

Review of concepts and trends in International Construction Joint Ventures Research

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Abstract

The adoption of international construction joint ventures (ICJVs), of late, for more complex and large-scale construction projects across the globe, has drawn an increasing broad range of research interest since early 1990s. A number of studies on ICJVs focusing on diverse perspectives have been published by globally renowned construction management (CM) journals over the past two decades. However, a systematic review of research development in this domain is still lacking. Thus, it is critical to conduct a comprehensive review to detect current research priorities and future research directions for development. This study aims to fill this gap through a comprehensive and systematic analysis of selected ICJV research papers published in 17 selected CM journals from 1990 to 2018. Using Scopus search engine and keywords, a systematic desktop search was conducted, followed by the selection of journals and papers. It analyzed the trend of ICJV research in terms of annual publication, countries' contributions, contributions by institutions and researchers, data collection and analysis methods adopted, and research interests. The results highlighted an increasing attention to ICJV research within the studied period. Also, the results indicated that while the largest contribution to ICJV research has come from developed countries like Singapore, the UK, and the US, developing countries like China and Turkey have also made enormous contribution. Key research topics covered include entry modes, formation decision strategies, and operation; risk assessment and management practices; performance evaluation; dispute resolution mechanisms; management issues in ICJVs; influential factors for ICJV practice;

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and technology transfer. This study also suggests useful directions for future research. The findings provide in-depth understanding of ICJV research to practitioners and researchers and stimulate future research based on the identified gaps.

Keywords: International construction joint ventures; Construction industry; Construction management; Literature review; Research trends.

Introduction

The collaboration of multinational construction firms as International Construction Joint Ventures (ICJVs) has become popular in the global business environment today (Ozorhon et al. 2007). Its attractiveness to global industry players is because of the demand for bulk market opportunities, and other related benefits (Gale and Luo, 2004; and Zhang and Zou, 2007). ICJVs have extensively been utilized for more complex and large-scale construction projects including: off-shore oil exploration and production, design and real estate development, industrial projects, urban public facility projects and underground rail construction (Harrigan, 2003; and Hwang et al., 2016). Ultimately, the expansion of its adoption has resulted in a more complex web of construction organizations, necessitating great attention to successful operations and management. Hence, there have been a number of studies on ICJVs with diverse focus from both the perspective of developed and developing countries (Gale and Luo, 2004; and Razzaq et al., 2018). For instance, Mohamed (2003) encapsulated some key research interest in published works on ICJVs as motivations behind ICJV formation; related benefits and disadvantages; critical success factors (CSFs); and risk analysis and management. Likewise, Ozorhon et al. (2008) identified 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. According to Cohen et al. (2002), one of the ways through which scholars can influence industrial practice and inform policymakers is publication of research papers and reports. While other countries might benefit from the research outputs from a particular country, the number of research outputs and publications from a particular country on a certain topic has a key role in advancing industrial development on that topic in that country (Hong et al., 2011). Darko and Chan (2016) emphasized that it is important to keep a track record of publications on a specific topic in different locations in order to devise strategies for advancement where required. While Hong and Chan (2014) reviewed the literature on joint ventures in construction, their study has a number of limitations. First, it did not analyze joint ventures in construction from an international perspective. Second, it did not analyze the research outputs from various locations, institutions, and authors. Third, it does not cover the literature published over the last half decade since the analysis was made of publications from 1993 to 2012. To address these limitations, the present review study aims at answering these research questions: (1) what is the annual publication trend of ICJV-related studies from 1990 to 2018? (2) what are the contributions of authors from different countries and institutions to ICJV research? And (3) what are the key research areas?

The review of analyzing contributions made by various countries, institutions and authors has been adopted by many researchers (Yi and Chan, 2014; Li et al., 2014a; Darko and Chan, 2016) to present research trend in different construction management disciplines. However, the present study is the first to replicate this review methodology in the context of ICJV research. This review

study is restricted to ICJV research papers published in selected CM journals from 1990 to 2018 (as of end of August). In the academic discipline, it is useful for especially 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., 2011; and Tsai and Lydia Wen, 2005). This study provides invaluable insights for researchers and practitioners to appreciate ICJV research trends and developments and expand the knowledge in the field.

ICJV Definition: A Global Perspective

A number of unrelated definitions of the term “Joint Ventures (JVs)” exist in the literature (Hong and Chan, 2014). In the international business literature, it is viewed as a long-term relationship between two or more legally distinct organizations who combine complementary resources for a long-term benefit, under a common legal law system (Tomlinson, 1970; and Geringer, 1988). Thus, there is a creation of the newly incorporated company where each has an equity position (Killing, 1988). In the view of Garbs (1988), from the construction industry perspective, JVs exist for a limited period with the objectives of undertaking procurement works, engineering, consulting, construction and construction management services through resource collaboration. The NJCC for Building (1985) added that, for JVs in construction, partnering companies have joint and several liabilities for their contractual commitments to the client. This was reinforced in Kreitl et al.’s (2002) study that, there is a contractual relationship between the client and the joint venture. Accordingly, a construction joint venture (CJV) turn up to be one project or typically a short-term agreement (Badger et al. 1993). It can also be formed either with a limited objective or without a time limit (Kreitl et al. 2002). Hong and Chan, (2014) defined CJVs as the marriage between at least two firms who join forces together in pursuit of Architectural, Engineering and Construction projects. It becomes “international” where the headquarters of at least one partner is situated

outside the venture operation country (Geringer and Hebert, 1989). In the same vein, Girmscheid and Brockmann (2010) also argued that, if the partners come from different countries, then we talk about an international joint venture (IJV). In addition, Girmscheid and Brockmann (2010) pointed out that, when the employer or client becomes part of the JV system through a construction contract, then we have ICJV. With a plethora of studies on JVs and IJVs, literature on ICJVs are scarce (Contractor and Lorange, 2002). Therefore, Girmscheid and Brockmann (2010) proposed a framework to clearly 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 (i.e. regulated by both the JV contract and construction contract signed with the client).

The differentiation of the two was based on their contractual regulations and the extent of duration. 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 arrangement as indicated earlier. Contractual joint ventures also undergo growth cycle, however, with limited time period as construction contract defines the task, budget and time precision (Gale and Luo, 2004; Prasitsom and Likhitrungsilp, 2015). This is depicted in figure 1.

