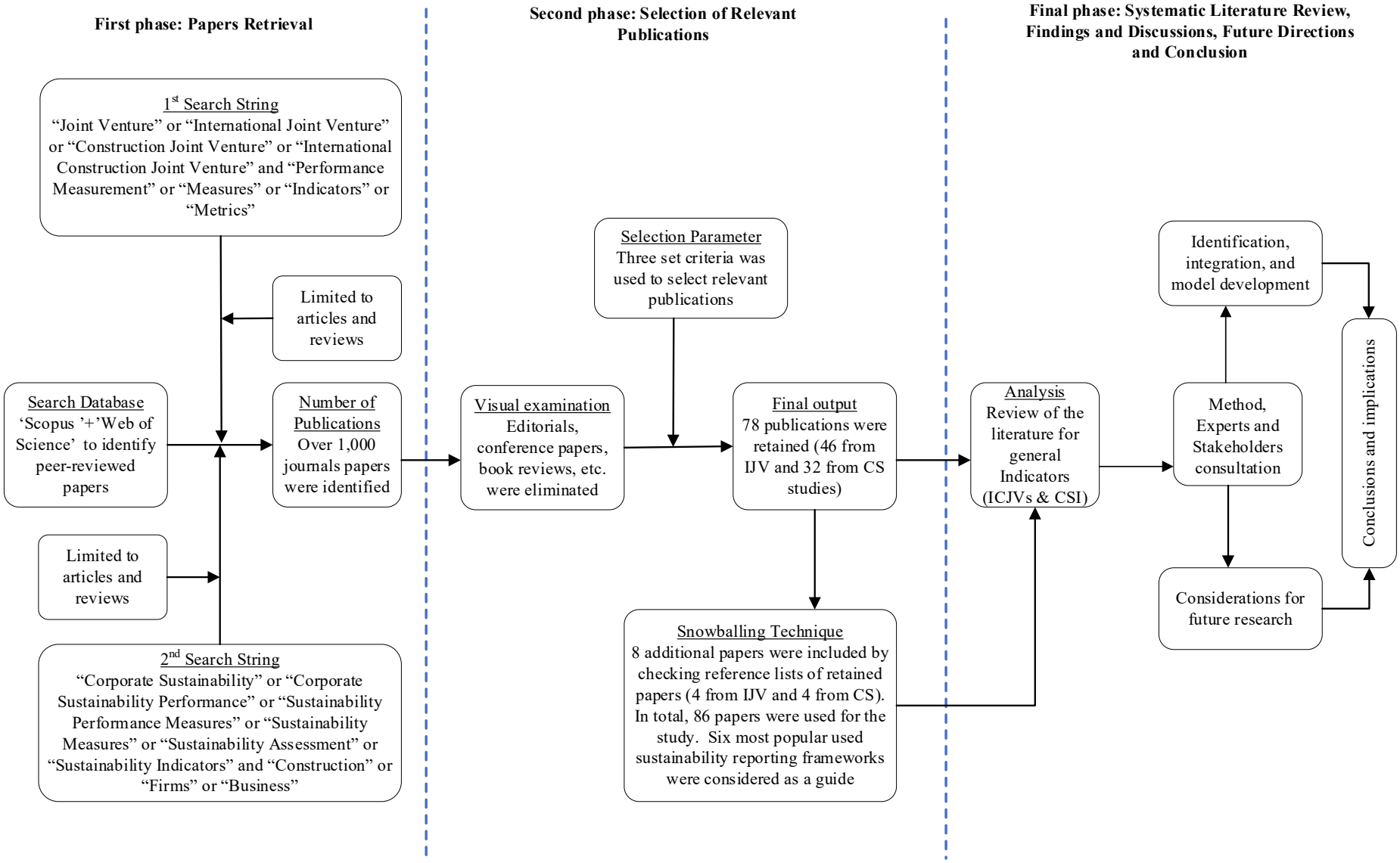


Figure 1 Research