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1 **Key drivers for implementing international construction joint ventures: Global insights for**  
2 **sustainable growth**

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35 **Declaration of competing interest**

36

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38 implementing international construction joint ventures: global insights for sustainable growth" has  
39 not been published neither is it under consideration elsewhere.

40

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86 **Key drivers for implementing international construction joint ventures (ICJVs): Global**  
87 **insights for sustainable growth**  
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89 **Abstract**

90 **Purpose** – International construction joint ventures (ICJVs) are an effective strategy for  
91 construction companies worldwide for delivering large and complex projects. Despite numerous  
92 ICJVs studies, there is a lack of comprehensive empirical examination of what drives ICJVs  
93 implementation. This study aims to investigate the key drivers for implementing ICJVs through  
94 an international survey.

95 **Design/methodology/approach** – Grounded on a comprehensive literature review and structured  
96 questionnaire survey, 123 ICJV experts' responses from 24 different countries/jurisdictions were  
97 analyzed using inferential and descriptive statistics. Mann-Whitney *U* test was used to determine  
98 any divergence of ranking of the drivers by the experts. Factor analysis (FA) was used to identify  
99 the clusters underlying the key drivers. Rank agreement analysis was later used to investigate the  
100 consensus between experts from developing and developed countries/jurisdictions on their ranking  
101 of the clusters.

102 **Findings** – 26 out of 34 factors greatly drive the implementation of ICJVs. Mann-Whitney *U* test  
103 results prove the absence of significant disparity among the experts in the ranking of the drivers.  
104 Six clusters were obtained through factor analysis, namely, market-penetration and innovation-  
105 driven drivers, legal and market-driven drivers, fiscal incentives and market expansion drivers,  
106 personal branding drivers, sustainable advantage/power drivers, and industrial and organizational  
107 promotion drivers. Rank agreement analysis exhibited varied levels of concurrence between  
108 professionals from developed and developing countries/jurisdictions.

109 **Practical implications** – The appreciation of the factors motivating ICJVs is beneficial to the  
110 successful implementation of ICJV strategies. A clear understanding of the drivers can help  
111 practitioners and policymakers to customize their ICJVs to reap the expected benefits.

112 **Originality/value** - The study has generated valuable insights into the factors greatly driving the  
113 implementation of ICJVs worldwide. While the findings of this study provide a profound  
114 contribution to theory and practice, it contributes to sustainable growth in different perspectives.  
115

116 **Keywords:** International construction joint ventures, drivers, benefits, sustainability, construction  
117 management.  
118

119 **1. Introduction**  
120

121 The need for advancing sustainability of the built environment has been coupled with  
122 megaprojects, which have caused an increase in inter-firm collaboration in the global construction  
123 markets via international joint ventures (IJVs). The drive is to successfully realize these projects  
124 (Tetteh and Chan, 2019). Among many others, the desire to achieve some benefits of a global  
125 strategy or the need to compensate for the absence of, or weakness in a (perceived) needed asset  
126 or competency in most countries/jurisdictions are the prime reasons for the recognition of the  
127 importance of such hybrid arrangement. Engaging in international construction joint ventures  
128 (ICJVs) has become a good strategy for companies' survival and as an effective approach to

129 sustainable development (Shah, 2015; Tetteh et al., 2019). ICJVs support sustainable development  
130 by enhancing the operational efficiencies of corporate firms through the combination of  
131 complementary resources (e.g., operational capabilities, social organizing capacity, capital, etc.)  
132 to deliver megaprojects, which involve high stakes and have major social, economic, and  
133 environmental impacts – key indicators of sustainability. Thus, through ICJVs the targeted  
134 objectives and larger societal benefits of these projects within their designated scope, schedule,  
135 and budget are achieved (Brockmann and Brezinski, 2013). ICJVs are formed by a network of  
136 contractual relations between at least two legally distinct (i.e., different locations of headquarters)  
137 construction companies, design firms, engineering firms, subcontractors, and the organizational  
138 network of the client (Girmscheid and Brockmann, 2010; Hong and Chan, 2014). In the few years  
139 to come, ICJVs will dominate the growing business organizations globally (Chan et al., 2020).  
140 There has been considerable progress in documenting ICJVs implementation efforts, over the past  
141 few decades. Recently, Tetteh and Chan (2019) reviewed the literature and identified a broad range  
142 of ICJVs research interests, which include entry mode, formation decision strategies, and  
143 operation; dispute resolution; management issues; influential factors for practice; performance  
144 evaluation; risk assessment and management; and technology transfer. Chan et al. (2020) argued  
145 that factors driving the implementation of ICJVs are important to be considered for successful  
146 management strategies and mitigation action formulation. However, studies on drivers for  
147 implementing ICJVs are limited and remain fuzzy in terms of the assessment from the perspectives  
148 of both developed and developing countries/jurisdictions. A proper and deeper understanding of  
149 the factors driving the implementation of ICJVs is necessary for promoting the widespread  
150 implementation of ICJVs.

151 While diverse ICJV research interests exist, the existing literature provides no empirical  
152 examination on the factors driving the implementation of ICJVs and in a global view, as tackled  
153 in this study. According to Chan et al. (2020), the driving forces behind ICJVs implementation  
154 progress, yet our understanding is incomplete, as most of the drivers that exist remain tied to IJVs  
155 in the general business/management literature and opinion-based of researchers. The interest over  
156 ICJVs confirms that it has its attractiveness; hence, the awareness and understanding of the  
157 implications and ramifications is a major prerequisite, crucial to encourage its widespread adoption  
158 in the global construction market.

159 Aside from the salient need to identify the major drivers of ICJVs implementation, it is crucial  
160 to highlighting how feasible ICJVs promote sustainability in the built environment. The wake of  
161 sustainability focus in ICJVs operation has been recently sparked by Tetteh et al. (2020); however,  
162 their study did not demonstrate how it supports sustainability. Moreover, ICJVs adoption is  
163 inconsistent across various countries and jurisdictions in the world (Hong and Chan, 2014; Tetteh  
164 and Chan, 2019). This raises a fundamental question: What drives the adoption of ICJVs across  
165 various countries/regions in the world? How are some countries/jurisdictions able to implement  
166 ICJVs effectively while others are less successful? It worth noting that reasons for creating ICJVs  
167 may vary locally, regionally, or nationally contingent on multiple goals. To address this gap in the  
168 literature, this study aims to identify and gain a complete understanding of the major drivers for  
169 implementing ICJVs via an international expert survey.

170 In this study, drivers denote, respectively, the ‘push’ and ‘pull’ factors that compel and attract  
171 firms to engage in ICJVs. Simply put, they are potential benefits, motivations, and positive

172 influential factors that encourage construction companies to implement ICJVs (Chan et al. 2020).  
173 Whereas the current study makes an exceptional contribution to ICJVs body of knowledge through  
174 the robust and rigorous identification, categorization, and in-depth and understandable  
175 explanations of the main factors that drive ICJVs adoption, it also has practical and sustainability  
176 values. Practically, the findings will provide directions and administrative buttress in  
177 implementing ICJVs. Thus, knowledge of the key drivers aids successful implementation  
178 strategies – choice of measures which improves organizational performance, and greatly drive  
179 competitive advantage. Practitioners and policymakers can focus on the key driving factors to  
180 popularize and make informed decisions on ICJVs implementation effectively and efficiently.  
181 Thus, it will enable potential parties to evaluate their compatibility before entering the ICJV  
182 contract. Besides, it facilitates the possibility of understanding the objectives of entities in ICJVs.  
183 In the sustainability context, the wider achievable hybridization of firms’ strategic goals and  
184 success in delivering large and complex infrastructure projects are potential positive implications  
185 on socio-economic and environmental development.

## 186 187 **2. Literature review on drivers for implementing ICJVs**

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189 ICJVs and IJVs are two different theoretical concepts that confuse researchers whenever they  
190 are simultaneously mentioned in a study. Literature from the international business field defined  
191 IJVs as a long-term relationship wherein at least two legally distinct firms of different headquarters  
192 combine complementary resources to a semi-autonomous legally separate entity in pursuit of a  
193 mutual goal (Geringer, 1988). IJVs are regarded as equity joint ventures and independent of their  
194 parent companies through the establishment of the corporate contract (Girmscheid and  
195 Brockmann, 2010). The longstanding of IJVs operation, if formed as production joint ventures  
196 where they produce exchange goods determines their motivational dynamics for the corporation.  
197 Since they have time to develop and grow, long-term relationships are key to their existence. On  
198 the other hand, ICJVs exist for a short period with the objectives of undertaking construction or  
199 civil engineering works (Garb, 1988). Kreitl et al. (2002) argued that it can also be formed with a  
200 limited objective. However, Girmscheid and Brockmann (2010) emphasized that aside from the  
201 equity contract that determines the internal relations between the parties involved, there exists also  
202 an external contract signed with the client, which defines the construction contract. This contract  
203 puts pressure on the ICJV making it project-based – “finish and go” in nature. In short, ICJVs  
204 directly serve two sides, the joint venture contract, and the client. This information necessitates  
205 our discussion and reinforces the condition that multiple factors drive ICJVs implementation.  
206 Figure 1 displays the differences between ICJVs and IJVs. For a more and better understanding of  
207 the dissimilarities between ICJVs and IJVs, the reader is referred to Girmscheid and Brockmann  
208 (2010) and Tetteh and Chan (2019).

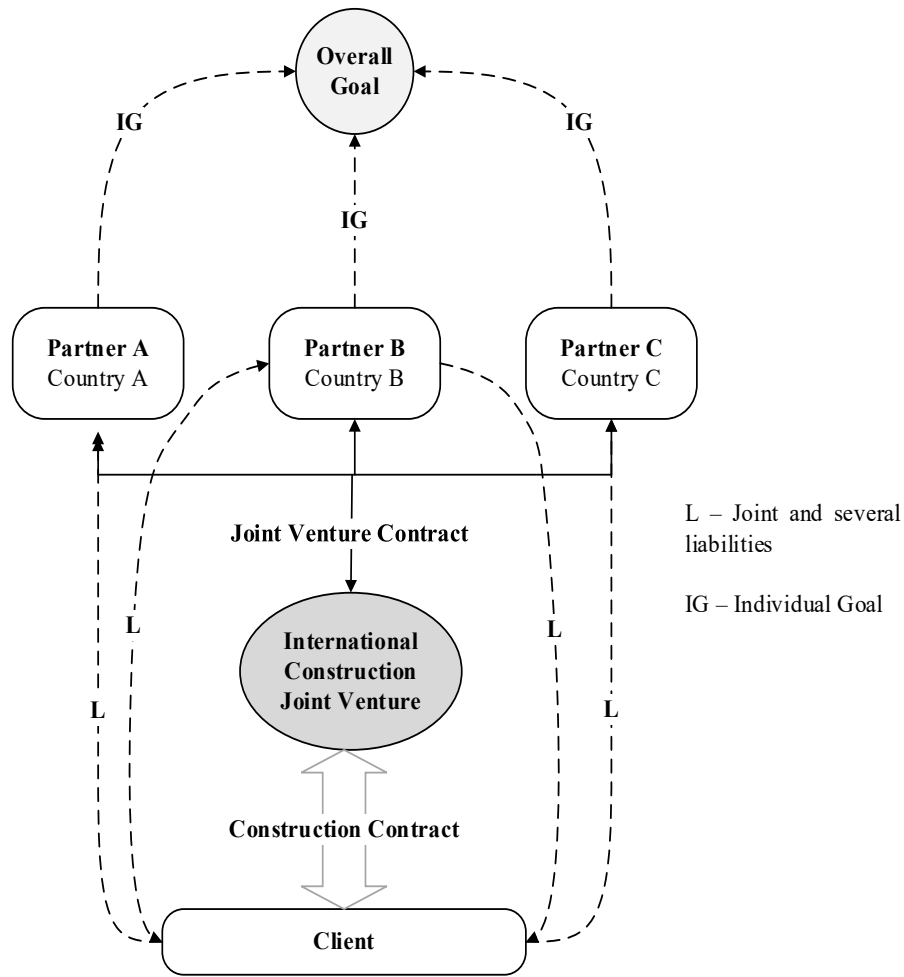
209 Sustainable development raises complex economic, social, and environmental issues, which  
210 often exceed the capacity of individual organizations or even national governments to solve them  
211 on their own (Fobbe, 2020). Collaboration has been promoted as a means of enabling participation  
212 to address the complex United Nations’ Sustainable Development Goals (SDGs) (Pot, 2020).  
213 Specifically, goal 17 highlights the need for coordinated efforts towards building and strengthening  
214 collaboration forms for global sustainable development. ICJVs provide a platform for