(Insert Figure 1)

Therefore, 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.

Research Methodology

A review methodology adopted by previous researchers Darko and Chan (2016) and Oppong et al. (2017) was used in searching and selecting suitable research output for this review. The research

process is shown in Fig. 2. 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 trend, as well as identify key areas for future research. ICJVs has gained popularity both in academia and industry since 1990 (Luo, 2001; and Hwang et al., 2017). Additionally, papers obtained during this period provide a good picture of the historical and current trends in ICJVs research. The entire study approach began with the selection of construction management journals with the help of the Scopus search engine and some related keywords. This was followed by the selection of relevant papers from targeted CM journals through some set of parameters. Afterward, a critical analysis of the papers was carried out. An in-depth explanation of the various stages is given in the following sub-sections.

Selection of Construction Journals

CM journals that have published ICJVs-related papers from 1990 to 2018 were consulted for this study with the help of Scopus. Scopus has been widely used in similar studies on a variety of topics in the literature (Hong and Chan, 2014; Bao et al., 2018; Khoshbakht et al., 2018). The Scopus database is comprehensive and covers publications in the broader fields of management, accounting, engineering, business, and construction (Hong and Chan, 2014). Likewise, Scopus performs well in terms of accuracy and coverage than the other search engines such as PubMed, Web of Science and Google Scholar (Falagas et al., 2008). Using Scopus, a systematic desktop search was conducted to identify and select relevant construction journals for the study.

The search keywords used included “International Construction Joint Venture”, “International Joint Ventures”, “Construction Joint Ventures”, “Joint Collaboration Ventures”, “ICJVs”, “International Construction” and was limited to the “Construction Industry”, or the “Building Industry”. Note that international joint ventures are broadly utilized in the business management

field and in other management discipline. With the focus of the study, it was merely limited to the construction industry in order to retrieve ICJVs-related papers to overcome the challenge of obtaining a workable number of relevant papers for the research (Darko and Chan, 2016). The search was performed under the “article title/abstract/keywords” field of Scopus, and with document type of “article or review”. A total of 374 papers were originally identified from over 50 different journals (both construction and non-construction journals showed up) (searched on August 28, 2018). The entire search code is as follows:

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).

Regardless of the restrictions, many journals focusing on unrelated domain appeared (e.g. Nursing, Medicine and Energy). Thus, journals that do not concentrate on construction management were discarded. Afterward, a total of 36 construction journals were retained for further examination. After this process, the initial number of papers (i.e. 374) reduced to 233. Due to the limited number of publications specifically in this area, and to ensure that an adequate number of research outputs are captured, and relevant papers are not missed, a direct search was conducted using the same keywords in the retained journals. The titles and previews of the outcome of each journal were briefly reviewed before deciding on their inclusion (Oppong et al. 2017). Also, note that duplicated publications were eliminated. After filtering, an additional 28 papers

were found relevant for further analysis. That is, in total, 261 papers were retained for further analysis.

Selection of Relevant Publications

After the first phase was achieved, a preliminary screening was conducted of all the 261 publications to discard book reviews, conference papers, and editorials even though they contained some valuable information. This is because, such publications do not go through rigorous examination or review process, and are not sufficiently advanced for wide dissemination in the academic community (Drott, 1995). As asserted by Tsai and Lydia Wen (2005), refereed journal papers are widely acknowledged in the academic discipline as compared to conference papers, book reviews, etc. Similar review process has been adopted by Owusu et al. (2017) and Oppong et al. (2017), and this justifies the inclusion of only refereed journal papers for the study. Thus, 246 publications were retained before collating them under their respective journals. To facilitate the relevant paper selection process, two set parameters adopted by Hong and Chan (2014); Osei-Kyei and Chan (2015); Darko and Chan (2016) and Owusu et al. (2017) were considered to reduce the number of papers retained. Hence, journals selected in this study met either one of the criteria below:

1. The journal must have at least two papers according to the search results to reduce the possibility of ignoring relevant publications (Bao et al. 2018).
2. The journal ranks within the top six of Chau's (1997) quality rating of construction management journals. This ranking is widely accepted and adopted by many researchers in the construction management domain.

Finally, a total of five journals: Journal of Construction Engineering and Management (JCEM); Journal of Management in Engineering (JME); International Journal of Project Management

(IJPM); Construction Management and Economics (CME); and Engineering, Construction and Architectural Management (ECAM) were selected contingent on the second parameter. Twelve journals: Building Research and Information (BRI); Journal of Professional Issues in Engineering, Education and Practice (JPIEEP); Journal of Facilities Management (JFM); Automation in Construction (AC); Construction Economics and Building (CEB); Advance in Civil Engineering (ACE); Journal of Civil Engineering and Management (JCEM); Canadian Journal of Civil Engineering (CJCE); International Journal of Construction Engineering and Management (IJCEM); International Journal of Construction Management (IJCM); International Journal of Civil Engineering (IJCE); and Construction and Architectural Management (CAM) that met the first criteria. Thus, 17 construction journals were selected for the study.

After this exercise, the 17 construction journals captured 231 articles; nonetheless, there was a possibility that unrelated papers still appeared; because they met some of the keywords. Therefore, a robust and comprehensive examination was conducted by reading the abstract and whole document of each of the 231 papers to filter out irrelevant papers. Note that, publications that did not fully or partially satisfy the subject matter were excluded. After filtering, a total of 53 papers formed the basis of the review. Table 1 explicitly summarizes the targeted journal papers that were finally selected for the review.

In all, 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. Osei-Kyei and Chan (2015) for instance presented a literature review with 27 papers on critical success factors (CSFs) for implementing construction public-private partnerships (PPP). With 26 papers, Yu et al. (2018) presented a review on social responsibility factors for sustainable development in public-private

partnerships. Owusu et al. (2017) also used 37 papers to present a review of the causal factors of corruption in construction project management. Also, with 17 papers, Dwaikat and Ali (2016) presented a review of empirical evidence on the cost premium of GBs. More importantly, the small sample size could be attributed to the fact that, ICJVs-related publications are limited. Better still, the 53 papers could provide knowledgeable information on ICJVs.