methodological framework

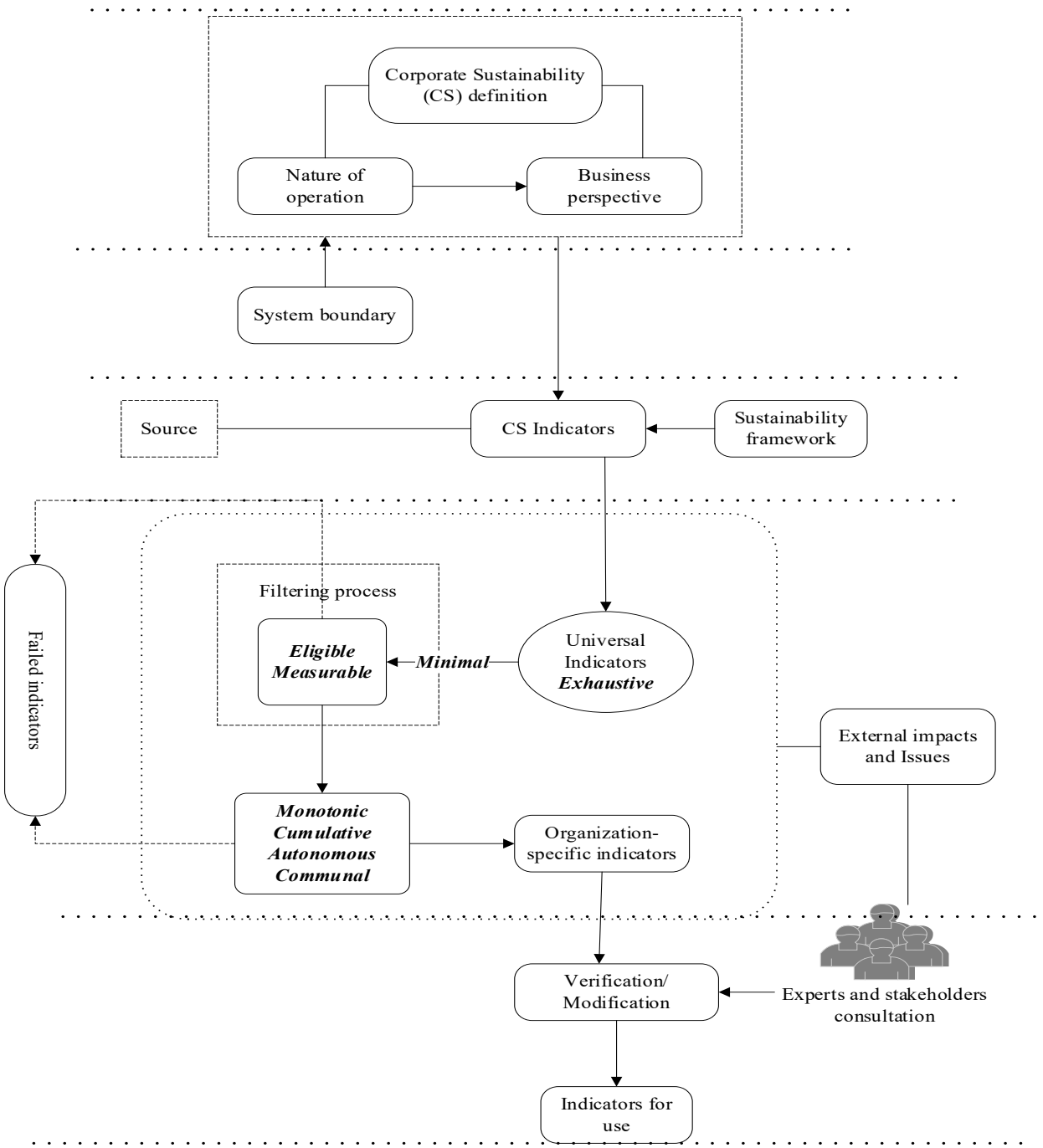