215 organizations to develop and build strength to achieve success in realizing the stipulated  
216 sustainable development goals of megaprojects (Brockmann and Brezinski, 2013). Cao and Zhang  
217 (2013) confirmed that the heart of collaboration arrangements is capacity building and knowledge  
218 transfer. Although the existing studies pursue generalization, the interest over ICJVs is unique as  
219 multiple performance goals hold (Ozorhon et al. 2010a). Abridged from a range of theoretical  
220 standpoints, including resource dependency, transaction cost, organizational learning, strategic  
221 positioning, relational based, etc., previous studies have highlighted the endless  
222 motivations/potential benefits driving the implementation of ICJVs (hereafter, drivers) (see, Table  
223 1). From the transaction cost perspective, firms can reduce transaction costs by obtaining more  
224 effective governance mechanisms (Klijn et al. 2014). IJV provides a platform for partners to learn  
225 from each other (Martin and Emptage, 2019). And through joint learning, partners can improve  
226 project performance (Ozorhon et al. 2007a; Lin and Ho, 2013), enhance IJV stability (Park et al.  
227 2011; West, 2014), overcome the lack of local/foreign knowledge of international firms (Dulaimi,  
228 2007), etc. The resource-based view suggests that cooperative partnerships are largely motivated  
229 by the difference in skill level, specialization, input, and urgency of meeting a common target  
230 (Tsang, 2000). From this theoretical standpoint, Girmscheid and Brockmann (2010) categorized  
231 ICJVs drivers into collective and individual drivers. Thus, parties can either pursue common or  
232 separate interests. Technology transfer, learning managerial skills, attracting capital investment,  
233 and the opportunity to work on large and complex projects constitute a key set of strategic drivers  
234 for implementing ICJVs by developing countries/jurisdictions (Devapriya and Ganesan, 2002;  
235 Panibratov, 2016). On the other hand, the key strategic drivers for developed  
236 countries/jurisdictions include faster entry into local markets, facilitating international expansion,  
237 and conforming to the host/local government policy (McIntosh and McCabe, 2003; Mohamed,  
238 2003). Also, in developed countries/jurisdictions, ICJV-implementation is often motivated by  
239 *guanxi* (relationship), a perfect quick fix to government-mandated barriers, and not necessarily by  
240 competency; the reverse is rather true in developing countries/jurisdictions. However, both  
241 developed and developing countries/jurisdictions jointly improve their competitive positions  
242 (Gunhan and Arditi, 2005), develop special knowledge and promoting diversification (Norwood  
243 and Mansfield, 1999), build reputation (Shen and Cheung, 2018), reduce, or share project risks  
244 (McIntosh and McCabe, 2003; Ozorhon et al. 2007b), etc. ICJVs offers a client-focused service  
245 package that meets the need of clients, bridging knowledge and expertise gaps, and discovering  
246 prospects which adds value to ventures organization (Walker and Johannes, 2003; Famakin et al.  
247 2012). The adoption of ICJVs completely transforms the industry structure and radically changes  
248 the way companies operate. Thus, making their operations more sustainable.

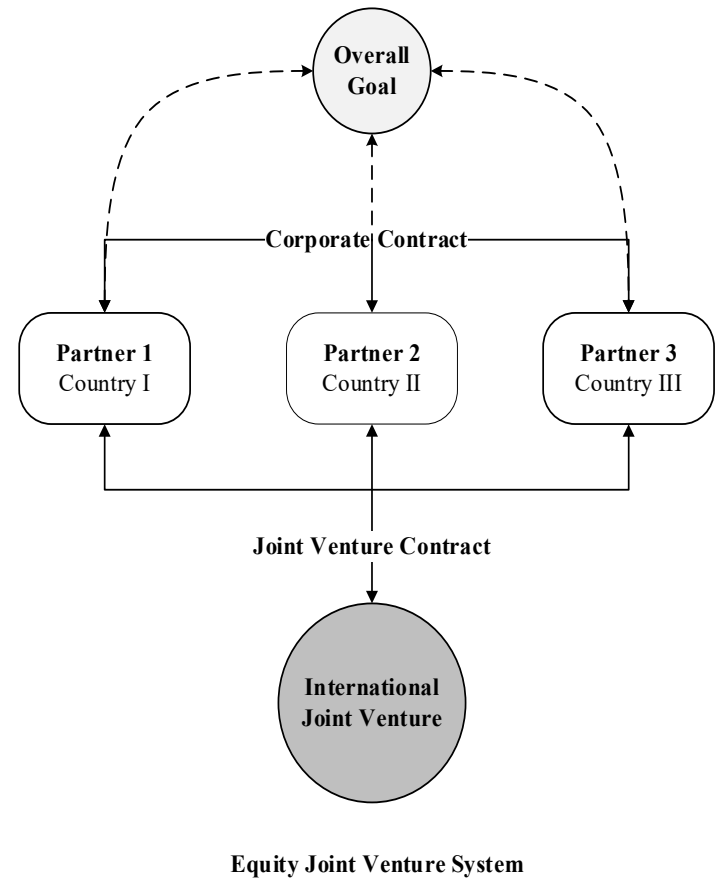
249 Contextually, there exists some varying importance of factors driving ICJVs adoption as Chan  
250 et al. (2020) argued. Previous studies have identified different drivers for implementing ICJVs, yet  
251 they shed little empirical investigation on the relative importance of these drivers between  
252 developed and developing countries/jurisdictions and focused on very few driving factors. While  
253 they remain fragmented and lack empirical justification, relevant publications were identified and  
254 extensively reviewed to ascertain only those drivers mentioned repeatedly in the literature.  
255 According to Chan et al. (2017), experts can respond well when they are familiar with the factors.  
256 Besides, it would have been impractical to incorporate all possible drivers for the study. Table 1

257 presents a summary of the possible drivers of ICJVs implementation extracted from the literature  
258 review.

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Construction Joint Venture System



Equity Joint Venture System

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Figure 1. Architecture of ICJVs and IJVs (Adapted from Girmscheid and Brockmann (2010) and Tetteh and Chan (2019))



304 **Table 1.** List of drivers of ICJVs implementation

Code	Drivers	References
d01	Reduce project risk/sharing of risks	McIntosh and McCabe (2003), Ozorhon et al. (2007b), Girmscheid and Brockmann (2010)
d02	Advance construction technology acquisition	Devapriya and Ganesan (2002), Abdul-Aziz and Cha (2008)
d03	Advancement in managerial skills	Sillars and Kangari (1997), Panibratov (2016)
d04	Improve quality level of projects	Lin and Ho (2013), Ho et al. (2009)
d05	Competition as driving force	Devapriya and Ganesan (2002), Gunhan and Arditi (2005)
d06	Economics of scale	Ozorhon et al. (2008), West (2014)
d07	Promotion of economic growth	Luo (2001), Hwang et al. (2017)
d08	Demand for value for money	Walker and Johannes (2003), Shen and Cheung (2018)
d09	Better execution of project	Zhao et al. (2013), Ozorhon et al. (2007a)
d10	Overcome cultural and political barriers	Carrillo (1996), Fisher and Ranasinghe (2001)
d11	Mode of foreign investment	Xu et al. (2005), Hwang et al. (2017)
d12	Enter new construction market	McIntosh and McCabe (2003), Mohamed (2003), Girmscheid and Brockmann (2010)
d13	Satisfaction of client requirement/achievement of pre-qualification conditions	Walker and Johannes (2003), Kumaraswamy and Shrestha (2002)
d14	Increase market share	Zhang and Zou (2007), West (2014)
d15	Increase productivity	Devapriya and Ganesan (2002), Ozorhon et al. (2007a)
d16	Diversification	Norwood and Mansfield (1999)
d17	Opportunity to work on large and complex projects	Zhao et al. (2013), Luo (2001)
d18	Ensure stability	Dulaimi (2007), Park et al. (2010), West (2014)
d19	Improve company's image	London and Siva, (2011), Shen and Cheung (2018)
d20	Attract capital investment	Luo et al. (2001), McIntosh and McCabe (2003)
d21	Growth in construction globalization	Sillars and Kangari (1997), Oswald et al. (2018)
d22	Social support	Aleshin, (2001), McIntosh and McCabe (2003)
d23	Competing interest of national development	Mohamed (2003)
d24	Increase efficiency	Kumaraswamy and Shrestha (2002)
d25	Improve track records	Carrillo (1996)
d26	Overcome the lack of local/foreign knowledge of international firms	Dulaimi (2007)
d27	Building reputation	Shen and Cheung (2018)
d28	Increase credibility	Shen and Cheung (2018)
d29	Promote industrial integration	Munns et al. (2000)
d30	Prevention of wholly own foreign companies	Mohamed (2003)

d31	Acquire new construction project	Sillars and Kangari (1997)
d32	Overcome environmental deficiencies	Panibratov (2016)
d33	Improve existing imperfect mechanism of the construction industry	Luo et al. (2001)
d34	Stimulate export-orienting contracting	Luo et al. (2001)