(Insert Figure 2)

(Insert Table 1)

Determining Contributions Examination

Notwithstanding the limited studies conducted in ICJVs, there exist an appreciable contribution to both industry development and research progress through research publications (Cohen et al. 2002). It is of the belief that the number publications in a specific research area and conducted in a particular country prove the extent of industrial practice and its application in the country (Hong et al., 2011). Accordingly, it is imperative to analyze the contributions of each researcher, country, and institutions to better understand a particular research domain, in order to record the achievements of past researchers and advance on their contributions.

Adopting scoring methods employed by earlier researchers to conduct similar reviews studies in different CM journals (Yi and Chan, 2014; and Darko and Chan, 2016), the contributions of authors, country and institutions was quantitatively analyzed and ranked in this paper. With reference to Howard et al.'s (1987) widely adopted formula, contributions of multi-authored publications from different countries were calculated. The reliability and suitability of the formula is guaranteed as posit by Darko and Chan (2016), due to its widely used. From equation (1) below, in a multi-authored paper, credits were proportionally divided among authors with the higher score given to the first author, followed by the second author and the third in that order. For example, if a paper is published by a single author, the author will receive a score of 1.00; if a paper is

published by four authors, in a descending order, they will receive a score of 0.42, 0.28, 0.18 and 0.12 respectively (*see* Table 2).

$$\text{Score} = \frac{1.5^{n-i}}{\sum_{i=1}^n 1.5^{n-i}} \dots\dots\dots(1)$$

Where n denotes the number of authors for a particular paper and i denotes the order of specific authors. With each paper representing a score of one point, a detailed score matrix for authors is presented in Table 2. The accumulated score for each country, institution, together with the authors was computed, ranked and analyzed based on the score matrix.

(Insert Table 2)

Analysis and discussion of results

The results presented in this paper cover exclusively publications obtained from the sampling approach discussed in the third section. This clearly puts a great emphasis on the findings when interpreting the results. For instance, the condition that the identified contributors to ICJV research as the most important contributors can vary is largely permitted (*cf* Darko and Chan, 2016). The following sub-sections captures the annual publication trend, various countries contributions, institutions and authors contributions as well as the research topics covered over the years.

Overview of ICJV Publication Trend

Fig 3 depicts the annual distribution of ICJV-related articles that were published between the year of 1992 to 2018. From the figure below, as indicated in previous studies, ICJVs started to gain popularity in the academic discipline from 1992 (Hwang et al., 2017). Likewise, between 1999 to 2010, demonstrates an ever-increasing publication trend of ICJV studies. Of the 53 identified ICJV-related publications 35 number of articles were published between that period indicating the increasing devoted attention that the ICJV discipline received from researchers. Similar results were reported by Hong and Chan (2014). However, nine papers were published in 2008, a peak

within the studied period. Comparatively to the industrial practice of ICJVs, this might be the period (within the first 10 years of the 21st century) where the industrial practices of ICJVs and innovations progressed as emphasized by Hong et al. (2011). A study by Do and Lee (2012) on the key factors of successful joint ventures in Korea – two different case scenarios – supports the assertion of the relatively mature practice of IJVs in the construction industry within the specified period. It is within this period that a greater number of publications focused on risk assessment and management strategies in the discipline, as a result of the risky nature of this hybrid collaboration arrangement.

Table 1 indicates that CME, JCEM, JME, IJPM, BRI and JPIEEP journals published the highest number of ICJV-related articles during the study period. CME JCEM and JME have the highest number of publications than any other journal. That is 12, 8 and 7 respectively. This clearly shows that these three journals have the most significant contribution to the ICJV discipline. After the increased publication period (i.e. 2010), there have been an unstable and reduction in the number of ICJV research publications from 2010 to 2018 (as of end of August). However, there is a great potential for increase due to the increase in practice of this hybrid-collaboration form (Hong and Chan, 2014).

(Insert Figure 3)

Contributions of Countries of Origin, Institutions, and Researchers to ICJV Research

As mentioned earlier, in determining the country of origin and contribution of institutions, the individual scores of all authors coming from the same country were computed to obtain an overall score. For instance, if author ‘X’ published two different papers involving two authors (i.e. author ‘X’ and ‘Y’) from different countries, and in the papers, author ‘X’ appeared first and second respectively, in computing the score for author ‘X’, from the score matrix, author ‘X’ is scored

one point (0.6+0.4) each for the country and institution. Table 3 summarizes together the overall score for each country of origin in addition to the number of researchers, institutions, and papers produced.

The results indicate that Singaporean researchers dominated and have contributed much to the ICJV studies. In overall, researchers in Singapore were involved in 14 papers and accumulated an overall score of 11.5. Following in the descending order, countries that have contributed significantly to ICJV research are: China, Turkey, USA, UK, Hong Kong, Australia, and Taiwan obtained a contribution score of 8.36, 7.15, 6.70, 6.00, 4.32, 3.32 and 2.84 respectively. Unsurprisingly, both the developed and developing countries have contributed much to ICJV research and bulk of the studies were from the Asian countries. Literature explicitly confirms that many of the countries for instance Singapore, Taiwan, China, and Hong Kong engage in large and complex infrastructure projects (such as, Sea bridges, underground rails construction, skyscrapers etc.), which requires high-level of civil engineering technologies and a large amount of capital (Zhao et al. 2013; Hwang et al. 2014; Liang et al. 2018). Typical examples include the channel tunnel between the United Kingdom and France, the Taiwan high-speed railway, the expressway system in Bangkok or the Three Gorges Dam in China (Girmscheid and Brockmann, 2009). A more recent example is the Hong Kong-Zhuhai-Macau Bridge (a large-scale island and tunnel engineering project) jointly developed by three regional governments of Guangdong Province, Hong Kong Special Administration Region and Macau Special Administration Region (Liang et al. 2018). Also, legal regulations (local content policy) and government insistence promote this joint collaboration (Gale and Luo, 2004; Zhao et al. 2013). For instance, in Singapore, the government encouraged foreign firms to form ICJVs with local contractors through the introduction of the Preferential Margin Scheme (PMS) (Zhao et al. 2013; Hwang et al. 2014).