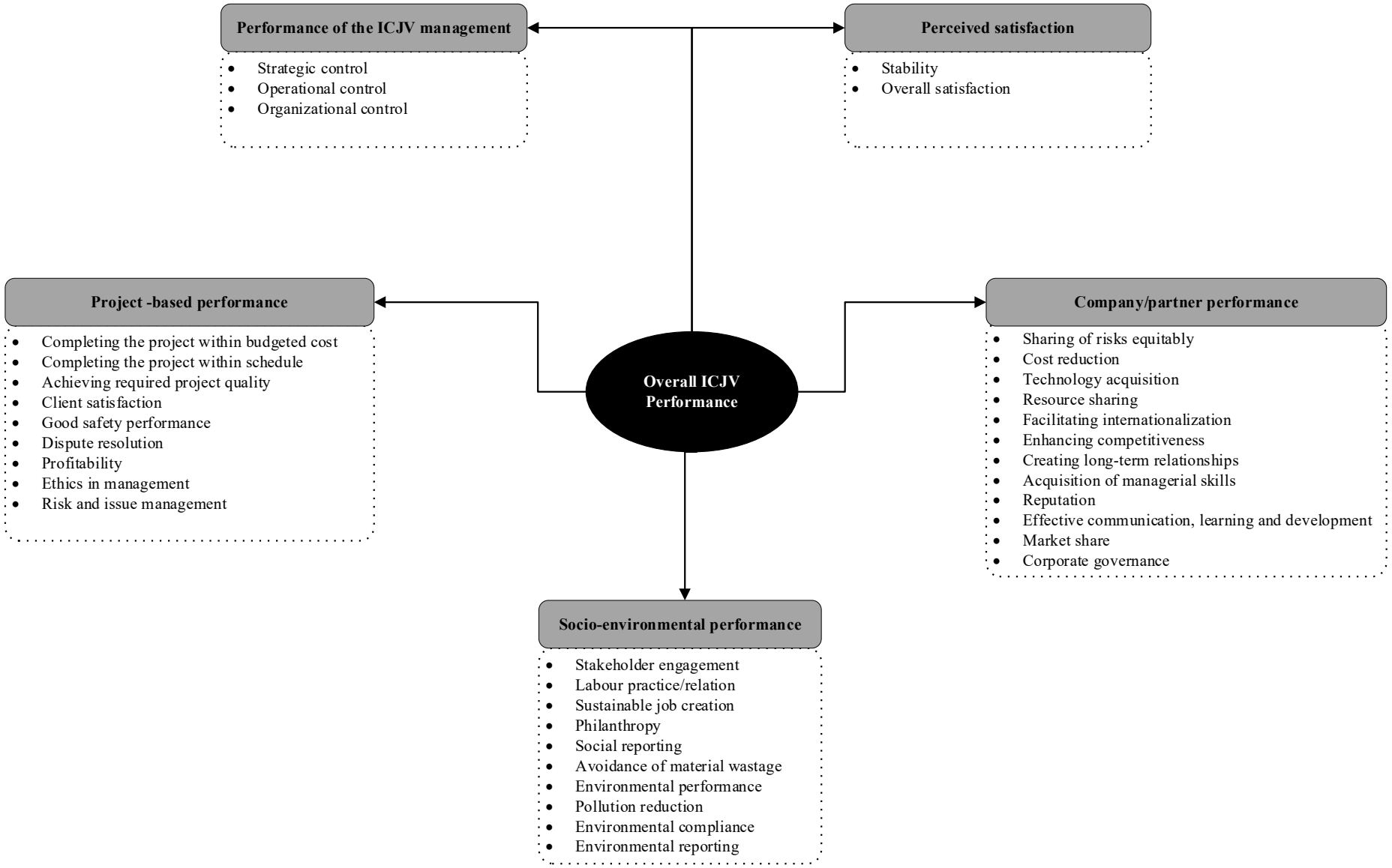