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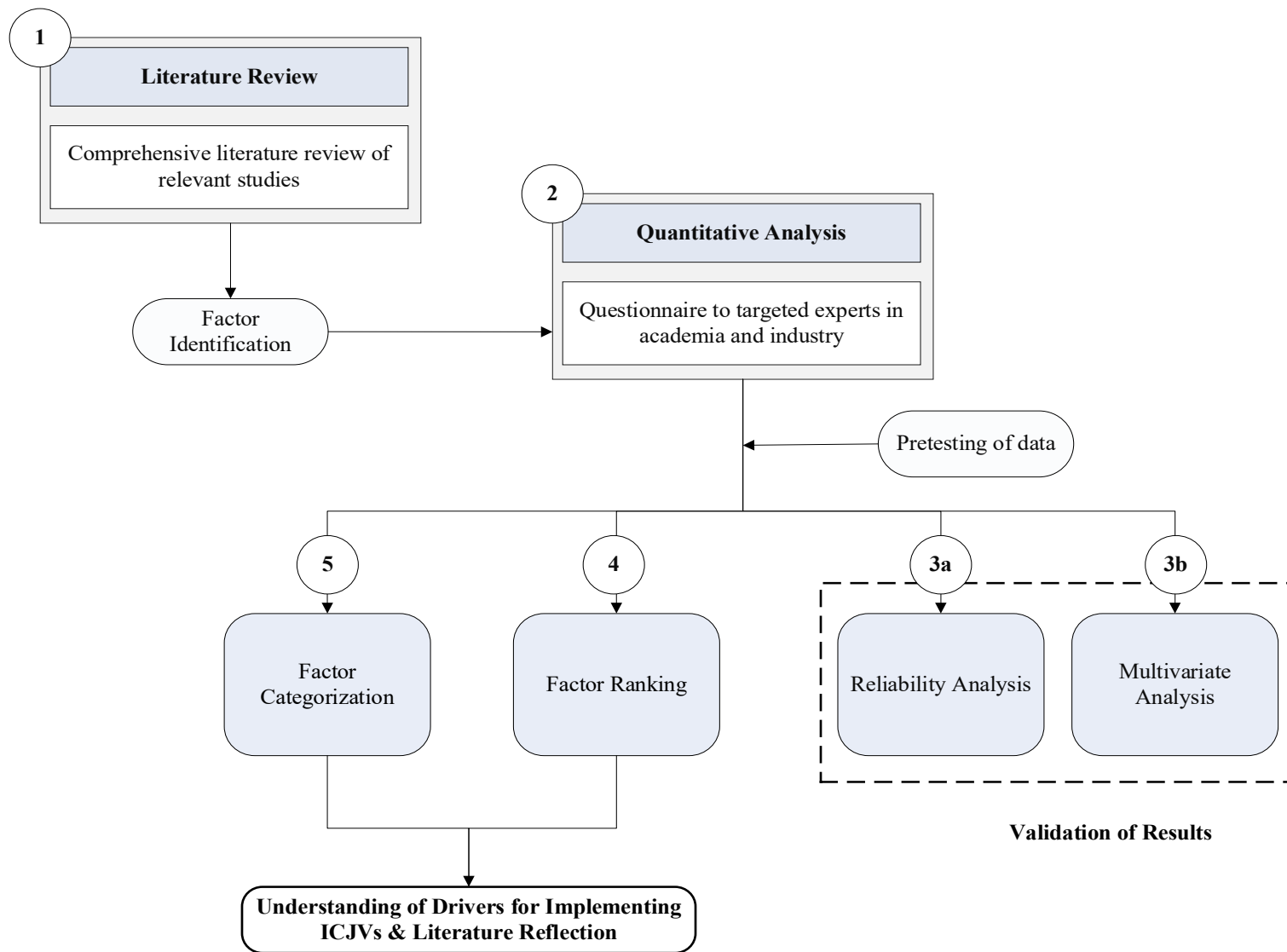
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### 3. Research methodological framework

To address the research problem, a systematic approach that incorporates a quantitative research design within a positivist paradigm wherein global experts' opinions formed the basis of assessing the major drivers for ICJVs implementation was adopted. The process involved the identification of factors via a comprehensive literature review, expert review, questionnaire design pre-testing, and administration, a multivariate analysis which includes descriptive means, normalization analysis, rank agreement analysis, and factor analysis. [Figure 2](#). Shows the methodological framework for this study.



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**Figure 2.** The methodological framework used in this study

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### 376 *3.1 Identification of ICJVs implementation drivers*

377

378 First, a search string was developed to aid the identification of relevant documents for this study.  
379 The search string used include but is not limited to international joint ventures, international  
380 construction joint ventures, construction joint ventures, etc. Note that for comprehensiveness and  
381 to reduce the possibility of ignoring relevant publications, there was no year limitation. Similarly,  
382 the term “international joint ventures” was used in the search string to identify relevant/related  
383 studies that focused on construction or infrastructure projects but did not use the key terms (i.e.  
384 ICJVs). For example, those studies used “international joint ventures in construction”,  
385 “international joint ventures in infrastructure projects”, etc. The Virtual Libraries (VL) of  
386 construction management (CM) journals were assessed directly to retrieve related publications.  
387 The top 60% CM journals according to Chau’s (1997) ranking list were considered – the leading  
388 12 CM journals. Multiple databases such as the Web of Science, Scopus, Engineering Village, etc.  
389 were also used to substantiate the search process. For the comprehensive details of the journal  
390 selection process including the exclusion and inclusion criteria, interested readers are referred to  
391 Chan et al. (2020). Afterward, a systematic literature review was conducted based on the selected  
392 publications to identify potential drivers for ICJVs implementation (see, [Table 1](#)). The drivers were  
393 extracted directly from tables, charts, figures, etc., and through a content analysis, open coding  
394 method, where the factors are not shown directly in tables and charts. This is where sections of the  
395 literature that focused on the drivers were first extracted, and the factors identified and regrouped  
396 based on their homogeneity or similarity in meaning ([Oppong et al. 2017](#)). Next, six experts were  
397 requested to review the list to verify their significance in driving ICJVs implementation. Among  
398 them were three academic experts and three joint venture managers who were on the Hong Kong-  
399 Zhuhai-Macau bridge construction. After this process, a final set of 34 ICJVs drivers was used for  
400 the survey.

401

### 402 *3.2 Questionnaire survey and experts’ participation*

403

404 To obtain objective and measurable outcomes, questionnaire survey was used as the data  
405 collection instrument. Besides, to cumulate the experiences and knowledge of global experts, a  
406 questionnaire survey is suitable. This allowed for data to be collected from 24 different  
407 countries/jurisdictions (including the US, Singapore, UK, Hong Kong, Ghana, Thailand, China,  
408 Nigeria, Germany, Canada, etc.) and ensured respondents’ anonymity. To investigate the key  
409 drivers for implementing ICJVs worldwide, the questionnaire consisted of two sections: the first  
410 section collected relevant background information of the experts, and the second section asked the  
411 experts to assert their professional views on the major drivers for the implementation ICJVs. A 7-  
412 point rating scale was used (1 = strongly disagree, 2 = disagree, 3 = disagree somewhat, 4 = neither  
413 agree nor disagree, 5 = agree somewhat, 6 = agree, and 7 = strongly agree). The scale has the  
414 advantages of providing respondents a comprehensive explanation to each driver in terms of  
415 evaluation, making the dataset suitable for robust statistical analysis, and reducing central tendency  
416 and leniency concerns in ordinal scales ([Chan and Tam, 2000, p. 429](#); [Ameyaw and Chan, 2015,](#)  
417 [p. 194](#)). To have a better understanding of the survey, a sample of the questionnaire is provided in

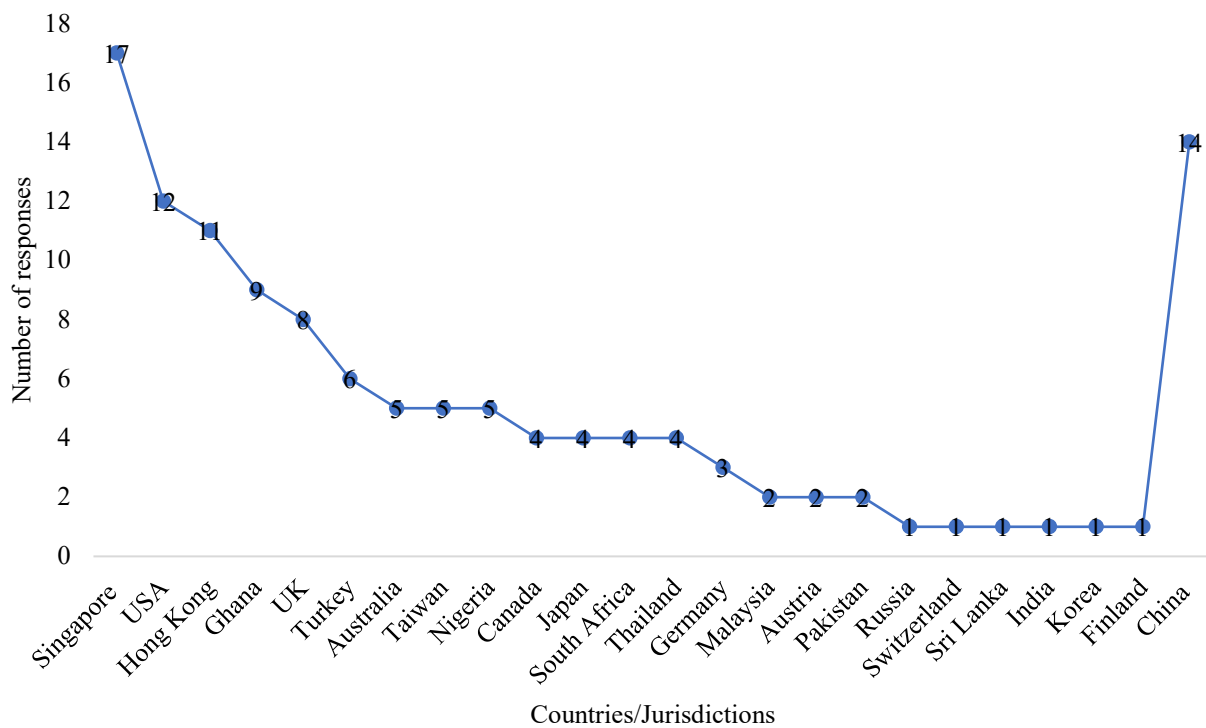
418 Appendix 1. Prior to the main data collection, a pilot study, a dress rehearsal of an actual study,  
419 was employed to test the comprehensiveness and relevance of the questionnaire (Darko et al.  
420 2017). The pilot study involved a team of two professors, a senior lecturer, and two postgraduate  
421 researchers who were experienced in this research area. They were asked to assess the  
422 questionnaire with regards to wording – technical language/term, answerability of questions, and  
423 whether any driver could be added to, or deleted from the survey. Their feedbacks confirmed the  
424 appropriateness of the question construction and the inclusion of all the potential drivers for  
425 implementing ICJVs.

426 The population of this study comprised all international experts (both academics and industry  
427 practitioners) with relevant practical knowledge and/or experience in ICJV implementation. An  
428 expert in this study represents someone qualified to hold a position or someone having unique  
429 expertise evident by his/her leadership in a professional organization or someone who has  
430 theoretical/research recognition that is evident by his/her publications in a reputable journal  
431 (Cabaniss, 2002). A nonprobability sampling technique, purposive sampling method, was used to  
432 select relevant experts for this study, as no central global database for ICJV experts (sampling  
433 frame) exists. Purposive sampling has been widely adopted for collecting data in the construction  
434 management domain due to the complexity of gathering a large number of data, and from multiple  
435 experts (Wuni and Shen, 2020). Academic experts were identified from peer-reviewed journal  
436 papers with titles and whole content explicitly containing terms that include but not limited to  
437 international construction joint ventures, construction joint ventures, and international joint  
438 ventures. The industry representatives were identified from construction industry institutes,  
439 international bodies, associations worldwide (such as Hong Kong Construction Association,  
440 Turkish Construction Association, etc.), and lists obtained through government agencies such as  
441 Ghana Investment Promotion Centre. Experts were only eligible if: (1) they had research  
442 experience and theoretically verse in ICJV implementation, (2) they had sufficient direct hands-  
443 on ICJV implementation worldwide, and (3) they had been involved in at least one implementation  
444 of ICJV project. Personalized emails were sent to each of them, attaching a Microsoft *Word* file,  
445 and providing a web link to facilitate online responses. To enhance the response rate, six months  
446 were used for data collection, which includes multiple rounds of reminders. Also, in a humble  
447 appeal, respondents were asked to forward the questionnaire and weblink to other experts  
448 knowledgeable in the area under discussion (Adabre et al. 2020). Approximately 300  
449 questionnaires were distributed. Due to several constraints such as the busy schedule of experts,  
450 123 valid responses were gathered worldwide, which is made up of 65 and 58 responses from  
451 developed and developing countries/jurisdictions, respectively. Figure 3 shows the responses  
452 obtained from the 24 countries/jurisdictions. This response rate compares favorably with similar  
453 international surveys in the construction management domain. For example, Darko et al. (2017)  
454 identified the major drivers for implementing green building technologies using 104 expert  
455 responses from 20 different countries. Wuni and Shen (2020) evaluated the potential factors for  
456 MiC projects with 56 international experts from 18 different countries. Likewise, Adabre et al.  
457 (2020) identified critical barriers to sustainable affordable housing from an international  
458 perspective using 51 experts from 18 countries Equally, this satisfies the central limit (minimum  
459 sample size of 30) of any group as recommended by Sproull (1995) and Ott and Longnecker,  
460 (2015).