(Insert Table 3)

Widely adoption of this collaborative arrangement in those countries puts a great emphasis on the advancement of ICJV studies in this location. Similarly, countries like Malaysia, South Africa, Thailand, Austria, Finland, Pakistan, Nigeria, etc. have also made a great attempt in increasing ICJV research, with a contribution score of 1.00 each. Generally, in terms of research, the developing countries have received the limited attention of ICJV-related studies which implies that the extent to which industrial innovation and practices are progressing in the research area is slow. This creates the impression that multiple factors hinder research contribution in the developing countries. It could be because of immature publication culture or the high failure rate of such hybrid collaboration as literature pronounced due to management control challenges, unreliable local partners, the unpredictability of local environment etc. which deters its adoption to drive academic research. However, the overall results show a dedicated effort by researchers from different parts of the world and institution to contribute significantly to ICJV research for the studied period.

Table 4 presents the top 10 institutions publishing ICJV papers in the construction field. Also, the origin of the research centers, number of authors and papers are well presented. Research institutions that have contributed most to ICJV research include Nanyang Technology University (Singapore), Illinois Institute of Technology (US), Southeast University, Nanjing (China), Middle East Technical University (Turkey), National University of Singapore (Singapore), and Hong Kong Polytechnic University (Hong Kong), with a contribution score of 4.66, 3.60, 3.57, 3.43, 3.41, and 2.00 respectively. Predominantly, Asian institutions still dominate in the study area as mentioned earlier.

Further, the contributions of several authors were identified based on their number of papers and the weighting score. However, authors with at least a score point of one were considered. Note that some key researchers with many publications in the ICJV discipline may not be present due to the formula employed for calculating the contribution scores. As presented in Table 5, the analysis depicts that nine (9) researchers scored at least one point in contributing to ICJV research. Among them, Xianbo Zhao from National University of Singapore (Singapore) and Beliz Ozorhon from Illinois Institute of Technology (US) obtained the highest contribution score of 2.49 and 2.15 respectively. The effort of these two researchers also reflects in the highest score for their respective researcher centers. The study provides a relevant source of information for scholars and practitioners who are interested in ICJV research and development, and to further explore the subject area through research collaborations (Hong et al. 2011).

(Insert Table 4)

(Insert Table 5)

Key Research Areas and Sub-focus Captured in ICJV Study

With the growing interest in ICJV-related studies and a diversified array of published papers within the studied period, it deemed necessary to capture, organized and classify them into constructs and their underlying sub-groups in order to distinguish them. However, a significant effort was made by previous researchers, e.g., Mohamed (2003) and Ozorhon et al. (2008), who classified ICJV-related studies into similar scopes with limited number of studies as; motivations behind ICJV formation; related benefits and disadvantages; critical success factors (CSFs); risk analysis and management, factors affecting the performance of ICJVs; and management related issues. In a more recent study by Hong and Chan (2014), they categorized CJV studies into seven major themes based on some selected journals papers within their study period as; theory and model

development; identification of motives, benefits and other strategic demands of application; performance measurement or management; risk assessment or management; influential factors for practice; problematic issues and challenges in practice; and managerial practices of CJVs in the industry. Due to the generic nature of the concept by Hong and Chan (2014) in their study as mentioned earlier, the present study identified and classified ICJV-related papers into seven (7) best-fit constructs with underlying sub-groups (see Table 6 below).

Remarkably, it merits the attention that, some identified research interest/topic share the same ideological concept as Hong and Chan (2014) classification because their study shared some highlights on the ICJV concept. They include risk assessment and management practices; performance evaluation elements; and influential factors for ICJV practice. According to Themistocleous and Wearne (2000) and Holt (2010), the subjectivity involved in the categorization of a particular research interest/topic results in an undefined and unprofessional manner. Thus, the issue of subjectivity was reduced or otherwise possibly eliminated (Hong and Chan, 2014), through the collaborative nature of the study comparatively than sole authorship. More importantly, another condition was that each paper is to one of the identified research areas, and where a particular paper captures more than one area, it was encapsulated to the best-fit category as suggested by Hong et al. (2011) and Darko and Chan (2016). Also, a similar classification by other researchers was adopted which makes it more objective in nature than being subjective.

A detailed analysis of the selected ICJV papers within the studied period mainly covered the following; (1) entry modes, formation decision strategies and operation (e.g. Ling et al. 2005; Chen, 2008; Ling et al. 2008; Chen and Messner, 2009; and Isa et al. 2014); (2) risk assessment and management practices (e.g. Bing and Tiong, 1999; Bing et al. 1999; Kapila and Hendrickson, 2001; 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; Chang et al. 2018). (3) performance evaluation elements (e.g. Mohamed, 2003; Pheng et al. 2004; Ozorhon et al. 2007a; 2007b and 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; Neves and Bugalho, 2008; Ho et al. 2009; and Girmscheid and Brockmann, 2009); (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). A summary of all the seven broad research topics and their sub-topics together with the CM journals publishing those articles as well as the percentage of papers falling under each research topic is provided in Table 6 below.

(Insert Table 6)

As depicted in the table, much attention has been given to risk assessment and management with 42% of articles falling under this domain, followed by entry modes, formation decision strategies and operation (16%), management issues in ICJVs (11%), influential factors for ICJV practice (9%), performance evaluation elements (11%), technology transfer (7%). and dispute resolution mechanisms (4%).

A detailed discussion of the various constructs (research topic) is provided in the following section to better project what has been done from what needs to be done (Darko and Chan, 2016), so that the research gap can be identified to stimulate future research.

1) Entry modes, formation decision strategies, and operation. The adoption of joint ventures by AEC firms for strategic purposes in the global construction market is widely acknowledged in literature (Fisher and Ranasinghe, 2001 and 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 and Xu et al. 2005). A number

of ICJV-related studies have reported on the entry mode and formation decision strategies (Chen, 2008), factors that affects entry mode decision (Chen, 2008 and Jia et al. 2016), and model for entry location and timing (Isa et al. 2014).