Figure 2 Combination of PAM and Four-Pronged Approach (adapted from Tahir and Darton 2010 and Rahdari and Rostamy 2015)


Performance of the ICJV management
Strategic control
Operational control
Organizational control
Perceived satisfaction
Stability
Overall satisfaction
Project -based performance
Completing the project within budgeted cost
Completing the project within schedule
Achieving required project quality
Client satisfaction
Good safety performance
Dispute resolution
Profitability
Ethics in management
Risk and issue management
Overall ICJV Performance
Company/partner performance
Sharing of risks equitably
Cost reduction
Technology acquisition
Resource sharing
Facilitating internationalization
Enhancing competitiveness
Creating long-term relationships
Acquisition of managerial skills
Reputation
Effective communication, learning and development
Market share
Corporate governance
Socio-environmental performance
Stakeholder engagement
Labour practice/relation
Sustainable job creation
Philanthropy
Social reporting
Avoidance of material wastage
Environmental performance
Pollution reduction
Environmental compliance
Environmental reporting

860

Figure 3 Conceptual framework of ICJV performance assessment

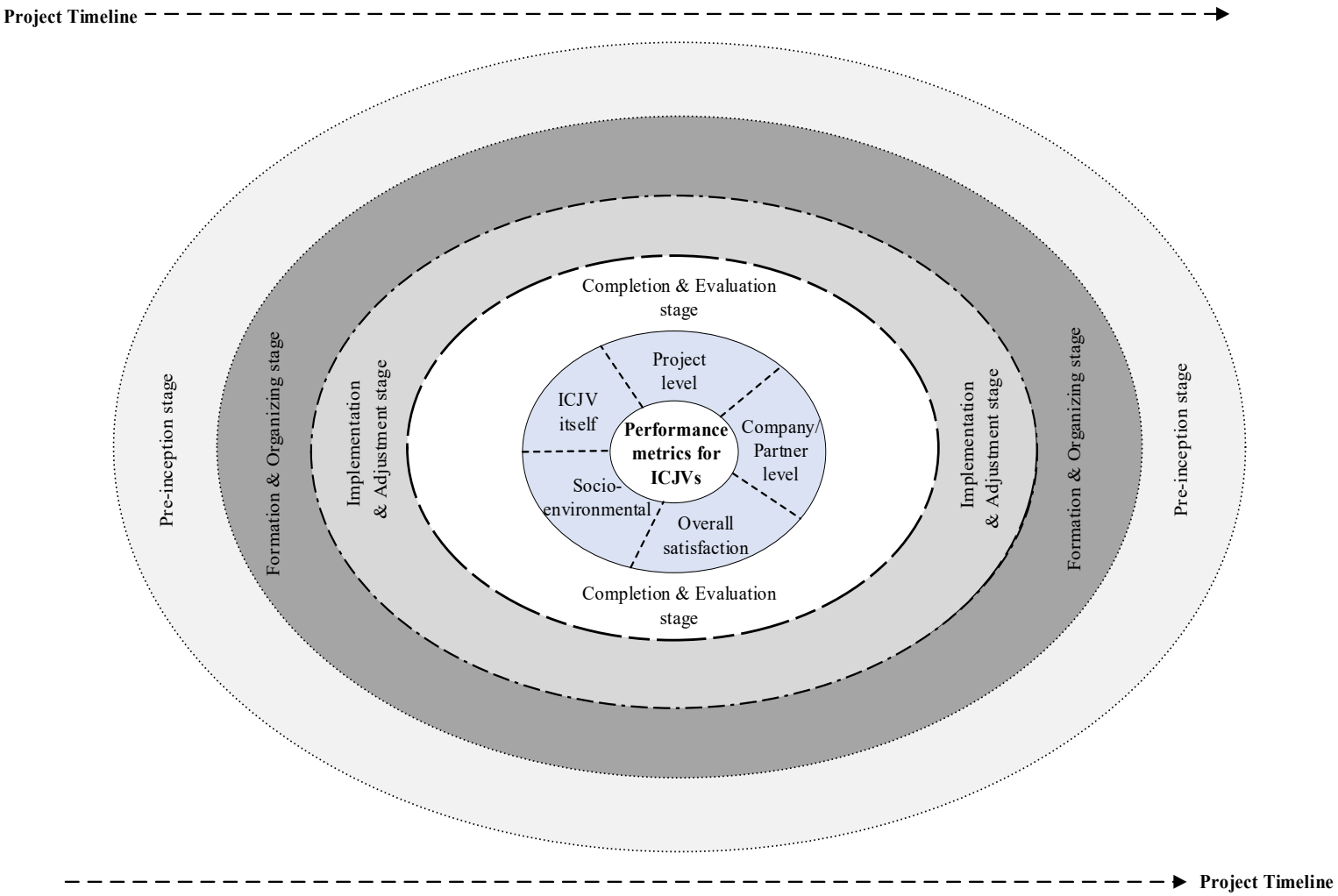


Figure 4 Research gap framework