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### 3.3 Experts' composition

Table 3 presents the demographics of the respondents. Overall, experts from the academic sector constitute approximately 57%, and 43% are industry practitioners. Among them, in the academic sector, about 65% and 48% are from developed and developing countries/jurisdictions, respectively. Likewise, 34% constitute industry practitioners from developed countries/jurisdictions and 52% from developing countries/jurisdictions. The experts have specialties in areas including architecture, quantity surveying, project management, and engineering, which account for about 84%. Most of the experts had between 5-10 years (38.2%) and over 20 years (35.8%) of experience in ICJV either by research and/or industry experience; only a few (9.8%) had less than 5 years of experience. Also, more than half of the experts (54.5%) have been involved in 3 ICJV projects, and 20.3% have been involved in more than 5 ICJV projects. These varied outlooks of experiences from both developed and developing countries blend well to produce more reliable and accurate data.



478 **Figure 3.** Responses from various countries/jurisdictions

479  
 480 **Table 2.** Respondents' profile

s/n	Category	Overall		Developed countries		Developing countries	
		Number of respondents	Percentage (%)	Number of respondents	Percentage (%)	Number of respondents	Percentage (%)
RP							

1.1	Academia/research institute	70	56.9	42	64.6	28	48.3
1.2	Industry practitioner	53	43.1	23	35.4	30	51.7
	Total	123	100.0	65	100.0	58	100.0
				RS			
2.1	Architect	20	16.3	13	20.0	7	12.1
2.2	Project/construction manager	20	16.3	10	15.4	10	17.1
2.3	Engineer	31	25.2	22	33.8	9	15.5
2.4	Quantity surveyor	32	26.0	9	13.8	23	39.7
2.5	Researcher	12	9.7	10	15.4	2	3.5
2.6	Others	8	6.5	1	1.5	7	12.1
	Total	123	100.0	65	100.0	58	100.0
				WE			
3.1	< 5 years	12	9.8	5	7.7	7	12.6
3.2	5-10 years	47	38.2	24	36.9	23	39.7
3.3	11-15 years	10	8.1	6	9.2	4	6.9
3.4	16-20 years	10	8.1	7	10.8	3	5.2
3.5	>20 years	44	35.8	23	35.8	21	36.2
	Total	123	100.0	65	100.0	58	100.0
				PI			
4.1	1	8	6.5	3	4.6	5	8.6
4.2	2	11	8.9	8	12.3	3	5.2
4.3	3	67	54.5	33	50.8	34	58.6
4.4	4	12	9.8	7	10.8	5	8.6
4.5	5 or more	25	20.3	14	21.5	11	19.0
	Total	123	100.0	65	100.0	58	100.0

Note: RP = Respondents' Position; RS = Respondents' Specialties; WE = Working Experience; PI = Projects Involved

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#### 482 4. Data analysis

483

484 *IBM\_SPSS v.25* was used to analyze the collected data. As indicated in the methodological  
485 framework, before the main analysis, pretesting of the dataset was first achieved. Cronbach's alpha  
486 coefficient ( $\alpha$ ) was used to investigate the internal consistency of the drivers. Thus, how closely  
487 related a set of survey items are as a group. While values ranging from 0.7-0.8 and above 0.8 show  
488 an acceptable and excellent internal consistency, respectively (Fornell and Larcker, 1981), the  
489 alpha values of the overall and respective groups are excellent (i.e., overall = 0.837; developed =  
490 0.892; and developing = 0.793). The Shapiro-Wilk test was conducted to determine the data  
491 normality, and this supported the use of a nonparametric test such as the Mann-Whitney *U* test.  
492 Mean score (MS), standard deviation (SD), normalization analysis, rank agreement analysis, and  
493 factor analysis were used to analyze the data. The combination of MS and normalization analysis  
494 helped in assessing the key drivers within the two contexts. For instance, drivers having  
495 normalization values  $\geq 0.50$  were considered significant to drive the implementation of ICJVs. The  
496 SD provides a sign of how divergent the scores are. Thus, it indicates how dissimilar the scores  
497 are among the respondents in rating the drivers. A low SD shows that respondents agreed on the  
498 importance of the factors, and vice versa. Therefore, factors with low SD were ranked higher in  
499 that order wherein factors have equal means. Although different drivers may have varied  
500 significant rates, they are not isolated but rather form a multifaceted correlation in driving ICJVs  
501 implementation. Therefore, factor analysis (FA) was used to group the drivers into underlying



502 components for better understanding. Results from the FA were later analyzed using rank  
503 agreement analysis, to investigate the consensus between experts from developing and developed  
504 countries/jurisdictions on their ranking regarding the key drivers based on the mean values in a  
505 particular group.

506

#### 507 *4.1 Mann-Whitney U test*

508

509 As a rank-based nonparametric test, the Mann-Whitney *U* test has been used to determine any  
510 divergence of ranking of ICJVs implementation drivers by the experts due to their varied  
511 experience and specialties. According to [Darko et al. \(2017\)](#), it has the power of examining  
512 dissimilarities between any two independent groups providing their opinion on any continuous  
513 variable. With this analysis, the scores are given by the experts (any two groups) on each  
514 continuous measure are converted to ranks, and then determine whether the ranks for the two  
515 groups are different or not. Using the Mann-Whitney *U* test, the *H0* is that "*there are no significant*  
516 *disparities amongst the two experts (academics and industry practitioners)*". The *H0* can, therefore,  
517 be rejected if the significant level (*p*) is greater than 0.05. [Table 3](#) shows that there is no statistically  
518 significant divergence in the ranking of the drivers by the experts. All the *p* values of each driver  
519 (d01-d34) are less than 0.05, thus negligible. This confirms the practical nature of ICJV application  
520 and practical translation of ICJV research for continuous development and implementation.

521

#### 522 *4.2 Factor analysis (FA)*

523

524 FA is used to reveal correlations between multiple factors, which are commonly defined as  
525 factors ([Viswanathan and Jha, 2019](#)). Thus, it is used to identify a relatively small number of factor  
526 groupings that best represent the structure of relationships among a larger set of interrelated  
527 variables ([Olawumi and Chan, 2019](#)). FA is widely acknowledged in the literature as a powerful  
528 method for regrouping and reducing a large number of variables to a smaller and more critical set  
529 ([Chong and Zin, 2012](#); [Viswanathan and Jha, 2020](#)). Besides, with the rapid increase of studies  
530 using intensive longitudinal designs, FA will continue to play a central role in contemporary  
531 research especially in the construction management field. FA was employed in this study to cluster  
532 critical drivers (factors) having the same underlying effect into a single component for better  
533 understanding. Thus, drivers explaining similar correlation trends are categorized into smaller and  
534 relevant sizes contingent on the respondents' grades ([Li et al. 2011](#)). Using FA, while factor  
535 extraction and rotation are considered critical, the suitability of the data was also evaluated. The  
536 Kaiser-Meyer-Olkin (KMO) – a measure of sampling adequacy and Bartlett's test of sphericity –  
537 variance homogeneity, were used. The KMO ranges from 0-1, with 0.5 considered fitting for FA,  
538 and a larger Bartlett's test of sphericity with a corresponding lower significance level is excellent  
539 ([Owusu and Chan, 2019](#)). A reliable KMO of 0.821 and a large value of Bartlett's test of sphericity  
540 (2940.148), with a low level of significance, was obtained (see, [Table 4](#)). It is important to mention  
541 that since the results from the Mann-Whitney *U* test revealed no significant disparities between  
542 the experts in the two contexts, the drivers were treated holistically for FA, and only the driving  
543 factors with normalized values  $\geq 0.50$  were deemed significant.

544

#### 545 4.3 Ranking agreement analysis on the drivers for ICJVs implementation

546

547 The rank agreement analysis is used to cross-compare the relative importance of factors as rated  
548 by different groups (Okpala and Aniekwu, 1988). It is suitable when measuring the agreement  
549 level in terms of ranking of multiple variables between two different groups (Adabre et al. 2019),  
550 and it is leverage upon in this study because it is not dependent on the sample size nor the scale of  
551 the data. Besides, it requires no critical assumptions and easy to comprehend the statistical rigor  
552 and strength of consensus among the different groups in question. Zhang (2005) used this method  
553 to determine the agreement level among industry practitioners and academic professionals on  
554 critical success factors for public-private partnerships in infrastructure development. Recently,  
555 Adabre et al. (2020) employed this analysis to analyze experts' views on the ranking of critical  
556 barriers to sustainable affordable housing between developed and developing countries.

557 The agreement analysis has been used in this study to investigate the agreement level on the  
558 ranking of the major drivers between experts from developing and developed  
559 countries/jurisdictions. The rank agreement analysis uses the "rank agreement factor" RAF, which  
560 shows the average absolute difference in the ranking of the factors between the two groups (Zhang,  
561 2005). The higher the value of RAF, the lower agreement between the two groups. Thus, a RAF  
562 of zero is an indication of perfect agreement. Given the two groups of experts defined as group  
563 one and group two representing those from developed and developing countries/jurisdictions,  
564 respectively; let the rank of a driver within the construct of group one be  $R_{i1}$  and in group two be  
565  $R_{i2}$  and  $N$  be the number of drivers and  $j = N - i + 1$ . Therefore,  $(R_{i1} - R_{i1})$  of a driver denotes the  
566 difference in ranks obtained by the two groups.  $R_i$  of a driver represents the sum of the ranks of  
567 the driver from developed and developing countries/jurisdictions. According to Okpala and  
568 Aniekwu, (1988), the RAF is defined as:

$$569 R_i = \sum_{i=1}^N R_{ij} \quad (1)$$

570  $R_{ij}$  represents the total ranks given to a driver by the two distinctive groups.