2) ***Risk assessment and management practices.*** Risk assessment and management control remains the most highly explored area within the study period as indicated earlier. Majority of the high failure rate inherent with ICJV formation and its operation is due to internal, project-related and external risk manifested in several empirical studies (Bing and Tiong, 1999; and Ho et al. 2009). Studies relating to risk in ICJV have expanded extensively from risk identification (Bing and Tiong, 1999; Zhao et al. 2013; Hwang et al. 2016 and Razzaq et al. 2018) to risk assessment (Zhang and Zou, 2007; and Hwang et al. 2017), to prioritization of risk (Bing and Tiong, 1999; Zhao et al. 2013; Hwang et al. 2017; and Razzaq et al. 2018), to risk management/treatment (Bing and Tiong, 1999; Bing et al. 1999; Kapila and Hendrickson, 2001; Odediran and Windapo, 2016; and Chang et al. 2018), 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 and 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. 2016; 2017). Generally, issues related to risk have empirically been given much attention from previous studies. However, there still exist limited studies in risk-related areas which have been addressed in the subsequent section for further studies.

3) ***Performance evaluation elements.*** Measuring the performance of ICJVs have always been a challenging task for both practitioners and researchers because practitioners are challenged with the perspective from which performance should be measured from (i.e.

either from the partner perspective, project-based perspective, ICJV itself, or the overall satisfaction), and researchers also find it difficult to determine variables relating to ICJV performance due to the partially unevenness and incompatibility of performance determinants in ICJV literature (Ozorhon et al. 2010b). Performance evaluation of international joint ventures (IJVs) from the international business domain even still remains uncertain (Geringer and Herbert, 1991), and the case is worsened in the construction market because of duration precision coupled with complex structures and dynamic environmental conditions. Drawing from the international business literature, objective and subjective measures have mainly been used for assessing the performance of IJVs. With the objective measures focusing on financial determinants (e.g. profitability measures, growth, and cost position, longevity, and survival), subjective measures relate to the overall satisfaction as perceived by the JV partners (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, structure of the ICJV, and inter-partner fit. With the increasing complexity of 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. In overall, an adequate combination of the performance measures may reflect ICJV success.

4) ***Dispute resolution mechanisms.*** With the earnest of attention given to dispute resolution in the construction management discipline, it was surprising to find that research attention on dispute resolution is by far the lowest in the ICJVs studies. In ICJVs, the increase in the number of partners with 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). Chan and Suen (2005a) studied the main sources of disputes and how they can be resolved in Sino-foreign joint ventures in China and in their study, they 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. Accordingly, contractual disputes are unavoidable and detrimental if not properly managed, and timely controlled. A number of studies have addressed empirically the contractual disputes resolution mechanisms in the international business field (Chan and Suen, 2005b; Gad et al. 2011; Gad et al. 2016). Some of these mechanisms include litigation, arbitration, mediation, adjudication, early neutral evaluation, mini-trial, Dispute Resolution View

Board (DRB)/Dispute Adjudication Board, and summary jury trial. They vary in terms of cost, time, decision enforceability, etc. (Chan and Suen, 2005a). However, the major issue becomes what process(es) best satisfies the parties' interest and whether it's cost and time efficient. The extant empirical studies on dispute resolution methods indicate the lengthy resolution of contractual disputes in ICJVs (Chan and Suen, 2005a). However, there are rare literature yet to improve and ensure timely and effective resolution of contractual disputes in ICJVs. Thus, more comprehensive studies on how to successfully resolve disputes in a timely manner in ICJVs are promising research interest.

5) ***Management issues in ICJVs.*** Management control, coordination, and governance in ICJVs are found to be crucial for efficiently utilizing resources and effectively implementing strategies (Girmscheid and Brockmann, 2009). Therefore, the ineffectiveness of management control results to unsatisfactory performance (Lin and Ho, 2012). Managerial practices identified from literature can be viewed from two different perspectives. That is management control (Luo, 2001; Neves and Bugalho, 2008; and Girmscheid and Brockmann, 2009) and governance structure choices (Ping Ho et al. 2009 and Lin and Ho, 2012). In examining management control in the construction industry, though with the limited number of studies in this area, different conceptualizations and measures have been used empirically. Thus, resulting in inconclusive findings. For instance, Luo (2001) investigated the relationship between management control and performance in Sino-foreign CJVs in China by using dominant and shared control as a management control 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 management control

structures 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). Accordingly, in JMJs there is a close coordination and frequent communications are extended to the entire JV organizational level. In respect of the SMJs, every partner is responsible for a portion/subtask of the overall project. Building upon Ho et al.'s (2009) study, Lin and Ho (2012) investigated the performance impacts of the two-governance structure taxonomy by holding the same level of governance structure fit and found a significant positive relationship between the two. With the limited studies in this area as well as the inconclusive findings from empirical studies require great attention for successful ICJV operations.

6) ***Influential factors for ICJV practice.*** Focusing on the relational and practical aspects in implementing ICJV operations, this construct captured the perceptual fact of key interrelated factors that lead to the operational success of ICJV 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 (*cf* Ozorhon et al. 2007a; 2008a) etc.

7) ***Technology transfer.*** Joint ventures as a tool/vehicle/mechanism for technology and knowledge transfer over the past decades has been extensively acknowledged in the

construction industry (Carrillo, 1996 and Ofori et al. 2001). ICJVs presents an immense potential means for local partners to achieve core technological advantage from their foreign partners. However, given the popularity and relevance of this research interest, it is surprising to notice that research attention given to it is low in the ICJV discipline. This can largely be attributed to the lack of set practical processes, mechanisms or systematic guidelines, the extent of realization of the need etc. as postulated by Zhang et al. (2010). 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). Dulaimi (2007) also added that lack of commitment and the readiness to create an enabling environment for knowledge transfer has clouded the recognition ICJVs as a vehicle for achieving knowledge transfer.

Data Collection and Analysis Methods in ICJVs Studies

The summary of data collection and analysis method for each identified research topic is presented in Table 7. The basic idea was to explore essentially in details the methodological process used in each research interest and appreciate the concluding findings. Thus, this could further stimulate more comprehensive research methodologies and statistical robustness of the analysis to achieve an all-inclusive as well as increase the objectivity of the research findings. Because the ICJVs

concept is a construction management practices for strategic gains, therefore, it's impractical to provide effective measures and propositions without knowledge of the industry practice. Thus, as depicted in Table 7, it is clear that questionnaire survey, case study/interview, and mixed methods are the main methods used for collecting data in previous studies. Generally, surveys and case studies/interviews are the main data collection techniques in ICJV studies (accounting for 91% of the articles). This is attributed to the practicality of the ICJV concept as it requires researchers to deeply understand situations base on an in-depth investigation.

All the survey studies adopted analytical tools such as frequency ranked analysis, standard deviation (SD), percentages, relative importance index (RII), mean score, factor analysis, *t*-test, regression analysis, criticality index, correlations, structural equation modeling (SEM), analytical hierarchy process (AHP), fuzzy analytical hierarchy process (AHP), and analytical network process (ANP). For instance, ranking analysis to determine or examine most influential factors for practice (Bing et al. 1999; Al-Sabah et al. 2014 and Hwang et al. 2017), factor analysis for grouping of multiple variables into constructs (Deng and Low, 2013 and Chang et al. 2018), structural equation modeling (SEM) for studying the interrelationships between multiple independent and dependent variables (Mohamed, 2003 and Ozorhon et al. 2007a), multicriteria decision-making tool (AHP) used for imprecision and complex decision problems for example, risk assessment at the formation stage by Zhang and Zou (2007) etc. The case studies mostly used interviews with content case analysis for drawing conclusions. A critical observation from the table indicates that the analytical tools employed for research topic like the entry modes, formation decision strategies and operation, dispute resolution mechanisms, management issues in ICJVs and technology transfer requires more robust analysis to reflect the actual industry practice due to

the complex and varying conditions of situations as it naturally happens. Further, more complicated methods, like simulation techniques, system

(Insert Table 7)

dynamics, artificial intelligent tools like the ANN etc. should also be utilized in ICJV studies to better reflect the reality. Therefore, there is an increasing future research study for ICJVs by applying different modeling techniques.

Knowledge Gaps and Future Studies

In the light of pointing out the research gaps in the existing body of knowledge for future studies, a systematic review of what has been done and what remains to be explored has been captured in a conceptual framework below (see Fig. 4). The framework projects both the current status and future research directions of ICJV studies in CM journals within the study period. Within the larger frame of the framework denotes the contract signed between the partnering firms (ICJV contract), and the various issues addressed in 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 of the research interests indicate that achieving a right balance of studies in each area drives industrial innovation which leads to higher performance. Also, 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

To conserve space, this study chose to emphasize five key gaps from the research topics identified from the literature. This includes performance evaluation; dispute resolution mechanisms; management issues in ICJVs; influential factors for ICJV practice; and technology transfer. The relevance of this research interest is in two folds; 1) key to the ICJV success, and 2) limited studies in these areas. The subsequent section focuses mainly on the analysis of future research directions worth to be noted and emphasized.

(Insert Figure 4)

Performance Evaluation Criteria. The performance measurement of ICJVs has received significant attention for the past few decades. Corporate bodies awareness to benchmark the operational success or prove that a planned effort has achieved a desired result in ICJV operations has increased due to the increase of its adoption. However, the difficulties that mask the perspective from which performance should be measured and the determinants/variables related to the performance still remains challenging both at the industry level and in academic studies. Considerable efforts have been made by previous researchers (Mohamed, 2003; Ozorhon et al. 2007a; Ozorhon et al. 2008b; and Ozorhon et al. 2010a), however, there still remains key indicators and variables to be added up as a result of the dynamic global circumstances. Previous studies have focused on the performance of ICJVs at the project level, company level, ICJV management, and overall satisfaction, and have neglected the overall sustainability performance of the ICJV operational initiatives. The increasing pressure on construction companies to increase their responsibility beyond economic performance, to an all-inclusive capturing 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). Thus, existing literature should further be extended to establish a more holistic performance indicator with key underlying variables, which covers all perspectives of ICJV performance together with economic, social, and environmental perspectives of corporate sustainability in evaluating the effectiveness of ICJVs operations.

Further, performance measurement in ICJVs has been too static and therefore failed to consider the evolutionary stages of the ICJV life cycle development. As previously indicated, ICJVs undergo growth cycle, however, with limited time period as construction contract defines the task, budget and time precision (Bing and Tiong, 1999; Gale and Luo, 2004; Prasitsom and Likhitrungsilp, 2015). Previous studies have placed more emphases on the whole ICJVs life cycle when measuring ICJV performance rather than categorizing various performance measures in stages (life cycle as indicated in Figure 3). Hence, future studies should address these two key research questions:

1) What success criteria should be adopted by a newly formed ICJVs from inception to completion?

2) Do newly formed ICJVs share the same objectives as existing ICJV organizations?

Thus, the development of an integrated performance measurement model that considers the stagewise progression of ICJV growth is probably a promising research direction. Future studies can utilize artificial intelligence tools like the neural networks (ANN) to predict the performance of ICJVs base on certain relevant factors.

- **Dispute Resolution Mechanisms.** Dispute and disputes resolution in ICJVs are key issues that demand critical attention, yet limited studies in the area. ICJVs are characterized by geographically dispersed multinational teams with different conflicting routines, strategies, diverse cultures, and language (Soibelman et al. 2010), and even worse when a third party

(client) becomes part of the team through construction contract. Thus, there will be an increase in construction disputes by nature. At the same time, the identified papers have mainly been devoted to the developed countries like China and Hong Kong (Chan and Suen 2005a; and Maemura et al. 2018), with limited studies in the developing countries. Thus, future researchers can explore the factors that lead to disputes as well as the mechanisms or strategies or methodologies for controlling them. Additionally, future studies can develop a holistic framework for curbing disputes and conflicts by considering the stagewise progression of ICJV lifecycle from both the developed and developing country's perspective. Also, more comprehensive studies on how to successfully resolve disputes in a timely manner in ICJVs using modeling techniques like simulation-based techniques, system dynamics etc., have yet to be conducted.