571 The mean value of the total ranks ( $R_{j2}$ ) is given by

$$572 R_{j2} = \frac{1}{N} \sum_{i=1}^N R_{ij} \quad (2)$$

573 The RAF is defined as

$$574 \text{RAF} = \frac{\sum_{i=1}^N |R_{i1} - R_{i2}|}{N} \quad (3)$$

575 Maximum rank agreement factor ( $\text{RAF}_{\max}$ ) is equal to

$$576 \text{RAF}_{\max} = \frac{\sum_{i=1}^N |R_{i1} - R_{i2}|}{N} \quad (4)$$

577 Percentage disagreement (PD) is equal to

$$578 \text{PD} = \frac{\sum_{i=1}^N |R_{i1} - R_{i2}|}{\sum_{i=1}^N |R_{i1} + R_{i2}|} \times 100 \quad (5)$$

579 Percentage agreement (PA) is equal to

$$580 \text{PA} = 100 - \text{PD} \quad (6)$$

581

## 582 5. Results and discussion

583

### 584 5.1 Ranking analysis results

585

586 **Table 3** presents the driving factors ranked according to the MS value, SD, and normalization  
587 scores, and computed for responses from the overall, developed, and developing  
588 countries/jurisdictions. Overall, based on the normalization scores (NS) ( $\geq 0.05$ ), 26 drivers are  
589 significant for the implementation of ICJVs. The top five key drivers for implementing ICJVs  
590 include: d21 – growth in construction globalization (MS = 5.98 and NS = 1.00) ranked first,  
591 followed by d26 – overcome the lack of local/foreign knowledge of international firms (MS = 5.98  
592 and NS = 1.00) ranked second. Note that factors with low SD are ranked higher, wherein factors  
593 have equal means. The third significant factor is d17 – opportunity to work on large and complex  
594 projects (MS = 5.94 and NS = 0.98), d03 – advancement in managerial skills (MS = 5.83 and NS  
595 = 0.92) ranked fourth, and d23 – competing interest of national development (MS = 5.76 and NS  
596 = 0.88) ranked fifth. Extrapolation from these top five major factors driving the implementation  
597 of ICJVs implies that ICJVs evolved as a strategic approach to foster national growth and  
598 knowledge accumulation. ICJVs offer unique opportunities to develop and build strength amidst  
599 the global construction market goals – SDGs. In the construction environment, meeting the SDGs  
600 such as zero pollution, zero waste, and zero injuries are difficult for a single firm to pursue,  
601 particularly for megaprojects and in areas where legislation and enforcement are wanting ([Florini  
602 and Pauli, 2018](#)). Besides, the high capital investments and high-tech involved force organizations  
603 or even national governments to scale up initiatives and accelerate progress towards achieving  
604 these goals. ICJVs have emerged to improve this value proposition of growth in the global  
605 construction market. The direct impact of growth in the global construction market can be seen in  
606 areas such as better safety performance, efficient resource utilization, integrated solutions of  
607 efficiency improvement, etc. ([Ning, 2014](#)). According to [Stanitsas et al. \(2020\)](#), sustainability in  
608 the construction environment is about achieving a win-win outcome for contributing to the  
609 improved environment and the advanced society, and at the same time for gaining competitive  
610 advantages and economic benefits for construction companies. One of the main reasons for  
611 implementing ICJVs is to make transition and operation in new markets easier and successful,  
612 respectively. ICJV helps corporate firms to harness the knowledge and competencies of  
613 international professionals to expand their capacities in taking advantage of the inherent synergies  
614 between sustainable building and constructability practices. For example, local partners always  
615 assist in the construction permit process and the adherence to the building regulations and provide  
616 valuable insights into the local market, including the availability of labour and information about  
617 their competitors ([Badger and Mulligan, 1995](#)). To achieve truly outstanding project outcomes of  
618 reducing project costs and construction time while still maintaining high-quality final products in  
619 local/foreign markets, the adoption of ICJVs is critical ([Famakin et al. 2012](#)). The primary function  
620 of ICJVs is promoting growth as mentioned earlier and, this lies in improving organizations’  
621 capacity and facilitating social development. Firms have been continuously utilizing this  
622 contracting form as they consider it inevitable ([Badger and Mulligan, 1995](#); [Gale and Luo, 2004](#)).  
623 Aside from the top five driving factors, d29 – promote industrial integration (MS = 5.73 and NS =  
624 0.87, ranked 6) is also considered a great motivation to drive ICJVs implementation. The fusing  
625 of multinational construction firms in pursuit of a common goal promotes networking  
626 opportunities and trust ([Munns et al. 2000](#)), which incentivizes firms to combine forces again when

627 the need arises. In Turkey, for example, [Ozorhon et al. \(2010\)](#) ascertained that harmonious  
628 industrial integration is the main driver for implementing ICJVs.

629 In developed countries/jurisdictions; 26 drivers appeared significant in driving ICJVs  
630 implementation. However, the top (five) major drivers are: d10 – overcome cultural and political  
631 barriers (MS = 6.23 and NS = 1.00, ranked first), followed by d01 – reduce project risk/sharing of  
632 risks (MS = 6.18 and NS = 0.98) ranked second, d26 – overcome the lack of local/foreign  
633 knowledge of international firms (MS = 5.98 and NS = 1.00) ranked third, d21 - growth in  
634 construction globalization (MS = 5.98 and NS = 1.00) ranked fourth, and d24 – Increase efficiency  
635 (MS = 6.05 and NS = 0.94) ranked fifth. Within this context, experts’ rankings (leading) drivers  
636 are concerned largely with market defense. The uncertainties in overseas markets affect business  
637 climate and harm project implementation, exposing international firms to losses that are not  
638 common in domestic markets ([Xiaopeng and Pheng, 2013](#)). ICJVs allow firms to operate in  
639 overseas markets while sharing risks with other firms. ICJVs help to alleviate the uncertainty of  
640 changes inherent in a foreign environment (e.g., unstable government policies, socio-cultural gaps,  
641 etc.). The utilization of local knowledge and expertise will minimize the foreign partner’s risk by  
642 working through the local bureaucracy, assisting custom clearance, obtaining payments, certifying  
643 work, understanding of the contract with government and industry, and assessing the local labour  
644 markets. More so, as the local partners are already established and understand the local labour  
645 market, negotiating for lower labour cost and benefit are easy ([Barringer and Harrison, 2000](#)). The  
646 least ranked driver among the key drivers is d03 – advancement in managerial skills (MS = 5.83  
647 and NS = 0.92, ranked 26). This finding is consistent with the view that developed  
648 countries/jurisdictions genuinely do not view ICJVs as a reliable source of knowledge – especially  
649 those relating to technology and management, but rather to conform to government policies as well  
650 as hedging potential uncertainties and challenges. ([Barringer and Harrison, 2000](#); [Girmscheid and  
651 Brockmann, 2010](#)).

652 In developing countries/jurisdictions, from the views of experts, 31 significant drivers were  
653 identified. The top five drivers include: d13 – satisfaction of client requirement/achievement of  
654 pre-qualification conditions (MS = 6.36 and NS = 1.00) ranked first, and the second-ranked driver  
655 is d03 – advancement in managerial skills (MS = 5.83 and NS = 0.92), followed by d22 – social  
656 support (NS = 6.10 and NS = 0.90, ranked third), d09 – better execution of project (NS = 6.02 and  
657 NS = 0.87, ranked fourth), and d18 – ensure stability (MS = 6.00 and NS = 0.86) ranked fifth. This  
658 hybrid contracting form is seen as a precondition for specific projects in many developing  
659 countries/jurisdictions. According to [Tetteh and Chan \(2019\)](#), satisfying managerial and  
660 technological gaps and efficiently deliver complex projects in developing countries necessitate  
661 ICJVs adoption. Therefore, ICJVs are formed to satisfy the bidding standards for some specific  
662 projects ([Kumaraswamy and Shrestha, 2002](#); [Walker and Johannes 2003](#)). Developing countries  
663 seek to gain a competitive advantage in the global construction market by acquiring new  
664 technology, absorbing new knowledge, and supporting innovation to help transform and advance  
665 their capabilities ([Martin and Emptage, 2019](#)). They mentioned that ICJVs are the key to Chinese  
666 firms’ success, resulting in one of the fastest rates (8%) of global economic growths per year since  
667 1979. This supports the assertion that organization’s ability to develop, search for, and exploit  
668 capabilities that they currently do not have is important.

669 In general, while the existing literature gives little empirical account of drivers for  
670 implementing ICJVs, the findings support academic attention stressing that efficiency, knowledge  
671 acquisition, and growth are important rationales for ICJVs formation (Park et al. 2011; Panibratov,  
672 2016). More so, it is surprising that sharing of risks and costs did not come through as a key driver  
673 for implementing ICJVs as stressed in previous studies (Munns et al. 2000; McIntosh and McCabe,  
674 2003; Odediran and Windapo, 2017). Although it was ranked second in the developed  
675 country/jurisdiction's context, interesting pattern of combination of more significant drivers  
676 critical to advancing ICJV adoption and implementation success emerged. More so, in a departure  
677 from previous studies which often assume a single driver for ICJVs this study showed that the  
678 relative importance of factors driving ICJVs adoption varies significantly between developed and  
679 developing countries/jurisdictions. It is, thus, observed in this study that most strategic motivations  
680 in developed countries/jurisdictions are concerned largely with fundamental strategic positioning  
681 concerns and not to do more with operational concerns; the reverse is rather true in the developing  
682 countries/jurisdictions.

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711 **Table 3.** Descriptive and Mann-Whitney *U* test statistics on the drivers for implementing ICJVs