- **Management Issues in ICJVs.** Management control structures used in ICJVs operations have greater implications on performance as acknowledged in the literature. However, given the limited number of studies in this area, yet there exist different conceptualizations and practices to reflect management control and governance in ICJVs as indicated earlier. It appears that identified publications within the study period focused more on the developed countries such as USA, Portugal, and Switzerland, and very few from the developing countries. Given the acceleration of large infrastructure projects, globalization, and intensification of domestic market competition, the use of ICJVs has gained much recognition in the developing countries. However, the collaboration of this hybrid form is normally prone to high failure rate due to management control and coordination difficulties (Yan and Gray, 2001). Also, with the central issue on the direct relationship between ownership and management control in the international business literature (Wong et al.

2005; and Li et al. 2009), an empirical investigation as reported by Luo (2001) between Chinese-French construction JV revealed that management control over ICJV is not certainly by majority of ownership. Also, the relationships between ownership, management control, and ICJV performance have received very little attention in ICJV-related studies. Thus, there are several inadequacies and inconsistencies associated with the existing studies on factors measuring ownership, and management control in ICJVs, which leads to difficulties in the benchmark for its measurement. Further studies should critically and systematically review literature on ownership and management control in IJVs to enable the benchmark of ownership and control in construction projects. Future studies can explore other measurable factors by which management control mechanism can be represented in the construction industry. Management control develops distinctively in various context and locations, and the processes and its establishments differ as well (Luo, 2001). Therefore, as control is likely to vary across multiple perspective situations. Future studies should assess the relationships between management control mechanisms and ICJV performance from the developing country's view. Likewise, future studies can also identify partners contributions and model its influence on mechanisms of control. Identifying key drivers that affects the choice of control mechanism in ICJVs is a pressing need. Researchers can also develop an integrated model for the effective management control mechanisms for ICJVs by considering the stagewise progression of ICJV life cycle. Future studies can also employ the ANN tool to predict the performance of ICJVs by using the mechanisms of control constructs, in order to appreciate the significant impact of management control in ICJV operations.

- **Technology Transfer.** As afore-discussed, 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), represents the main challenges for transferring knowledge and technology in ICJVs. 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 can examine the correlations between transfer, absorption and specific influential factors through the ICJV life cycle. Hence, future studies can simulate the transfer processes during ICJV development stages using simulation-based approaches. Also, further studies should be carried out to explore the challenges of transferring technology mostly in the developing countries as more 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.
- **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 applications factors for improving ICJV operations.

Generally, with reference to the research gap framework (see Figure 4) as presented above, there is a wide research gap in literature which demands critical attention to ensure successful ICJVs operations.

Conclusions

The adoption of international construction joint ventures (ICJVs), of late, for more complex and large-scale construction projects across the globe, has resulted in a more complex web of construction organizations, necessitating great attention for successful operations and

management. Consequently, there have been proliferation of research on ICJVs studies over the past two decades. Thus, the research objective was to systematically analyze ICJV research trends and development in globally renowned construction management (CM) journals. 17 selected CM journals, namely JCEM, JME, IJPM, CME, ECAM, BRI, JPIEEP, JFM, AC, CEB, ACE, JCEM, CJCE, IJCEM, IJCM, IJCE, and CAM from 1990 to 2018 was analyzed.

In overall, 53 ICJV- related papers were systematically analyzed in this study. The study analyzed the trend of ICJV research in terms of annual publication, countries' contributions, contributions by institutions and researchers, data collection and analysis methods adopted, and research interests. The results highlighted an increasing attention to ICJV research within the studied period. Both developed and developing countries like China, Turkey, USA, UK, Hong Kong, Australia, and Taiwan have contributed significantly to ICJV research. Similarly, countries like Malaysia, South Africa, Pakistan, and Nigeria have also made a good attempt at increasing ICJV research. There is a greater expectation from the developing countries to advancing ICJV research studies, given the acceleration of large infrastructure projects, globalization, and intensification of domestic market competition. Researchers from the various institutions like the Nanyang Technology University (Singapore), Illinois Institute of Technology (US), Southeast University, Nanjing (China), etc. have published most of the ICJV research papers. 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. Surveys and case studies/interviews are the main data collection techniques in ICJV studies. Statistical tool such as frequency ranked analysis, standard deviation (SD), percentages, relative importance index (RII), mean score, factor analysis, *t*-test, regression

analysis, criticality index, correlations, structural equation modeling (SEM), analytical hierarchy process (AHP), and fuzzy analytical hierarchy process (FAHP) are mostly utilized for analysis.

Further research directions are proposed based on the analysis of the current status of ICJV research topics. The limitations of this research study are the small sample size (53 paper) used for the analysis. This is justified by the inapplicability of considering all possible ICJV research keywords in a single review study. Though the findings reflect the overall ICJV research trend, not all related studies have been reviewed. Furthermore, there is a limitation on the generalizability of the research findings to other industries since it was restricted to only the construction industry. Further studies can increase the sample size and focus on other industry to provide a reference for future proofing of what has been done in this study. The findings provide an in-depth understanding of ICJV research to practitioners and researchers, and stimulate future research based on the identified gaps.

Data Availability Statement

Data generated or analyzed during the study are available from the corresponding author by request.

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Table 1. Overview of search results and distribution of selected publications (from 1990 – 2018)

Selected journals	No. of publications	No. of relevant papers for this study
Journal of construction Engineering and Management (JCEM)	58	8
Journal of Management in Engineering (JME)	37	7
International Journal of Project Management (IJPm)	18	4
Construction Management and Economics (CME)	37	12
Building Research and Information (BRI)	9	4
Journal of Professional Issues in Engineering, Education and Practice (JPIEEP)	5	3
Journal of Facilities Management (JFM)	5	1
Automation in Construction (AC)	6	2
Construction Economics and Building (CEB)	4	1
Advance in Civil Engineering (ACE)	3	1
Engineering, Construction and Architectural Management (ECAM)	21	1
Journal of Civil Engineering and Management (JCEM)	7	1
Canadian Journal of Civil Engineering (CJCE)	6	2
International Journal of Construction Engineering and Management (IJCEM)	2	1
International Journal of Construction Management (IJCM)	5	2
International Journal of Civil Engineering (IJCE)	3	1
Construction and Architecture Management (CAM)	5	2
Total	231	53