Code	Overall					Developed countries/Jurisdictions				Developing countries/Jurisdictions				Mann-Whitney <i>U</i> test statistics			
	Mean	SD	<i>p</i> -value	Rank	<i>N</i> -value	Mean	SD	Rank	<i>N</i> -value	Mean	SD	Rank	<i>N</i> -value	<i>U</i> stat	<i>W</i>	<i>Z</i>	<i>p</i> -value
d01	5.69 <sup>a</sup>	1.16	0.000	10	0.85 <sup>b</sup>	6.18	1.014	2	0.98 <sup>b</sup>	5.91	0.978	8	0.83 <sup>b</sup>	1144.000	2855.000	-3.932	0.000 <sup>b</sup>
d02	5.57	1.07	0.000	13	0.79 <sup>b</sup>	3.20	0.666	29	0.00	5.59 <sup>a</sup>	0.650	21	0.70 <sup>b</sup>	1255.000	2966.000	-3.535	0.000 <sup>b</sup>
d03	5.83	0.81	0.000	4	0.92 <sup>b</sup>	4.86	0.704	26	0.55 <sup>b</sup>	6.21	0.669	2	0.94 <sup>b</sup>	1060.000	3205.000	-4.559	0.000 <sup>b</sup>
d04	5.56 <sup>a</sup>	0.99	0.000	15	0.78 <sup>b</sup>	5.23	1.101	20	0.67 <sup>b</sup>	5.93 <sup>a</sup>	0.672	7	0.83 <sup>b</sup>	1220.500	3365.500	-3.885	0.000 <sup>b</sup>
d05	4.07	1.31	0.000	34	0.00	5.02	0.625	24	0.60 <sup>b</sup>	5.62	0.791	19	0.72 <sup>b</sup>	920.000	3065.000	-5.000	0.000 <sup>b</sup>
d06	4.61	1.17	0.000	33	0.28	4.26	0.889	33	0.35	5.55	0.730	22	0.69 <sup>b</sup>	1102.500	3481.500	-2.617	0.007 <sup>b</sup>
d07	4.76	1.10	0.000	31	0.36	5.12	0.992	22	0.63 <sup>b</sup>	5.76	0.733	14	0.77 <sup>b</sup>	1155.000	3300.000	-3.944	0.000 <sup>b</sup>
d08	4.87	0.77	0.000	30	0.42	4.48	0.503	30	0.42	4.86	0.805	32	0.42	737.000	2882.000	-6.437	0.000 <sup>b</sup>
d09	5.02	1.10	0.000	28	0.50 <sup>b</sup>	6.02	0.739	6	0.93 <sup>b</sup>	6.02	0.513	4	0.87 <sup>b</sup>	1391.500	3536.500	-2.647	0.008 <sup>b</sup>
d10	5.54	0.98	0.000	14	0.77 <sup>b</sup>	6.23	0.745	1	1.00 <sup>b</sup>	4.53	1.012	33	0.30	1327.000	3472.000	-3.028	0.002 <sup>b</sup>
d11	5.05	0.82	0.000	25	0.50 <sup>b</sup>	4.80	0.666	27	0.53 <sup>b</sup>	5.40	0.560	27	0.63 <sup>b</sup>	1224.500	3369.500	-3.661	0.000 <sup>b</sup>
d12	5.69 <sup>a</sup>	0.71	0.000	9	0.85 <sup>b</sup>	5.78	0.820	10	0.85 <sup>b</sup>	3.76	0.657	34	0.00	1187.000	3298.000	-4.697	0.000 <sup>b</sup>
d13	5.56	1.15	0.000	16	0.78 <sup>b</sup>	5.49 <sup>a</sup>	0.640	12	0.76 <sup>b</sup>	6.36	0.693	1	1.00 <sup>b</sup>	457.500	2602.500	-7.488	0.000 <sup>b</sup>
d14	5.04	0.94	0.000	26	0.51 <sup>b</sup>	5.05	0.891	23	0.61 <sup>b</sup>	5.22	0.460	31	0.56 <sup>b</sup>	1029.000	3994.000	-3.195	0.005 <sup>b</sup>
d15	5.45	0.77	0.000	18	0.72 <sup>b</sup>	5.37 <sup>a</sup>	0.698	16	0.72 <sup>b</sup>	5.53	0.842	23	0.68 <sup>b</sup>	1113.000	3908.000	-2.688	0.012 <sup>b</sup>
d16	5.00	1.15	0.000	27	0.49	4.60	0.981	28	0.46	5.88 <sup>a</sup>	0.860	11	0.82 <sup>b</sup>	725.500	2870.500	-6.087	0.000 <sup>b</sup>
d17	5.94	0.76	0.000	3	0.98 <sup>b</sup>	5.49 <sup>a</sup>	0.732	13	0.76 <sup>b</sup>	5.93 <sup>a</sup>	0.525	6	0.83 <sup>b</sup>	1430.000	3575.000	-2.464	0.014 <sup>b</sup>
d18	4.90	1.00	0.000	29	0.43	5.17	0.720	21	0.65 <sup>b</sup>	6.00	0.701	5	0.86 <sup>b</sup>	934.000	3079.000	-5.308	0.000 <sup>b</sup>
d19	5.72	0.63	0.000	7	0.86 <sup>b</sup>	5.98	0.599	7	0.92 <sup>b</sup>	5.67	0.711	18	0.73 <sup>b</sup>	1022.500	2733.500	-4.888	0.000 <sup>b</sup>
d20	5.63	0.74	0.000	12	0.81 <sup>b</sup>	5.35 <sup>a</sup>	1.052	19	0.71 <sup>b</sup>	5.88 <sup>a</sup>	0.462	10	0.82 <sup>b</sup>	886.500	3031.500	-5.624	0.000 <sup>b</sup>
d21	5.98 <sup>a</sup>	0.57	0.000	1	1.00 <sup>b</sup>	6.06	0.659	4	0.94 <sup>b</sup>	5.88 <sup>a</sup>	0.422	9	0.82 <sup>b</sup>	1201.500	3312.500	-3.750	0.010 <sup>b</sup>
d22	5.65	0.91	0.000	11	0.83 <sup>b</sup>	5.48	0.773	15	0.75 <sup>b</sup>	6.10	0.742	3	0.90 <sup>b</sup>	1307.500	3452.500	-3.216	0.001 <sup>b</sup>
d23	5.76	0.61	0.000	5	0.88 <sup>b</sup>	5.91	0.655	8	0.89 <sup>b</sup>	5.33	0.711	29	0.60 <sup>b</sup>	1411.000	3122.000	-2.737	0.006 <sup>b</sup>
d24	5.19	0.87	0.000	22	0.59 <sup>b</sup>	6.05	1.082	5	0.94 <sup>b</sup>	5.48	0.628	24	0.66 <sup>b</sup>	1384.500	3529.500	-2.772	0.006 <sup>b</sup>
d25	5.18	0.97	0.000	23	0.58 <sup>b</sup>	4.58	0.864	29	0.46	5.38	0.644	28	0.62 <sup>b</sup>	1459.000	3604.000	-2.453	0.014 <sup>b</sup>
d26	5.98 <sup>a</sup>	0.89	0.000	2	1.00 <sup>b</sup>	6.11	1.134	3	0.96 <sup>b</sup>	5.83	0.464	13	0.80 <sup>b</sup>	1292.000	3003.000	-3.237	0.001 <sup>b</sup>
d27	5.43	0.94	0.000	19	0.71 <sup>b</sup>	5.49 <sup>a</sup>	0.831	14	0.76 <sup>b</sup>	5.31	0.627	30	0.60 <sup>b</sup>	1128.000	2839.000	-4.171	0.000 <sup>b</sup>
d28	5.71	0.57	0.000	8	0.86 <sup>b</sup>	5.82	0.788	9	0.77 <sup>b</sup>	5.41	0.563	26	0.63 <sup>b</sup>	805.000	2516.000	-6.326	0.000 <sup>b</sup>
d29	5.73	0.69	0.000	6	0.87 <sup>b</sup>	5.37 <sup>a</sup>	0.720	17	0.72 <sup>b</sup>	5.45	0.680	25	0.65 <sup>b</sup>	1090.000	2801.000	-4.436	0.000 <sup>b</sup>

d30	5.39	0.57	0.000	20	0.69 <sup>b</sup>	4.05	1.316	34	0.28	5.69 <sup>a</sup>	0.799	17	0.74 <sup>b</sup>	1010.000	3321.000	-2.607	0.008 <sup>b</sup>
d31	5.50	0.84	0.000	17	0.75 <sup>b</sup>	5.35 <sup>a</sup>	0.975	18	0.71 <sup>b</sup>	5.71	0.622	15	0.75 <sup>b</sup>	1454.500	3599.500	-2.395	0.017 <sup>b</sup>
d32	5.28	0.74	0.000	21	0.63 <sup>b</sup>	4.92	0.568	25	0.57 <sup>b</sup>	5.69 <sup>a</sup>	0.706	16	0.74 <sup>b</sup>	876.000	3021.000	-5.727	0.000 <sup>b</sup>
d33	5.08	1.37	0.000	24	0.53 <sup>b</sup>	4.45 <sup>a</sup>	1.469	32	0.41	5.86	0.576	12	0.81 <sup>b</sup>	1337.500	3482.500	-3.164	0.002 <sup>b</sup>
d34	4.68	1.10	0.000	32	0.32	4.45 <sup>a</sup>	0.811	31	0.41	5.59 <sup>a</sup>	0.497	20	0.70 <sup>b</sup>	248.000	2393.000	-8.591	0.000 <sup>b</sup>

Note: Overall Cronbach's alpha = 0.837; Developed countries = 0.892; Developing country = 0.793; Normalization (*N*) value = (actual mean-minimum mean) / (maximum mean-minimum mean); SD = standard deviation; Grouping variable = developed and developing countries/jurisdictions; *W* = Wilcoxon *W*; and *MWU* = Mann-Whitney *U* at significant level of 0.05.

<sup>a</sup>Represents equal mean, wherein factors with low SD are ranked higher in that order

<sup>b</sup>Significant *p*-values and *N*-values

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## 734 5.2 Factor analysis (FA) results

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736 The drivers deemed significant from the overall view were considered for the FA. Therefore,  
737 26 drivers formed the basis of the FA as shown in Table 4. Satisfying all prerequisite conditions  
738 as mentioned earlier, six components were extracted employing the principal component analysis  
739 and varimax with Kaiser normalization as the factor extraction method due to the exploratory  
740 nature of this study. Conservatively, this study adheres to the 0.5 cut-off line (i.e., variables with  
741 factor loadings below the lower limit) established in the relevant literature (Adabre et al. 2020).  
742 The six components explain nearly 67% of the total variance, which is unquestionably higher than  
743 the minimum threshold of 60 and 65% as emphasized by Wuni and Shen (2020). The naming of  
744 factors was done using the common themes that run through the variables approach (Owusu et al.  
745 2019; Adabre et al. 2019). Moreover, in a situation where no common theme exists, the naming  
746 was done using a combined theme of the variables with the maximum factor loadings (Zhang et  
747 al. 2017). The naming of the six factors followed these two naming techniques. An in-depth  
748 discussion of the components follows.

749

### 750 5.2.1 Component 1: market-penetration and innovation-driven drivers

751

752 This driving theme forms the principal impetus for deciding to enter ICJVs, with a minimum  
753 factor loading of at least 0.5 and a factor scale rating of 5.51 (ranked third based on the average  
754 mean values of the underlying variables). It is made up of six driving factors and explains the  
755 highest level of variance of 25.7%. The factor focuses more on the use of ICJVs as an entry  
756 decision strategy and a channel to accumulating knowledge. The underlying drivers include: ‘enter  
757 new construction market’, ‘advance construction technology acquisition’, ‘improve track records’,  
758 ‘improve the quality level of projects’, ‘advancement in managerial skills’, and ‘acquire new  
759 construction project’. As entry mode choice theory explains, market structure and pressure (i.e.,  
760 institutional forms for operating abroad), determine the alliance model required (Chen and  
761 Messner, 2009). More information on gaining market access abroad can be found in Cheng (2006)  
762 and Lukas (2007). Theories behind firms’ intentions to innovate have been well documented in  
763 the literature (Hartmann, 2006; Hazarika and Zhang, 2019). In the construction industry, the main  
764 elements driving eco-innovation are technology push, market pull, and regulatory push/pull. ICJVs  
765 implementation supports the development of firms’ innovation capabilities, which generally drive  
766 the economy of a country/jurisdiction into a more sustainable economic growth path. Thus,  
767 partnering firms can gain insight in the views of the others and learn from each other, so that  
768 knowledge is accumulated, creativity is simulated, and a wider range of solution can be generated.  
769 Having technology advantages can affect the type of projects secured worldwide. Construction  
770 organizations adopt advanced technology and develop their managerial strength to effectively  
771 operate in the market. As there is every indication that construction projects are getting larger in  
772 size, and more technically complex, in future, host companies that have acquired the skills or  
773 advance technology or built their capacity and capability necessary to sustain socio-economic  
774 growth and development can undertake such projects on their own. In effect, this significantly  
775 contributes to improving sustainable development in the construction environment worldwide



776 (Ozorhon and Oral, 2017). It is worth mentioning that these benefits will be reaped in the long run  
777 after completion or involved in several ICJV projects.

778

### 779 *5.2.2 Component 2: sustainable advantage/power drivers*

780

781 This factor consists of five drivers that echo the operational efficiency of firms in terms of  
782 combining resources and spreading financial risks, overcoming cultural, environmental, and  
783 political boundaries, etc. It explains 16.7% of the total variance and ranked first with a factor scale  
784 rating of 5.69. The driving factors and the percentage of their loadings include: ‘overcome the lack  
785 of local/foreign knowledge of international firms’ (85.2%), ‘reduce project risk/sharing of risks’  
786 (75.0%), ‘overcome environmental deficiencies’ (72.7%), ‘opportunity to work on large and  
787 complex projects’ (72.4%), and ‘overcome cultural and political barriers’ (64.7%). When firms  
788 enter a foreign market alone, they are more likely to face multiple uncertainties and challenges,  
789 which are caused by political, environmental, market, production, policy, economic, and social  
790 risks (Ozorhon et al. 2007). While the concept of sustainable development itself stresses the need  
791 for mutual attainment of social development, environmental health, and economic wealth, for  
792 which the responsibilities and resources are allocated to different societal spheres, ICJVs can drive  
793 stronger, more sustainable strategies to make business more resilient for the successful operations  
794 and performance. Thus, ICJVs support business to pursue sustainable development initiatives that  
795 simultaneously create business value and address these operational difficulties for the efficient  
796 operation of firms (Li et al. (2009). Improving operational efficiency means completing projects  
797 within schedule, reducing duplications – not mistakenly repeating processes, as well as enabling  
798 continuous improvement. This may partially or more than fully offset the costs arising from getting  
799 information, management strategy, operation, etc. (Panibratov, 2016). Certainly, these goals  
800 directly translate into sustainable development attainment.