Table 2. Matrix showing the scores for multi-authored papers

Number of authors	Order of specific author				
	1	2	3	4	5
1	1.00				
2	0.60	0.40			
3	0.47	0.32	0.21		
4	0.42	0.28	0.18	0.12	
5	0.38	0.26	0.17	0.11	0.08

Table 3. Locations of selected ICJVs research papers

Country	Institutions/Universities	Researchers	Papers	Score
Singapore	19	25	14	11.35
China	19	22	11	8.36
Turkey	11	23	10	7.15
USA	12	18	10	6.70
UK	8	9	6	6.00
Hong Kong	5	6	6	4.32
Australia	7	9	8	3.32
Taiwan	3	8	3	2.84
Japan	2	2	3	1.23
Malaysia	2	2	2	1.21
South Africa	4	4	3	1.02
Thailand	1	2	1	1.00
Austria	1	3	1	1.00
Finland	1	1	1	1.00
Pakistan	2	4	1	1.00
Moscow	1	1	1	1.00
Canada	1	2	1	1.00
Nigeria	1	1	1	1.00
India	1	1	1	0.60
Switzerland	1	1	1	0.60
Germany	1	1	1	0.40
Sri Lanka	1	1	1	0.40

Korea	1	1	1	0.21
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Table 4. Top 10 research institutions publishing ICJV papers (using the score matrix)

Rank	Institution/University	Country	Researchers	Papers	Score
1	Nanyang Technology University	Singapore	4	5	4.66
2	Illinois Institute of Technology	US	4	4	3.60
5	Southeast University, Nanjing	China	5	4	3.57
3	Middle East Technical University	Turkey	2	4	3.43
4	National University of Singapore	Singapore	5	5	3.41
6	Hong Kong Polytechnic University	Hong Kong	4	3	2.00
7	National Taiwan University	Taiwan	2	4	1.84
8	Griffith University	Australia	1	1	1.00
9	University of Hong Kong	Hong Kong	2	3	1.00
10	University of Toronto	Canada	2	2	1.00

Table 5. Authors contributions to ICJVs related papers in construction (scoring at least one point)

Researcher	Papers	Affiliation	Country	Score
Xianbo Zhao	5	National University of Singapore	Singapore	2.49
Beliz Ozorhon	5	Illinois Institute of Technology	US	2.15
Irem Dikmen	4	Middle East Technical University	Turkey	1.87
Jun Luo	3	Ove Arup and Partners Ltd	UK	1.48
David Arditi	4	Illinois Institute of Technology	US	1.40
Bon-Gang Hwang	4	National University of Singapore	Singapore	1.39
S. Ping Ho	3	National Taiwan University	Taiwan	1.24
Yi-Hsin Lin	3	Southeast University, Nanjing	China	1.16
Low Sui Pheng	2	National University of Singapore	Singapore	1.07

975 **Table 6.** Research areas and sub-focus in ICJV publications from 1990 to 2018 (as of end of August)

Research area	Sub-focus	CM journals	Number of papers (%)
Entry modes, formation decision strategies, and operation	Culture characteristics to entry decision; Entry strategies; Collaboration and competition; Entry mode classification; Influential factors for entry mode choices; Model for entry location and entry timing; and Host country related factors on entry mode selection	CME (3), IJPM (1), JME (2); CEB (1), JPIEEP (1), CJCE (1)	16
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;	JCEM (7), CME (1), JME (2), ACE (1), AC (2), IJPM (2), IJCEM (1), IJCE (1), ECAM (1), JPIEEP (2), CAM (2)	42
Performance evaluation elements	Modeling perspective of performance; Multidimensional performance measures; comparative performance study	JCEM (1), CME (2), JME (3)	11
Dispute resolution mechanisms	Sources of disputes and resolution strategies	JCEM (2)	4
Management issues in ICJVs	Coordination and control; Trust; Management and operating performance; Governance structure strategies; Model for organizational governance choices; and Safety management challenges	CME (4), JCEM (2),	11
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	IJPM (1), IJCM (1), JME (1), CME (1), BRI (1)	9
Technology transfer	Knowledge transfer mechanisms; and learning effectiveness	CME (2), IJCM (1)	7

Note: CME- Construction Management and Economics; IJPM- International Journal of Project Management; JME- Journal of Management in Engineering; CEB- Construction Economics and Building; JPIEEP- Journal of Professional Issues in Engineering, Education and Practice; CJCE- Canadian Journal of Civil Engineering; JCEM- Journal of Construction Engineering and Management; ACE- Advance in Civil Engineering; AC- Automation in Construction; IJCEM- International Journal of Construction Engineering and Management; IJCE- International Journal of Civil Engineering; ECAM- Engineering, Construction and Architectural Management; CAM- Construction and Architectural Management; BRI- Building Research and Information

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977 **Table 7. Research areas and data collection and analysis method in ICJVs studies**

S/N	Research areas	Data collection method	Analytical tools employed	Number of papers	Percent (%)
1	Entry modes, formation decision strategies and operation	Survey	Regression analysis, factor analysis, and <i>t</i> -test	7	13
2	Risk assessment and management practices	Case study/interview	Content analysis	2	4
		Survey	Relative importance index (RII), mean score, factor, <i>t</i> -test, analysis, criticality index, correlations, structural equation modeling (SEM), and fuzzy analytical hierarchy process (AHP)	16	30
3	Performance evaluation	Case study/interview	Content case analysis	2	4
		Mixed method	Percentages, and Delphi technique	5	9
		Survey	Structural equation modeling (SEM), analytical hierarchy process (AHP), and analytical network process (ANP)	5	9
4	Dispute resolution mechanisms	Survey	Frequency ranked analysis	1	2
5	Management issues in ICJVs	Case study/interview	Content case analysis	1	2
		Survey	Correlation analysis, regression analysis, mean, and standard deviation	3	6
6	Technology transfer	Case study/interview	Content case analysis	3	6
		Survey	Percentages, regression analysis, and factor analysis	2	4
7	Influential factors for ICJV practice	Case study/interview	Content case analysis	1	2
		Survey	Structural equation modeling (SEM), mean score, standard deviation (SD) and percentages	4	8
		Case study	Content case analysis	1	2
	Total			53	100

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