801

### 802 *5.2.3 Component 3: fiscal incentives and market expansion drivers*

803

804 The factor highlights the economic opportunities and long-term growth in the construction  
805 industry. It explains 9.3% of the total variance and ranked fourth with a factor scale rating of 5.43.  
806 The underlying factors include: ‘attract capital investment’ (69.4%), ‘increase market share’  
807 (69.0%), ‘growth in construction globalization’ (56.9%), and ‘improve the existing imperfect  
808 mechanism of the construction industry’ (55.5%). Clients want contractors to make available  
809 innovative funding packages for the successful delivery of their projects. Financing is one of the  
810 pivotal challenges for sustainable development – megaprojects. Innovative finance is now  
811 recognized by national governments and private agencies as a key solution to realizing  
812 megaprojects. Thus, national governments and organizations across many sectors are deploying  
813 strategies and partnerships to tackle critical social and environmental challenges at various stages  
814 in delivering megaprojects. Through ICJVs firms can merge strength to offer innovative financing  
815 to the client (Gunhan and Arditi, 2005). For example, in the developing and emerging economies,  
816 infrastructure projects require large upfront capital investment firms to meet the combined effect  
817 of high demands and the tradition of late and insufficient supply through adequate and timely  
818 construction (McIntosh and McCabe, 2003). Several studies have mentioned that the main factor

819 driving the adoption of ICJVs is to spread financial investment fairly (Han et al. 2019; Tetteh et  
820 al. 2020). In Saudi Arabia, due to the high cost of production in the oil and gas sector (upstream  
821 project), ICJV formation has increased significantly purposely to share capital risks (Almohsen  
822 and Ruwanpura, 2016). Gale and Luo (2004) highlighted that satisfying construction markets'  
823 needs are deeply grounded in developing a resilient environment that supports collaborating  
824 contracting forms, promoting export-oriented contracting, growth, industrial integration, etc.  
825 ICJVs can revitalize the construction industry; thus, by mobilizing innovative experiences,  
826 finance, and technologies to completely modify the managerial and operational trajectories of the  
827 industry, leading to sustainable development. By long-term growth, Munns et al. (2000) affirmed  
828 that this hybrid contracting arrangement supports the development of continuous control and  
829 resolution tactic for overcoming future competition and complications.

830

#### 831 *5.2.4 Component 4: legal and market-driven drivers*

832

833 This factor explains 6.1% of the total variance with four driving factors (ranked fifth with a  
834 factor scale rating of 5.41). It focuses on the driving forces beyond the control of individual firms.  
835 Thus, they are external forces that compel/attract organizations to enter ICJVs (Chan et al. 2020).  
836 The underlying factors include: 'Satisfaction of client requirement/achievement of pre-  
837 qualification conditions' (65.5%), 'social support' (61.1%), 'mode of foreign investment' (52.7%),  
838 and 'prevention of wholly own foreign companies' (52.2%). Various national governments and  
839 external bodies have explored policy options to balance the attainment of national technology  
840 development objectives and realize the much-needed socio-economic infrastructures (Kobayashi  
841 et al., 2009). Open door policies primarily established by national governments and external  
842 organizations like the World Trade Organization (WTO) warrant firms to form ICJVs without any  
843 restrictions (Xu et al. 2005). For example, in China, as part of their foreign direct investment policy  
844 requirement, international construction firms are required to enter ICJV with local firms in the  
845 realization of megaprojects. In Singapore, the introduction of the Preferential Margin Scheme  
846 (PMS) by the government steered the promotion of ICJVs. Likewise, in many developing  
847 countries, such as Ghana, the Local Content Law 2013, requires international firms to form ICJVs  
848 with local firms and that local firms should hold much equity in terms of employment and benefit  
849 from the country's resources in the petroleum industry. In Libya, international firms can hold up  
850 to a 49% equity stake in such an arrangement. Similarly, the influence of clients/NGOs and the  
851 growing market requirement often act as an effective catalyst in driving the adoption of ICJVs.  
852 For example, clients may require contractors who intend to bid for their project to possess some  
853 unique expertise, which certainly calls for such a collaboration arrangement. It is also a  
854 requirement for certain types of government projects (Zhao et al 2013). For example, the  
855 government may require that corporations meet their minority or small business requirements by  
856 forming ICJV with the right firm to satisfy the need.

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861 **Table 4.** Factor analysis results

Code		Components						$\bar{x} = \frac{\sum xi}{n}$	Rank
		1	2	3	4	5	6		
<b>Component 1:</b>	<b>Market-penetration and innovation-driven drivers</b>							<b>5.51*</b>	<b>3</b>
d12	Enter new construction market	0.839	-	-	-	-	-	5.69	
d2	Advance construction technology acquisition	0.745	-	-	-	-	-	5.57	
d25	Improve track records	0.701	-	-	-	-	-	5.18	
d4	Improve quality level of projects	0.673	-	-	-	-	-	5.56	
d3	Advancement in managerial skills	0.645	-	-	-	-	-	5.58	
d31	Acquire new construction project	0.580	-	-	-	-	-	5.50	
<b>Component 2:</b>	<b>Sustainable advantage/power drivers</b>							<b>5.69*</b>	<b>1</b>
d26	Overcome the lack of local/foreign knowledge of international firms	-	0.852	-	-	-	-	5.98	
d1	Reduce project risk/sharing of risks	-	0.750	-	-	-	-	5.69	
d32	Overcome environmental deficiencies	-	0.727	-	-	-	-	5.28	
d17	Opportunity to work on large and complex projects	-	0.724	-	-	-	-	5.94	
d10	Overcome cultural and political barriers	-	0.647	-	-	-	-	5.54	
<b>Component 3:</b>	<b>Fiscal incentives and market expansion drivers</b>							<b>5.43*</b>	<b>4</b>
d20	Attract capital investment	-	-	0.694	-	-	-	5.63	
d14	Increase market share	-	-	0.690	-	-	-	5.04	
d21	Growth in construction globalization	-	-	0.569	-	-	-	5.98	
d33	Improve existing imperfect mechanism of the construction industry	-	-	0.555	-	-	-	5.08	
<b>Component 4:</b>	<b>Legal and market-driven drivers</b>							<b>5.41*</b>	<b>5</b>
d13	Satisfaction of client requirement/achievement of pre-qualification conditions	-	-	-	0.655	-	-	5.56	
d22	Social support	-	-	-	0.611	-	-	5.65	
d11	Mode of foreign investment	-	-	-	0.527	-	-	5.05	
d30	Prevention of wholly own foreign companies	-	-	-	0.522	-	-	5.39	
<b>Component 5:</b>	<b>Personal branding drivers</b>							<b>5.34*</b>	<b>6</b>
d9	Better execution of project	-	-	-	-	0.750	-	5.02	
d24	Increase efficiency	-	-	-	-	0.743	-	5.19	
d27	Building reputation	-	-	-	-	0.676	-	5.43	
d28	Increase credibility	-	-	-	-	0.632	-	5.71	
<b>Component 6:</b>	<b>Industrial and organizational promotion drivers</b>							<b>5.67*</b>	<b>2</b>
d29	Promote industrial integration	-	-	-	-	-	0.778	5.73	
d15	Increase productivity	-	-	-	-	-	0.675	5.45	
d23	Competing interest of national development	-	-	-	-	-	0.549	5.76	
d19	Improve company's image	-	-	-	-	-	0.538	5.72	

Eigenvalues	8.753	5.663	3.117	2.086	1.572	1.325	
Variance explained	25.745	16.654	9.343	6.136	4.623	3.898	
Cumulative variance (%)	25.745	42.400	51.743	57.879	62.502	66.400	
KMO measure of sampling adequacy							0.821
Bartlett's test of sphericity approximated Chi-square							2940.148
Degree of freedom							561
Significance							0.000

Note:  $\bar{x} = \sum xi/n$ , where  $\bar{x}$  = mean,  $\sum xi$  = summation of sampled values,  $n$  = number of variables or items in each component/construct.

**Extraction method:** Principal Component

**Analysis Rotation Method:** Varimax with Kaiser Normalization

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882 *5.2.5 Component 5: personal branding drivers*

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884 This component relates to the subjectively individual-motivated factors that drive stakeholders  
885 to implement ICJVs for better construction sustainability and explains 4.6% of the total variance.  
886 It is made up of four driving factors which include: ‘better execution of project’ (75.0%), ‘increase  
887 efficiency’ (74.3%), ‘building reputation’ (67.6%), and ‘increase credibility’ (63.2%). It is also the  
888 least ranked component with a factor rating scale of 5.34. ICJVs create an environment for parties  
889 to gain both tangible and intangible benefits within the construction industry. By receiving  
890 advanced knowledge, parties strengthen their skills, capabilities, instincts, etc. (Chan et al. 2020),  
891 required for gaining competitive benefit in the market (Panibratov, 2016). As sustainable  
892 development initiatives have a key role in business reputation, by efficiently and successfully  
893 completing megaprojects, partners can find new opportunities where they can promote wide range  
894 sustainable solutions for more environmentally and socially responsible client as and when the  
895 need arise. More so, as one of the hallmarks of success, ICJV partners consider themselves as  
896 winners in certain areas, and they would value their personal growth or other long-term interests  
897 over only focusing on maximizing economic benefits (Ozorhon et al. 2010a). ICJV projects are  
898 unique considering their characteristics, including large scale investment, political importance, and  
899 far-reaching impacts on the environment, and society. Therefore, participating in the construction  
900 of these projects is one of the pathways for individuals or companies to maintain or strengthen  
901 their ties with the government. In most cases, ICJV partners are more likely to get political  
902 promotion when they successfully deliver those projects. This motivates them to perform better,  
903 thereby enhancing their companies’ brand or reputation. Consequently, individuals can contest  
904 with their competitors during prequalification and work on large-scale and complex projects  
905 beyond their specialty. For the intangible benefits, individuals can gain a good image and  
906 reputation by the public upon completing projects that either characterize a local innovative or one  
907 that puts forward more technical challenges (Hong, 2014).

908

909 *5.2.6 Component 6: industrial and organizational promotion drivers*

910

911 This category includes driving factors focusing on the desire of companies to strive for success  
912 and improve the image of the company and industry, respectively. It explains 3.8% of the total  
913 variance and ranked second with a factor scale rating of 5.67. It constitutes four driving factors:  
914 ‘promote industrial integration’ (77.8%), ‘increase productivity’ (67.5%), ‘competing interest of  
915 national development’ (54.9%) and ‘improve company’s image’ (53.8%). Presently, there is an  
916 understanding that every successful organization implements innovation. The increasing external  
917 forces in domestic markets represent an unsafe working environment for local companies,  
918 therefore, construction companies adopt ICJVs not to be left out, but rather to have a differentiating  
919 advantage and build a strong reputation. ICJVs are regarded as an innovation strategy to provide  
920 groundbreaking and better services and improving work culture in organizations (London and  
921 Siva, 2011). Aside from the increased industrial acknowledgment and status, it provides them the  
922 convenience to undertake mega infrastructure projects and sustain the longstanding growth of the  
923 industry (Chan et al. 2020). Construction firms are rebranding themselves as smart engineering  
924 solutions providers, and to be competitive in the global construction markets. A good brand or

925 reputation will improve a company’s competitiveness, thus contribute to an increase in long-term  
926 potential interest. There is also an opportunity to gain more projects and more resources such as  
927 higher legitimacy and market share.

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### 929 *5.3 Rank agreement analysis results on the key drivers*

930

931 The results of the FA were subsequently used for the rank agreement analysis to determine the  
932 level of agreement between experts from developing and developed countries/jurisdictions. Table  
933 5 shows the results of the rank agreement analysis among the two contexts. Following the  
934 equations provided in section 4.3, the PA of each component was calculated. For example, PA for  
935 the first component – Market-penetration and innovation-driven drivers was determined by using  
936 equations (5 and 6). Thus,  $PD = \frac{12}{12} * 100 = 100\%$ , and  $PA = 100 - 100 = 0\%$ .

937 Overall, among the six constructs on which the rank agreement analysis was performed, three  
938 of them showed relatively a good PA between experts from developed and developing  
939 countries/jurisdictions: ‘fiscal incentives and market expansion drivers’, ‘legal and market-driven  
940 drivers’, and ‘personal branding drivers’ (62%, 75%, and 75%, respectively). This is as a result of  
941 the relatively high degree of consistency in terms of rank order for the highest and lowest-ranked  
942 drivers, although there are some slight differences in the rank order. For example, concerning ‘legal  
943 and market-driven drivers’, ‘satisfaction of client requirement/achievement of pre-qualification  
944 conditions’ and ‘attract capital investment’ was ranked first and second by experts from both  
945 developing and developed countries/jurisdictions with MS of 5.49, 5.48, and 6.36, 6.10,  
946 respectively. Among experts from developed countries/jurisdictions, ‘mode of foreign investment’  
947 was ranked third followed by ‘prevention of wholly own foreign companies’ with MS values of  
948 4.80 and 4.05, respectively. Meanwhile, among experts from developing countries/jurisdictions,  
949 ‘prevention of wholly own foreign companies’ was ranked third and ‘mode of foreign investment’  
950 ranked fourth with MS values of 5.69 and 5.40, respectively.

951 The remaining constructs – ‘market-penetration and innovation-driven drivers’ (0%),  
952 ‘sustainable advantage/power drivers’ (33%), and ‘industrial and organizational promotion  
953 drivers’ (33%) showed a low agreement level between experts from developed and developing  
954 countries/jurisdictions. Thus, there are high differences in the ranking of the various drivers of these  
955 constructs. For example, concerning ‘market-penetration and innovation-driven drivers’, aside  
956 from ‘improve track records’ that it ranked fifth and equally from both groups of experts, however,  
957 with different MS values (developed = 4.58 and developing = 5.38), the other drivers were ranked  
958 differently. From the perspective of experts from developed countries/jurisdictions, ‘enter new  
959 construction market’ ranked first with a relatively high MS of 5.78, followed by ‘acquire new  
960 construction project’ ranked second with MS value of 5.35, ‘improve the quality level of projects’  
961 ranked third with MS of 5.23, ‘advancement in managerial skills’ ranked fourth with MS of 4.86,  
962 and ‘advance construction technology acquisition’ ranked fifth with MS of 4.58. Equally, from  
963 developing countries/jurisdictions, ‘advancement in managerial skills’ was ranked first with MS  
964 of 6.21, ‘improve the quality level of projects’ ranked second with MS value of 5.93, followed by  
965 ‘acquire new construction project’ ranked third with MS value of 5.71, ‘advance construction  
966 technology acquisition’ and ‘enter new construction market’ ranked fourth and sixth with MS  
967 values of 5.59 and 3.76, respectively. Unsurprisingly, from developing countries' perspective, due

968 to the limited experiences and performance in the construction business, driving factors that aim  
969 at improving the working efficiency and narrowing their competency gaps are seen as major  
970 motivations for implementing ICJVs. Developed countries/jurisdictions, therefore, considers this  
971 as a positive strike to penetrate emerging and developing economies via ICJVs, as they have the  
972 strength/power to provide for their needs.

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101 **Table 5.** Rank agreement analysis on the drivers for implementing ICJVs

	Developed countries/jurisdictions			Developing Countries/jurisdiction			Agreement analysis			PA
	Mean	SD	Rank	Mean	SD	Rank	$R_i$	$(R_{i1} - R_{i2})$	$ (R_i - R_j) $	
<b>Component 1: Market-penetration and innovation-driven drivers</b>										<b>0%</b>
d12: Enter new construction market	5.78	0.820	1	3.76	0.657	6	7	5	0	
d02: Advance construction technology acquisition	3.20	0.666	6	5.59	0.650	4	10	2	3	
d25: Improve track records	4.58	0.864	5	5.38	0.644	5	10	0	3	
d04: Improve quality level of projects	5.23	1.107	3	5.93	0.672	2	5	1	2	
d03: Advancement in managerial skills	4.86	0.704	4	6.21	0.669	1	5	3	2	
d31: Acquire new construction project	5.35	0.925	2	5.71	0.622	3	5	1	2	
							$R_{j2} = 7$	$\sum_{i=1}^n (R_{i1} - R_{i2}) = 12$	$\sum_{i=1}^n  (R_i - R_{j2})  = 12$	
<b>Component 2: Sustainable advantage/power drivers</b>										<b>33%</b>
d26: Overcome the lack of local/foreign knowledge of international firms	6.11	1.134	3	5.83	0.464	3	6	0	0	
d01: Reduce project risk/sharing of risks	6.18	1.014	2	5.91	0.978	2	4	0	2	
d32: Overcome environmental deficiencies	4.92	0.568	5	5.69	0.706	4	9	1	3	
d17: Opportunity to work on large and complex projects	5.49	0.732	4	5.93	0.525	1	5	3	1	
d10: Overcome cultural and political barriers	6.23	0.745	1	4.53	1.012	5	6	4	0	
							$R_{j2} = 6$	$\sum_{i=1}^n (R_{i1} - R_{i2}) = 8$	$\sum_{i=1}^n  (R_i - R_{j2})  = 6$	
<b>Component 3: Fiscal incentives and market expansion drivers</b>										<b>62%</b>
d20: Attract capital investment	5.35	1.052	2	5.88 <sup>a</sup>	0.642	2	4	0	1	
d14: Increase market share	5.05	0.891	3	5.22	0.460	4	7	1	2	
d21: Growth in construction globalization	6.06	0.659	1	5.88 <sup>a</sup>	0.422	1	2	1	3	
d33: Improve existing imperfect mechanism of the construction industry	4.45	1.469	4	5.86	0.576	3	7	1	2	
							$R_{j2} = 5$	$\sum_{i=1}^n (R_{i1} - R_{i2}) = 3$	$\sum_{i=1}^n  (R_i - R_{j2})  = 8$	
<b>Component 4: Legal and market-driven drivers</b>										<b>75%</b>
d13: Satisfaction of client requirement/achievement of pre-qualification conditions	5.49	0.640	1	6.36	0.693	1	2	0	3	
d22: Social support	5.48	0.773	2	6.10	0.742	2	4	0	1	
d11: Mode of foreign investment	4.80	0.666	3	5.40	0.560	4	7	1	2	
d30: Prevention of wholly own foreign companies	4.05	1.316	4	5.69	0.799	3	7	1	2	



**Component 5: Personal branding drivers**

d09: Better execution of project	6.02	0.739	2	6.02	0.513	1	3	1	2	$R_{j2} = 5 \frac{\sum_{i=1}^n (R_{i1} - R_{i2})}{= 2} \frac{\sum_{i=1}^n  (R_i - R_{j2}) }{= 8}$ <b>75%</b>
d24: Increase efficiency	6.05	1.082	1	5.48	0.628	2	3	1	2	
d27: Building reputation	5.49	0.831	4	5.31	0.627	4	8	0	3	
d28: Increase credibility	5.82	0.788	3	5.41	0.563	3	6	0	1	

**Component 6: Industrial and organizational promotion drivers**

d29: Promote industrial integration	5.37 <sup>a</sup>	0.720	4	5.45	0.680	3	7	1	2	$R_{j2} = 5 \frac{\sum_{i=1}^n (R_{i1} - R_{i2})}{= 2} \frac{\sum_{i=1}^n  (R_i - R_{j2}) }{= 8}$ <b>33%</b>
d15: Increase productivity	5.37 <sup>a</sup>	0.698	3	5.53	0.842	2	5	1	0	
d23: Competing interest of national development	5.91	0.655	2	5.33	0.711	4	6	2	1	
d19: Improve company's image	5.98	0.599	1	5.67	0.711	1	2	0	3	

<sup>a</sup>Represents equal mean, wherein factors with low SD are ranked higher in that order

PA = Percentage agreement

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1026 **6. Theoretical, practical, and sustainability contributions of the study**

1027  
1028 Theoretically, the exploration of key drivers for implementing ICJVs via a global view  
1029 contributes significantly to the ICJV body of knowledge. Bringing to light the global view of ICJV  
1030 drivers reinvigorates theoretical development by shedding light on the understanding of multiple  
1031 rationales behind ICJVs formation from two different contexts. Consequently, future studies that  
1032 accommodate these findings to study multiple ICJVs within a specific country/jurisdiction would  
1033 significantly advance the field and hold more explanatory power. More so, giving the varying  
1034 degrees of impact by experts across the globe on the major drivers for implementing ICJVs provide  
1035 a complete basis for future scholars to conduct additional insights within different locations for  
1036 complete theory development.

1037 Practically, this research provides an exhaustive list of key drivers, which gives a significant  
1038 statute to practitioners and policymakers to determine the operational dynamics and success of  
1039 ICJVs. Specifically, appreciation of the factors motivating ICJVs is beneficial to the successful  
1040 implementation of ICJV strategies. A clear understanding of the drivers can help practitioners and  
1041 policymakers to customize their ICJVs to reap the expected benefits. It could also enable the  
1042 establishment of guidelines by the government to promote the adoption of ICJVs. The findings of  
1043 this study showed that these drivers, as benefits to be gained from implementing ICJVs are  
1044 multidimensional (i.e. benefiting organizations, practitioners, and countries/jurisdictions at large).  
1045 Therefore, it is recommended that governments including public policy makers should enact  
1046 suitable and more effective policies and regulations that would form regulatory pressure for both  
1047 public and private companies and stakeholders to adopt ICJVs. More so, it is important for  
1048 companies to fully support and promote the implementation of ICJVs because that would help  
1049 them build their capacities and gain some other benefits.

1050 From the sustainability point of view, the increase in worth of the driving factors for ICJVs will  
1051 encourage its wider adoption. Spillovers can bring a competitive advantage to both foreign and  
1052 domestic firms and can bring positive environmental/industrial change in developing countries by  
1053 providing a straightforward and incremental capacity development process, leading to an agile  
1054 transformation. Thus, domestic firms will be empowered in providing a systematic process to  
1055 evaluate construction project decisions and generate potential solutions that improve project  
1056 performance and sustainability.

1057  
1058 **7. Conclusions, limitations, and future research**

1059  
1060 ICJVs have become a good strategy for firms' survival and as an effective approach to  
1061 sustainable development. This study investigated the key drivers for implementing ICJVs through  
1062 an international expert survey. Based on a comprehensive literature review, 36 potential factors  
1063 driving the implementation of ICJVs were identified. The data were collected using a structured  
1064 questionnaire survey with 123 ICJV experts from 24 different countries/jurisdictions. The results  
1065 showed that growth in construction globalization, overcome the lack of local/foreign knowledge  
1066 of international firms, the opportunity to work on large and complex projects, advancement in  
1067 managerial skills, and competing interest of national development are the top five significant  
1068 drivers for ICJV implementation worldwide. Mann-Whitney *U* test results prove the absence of

1069 significant differences among the experts in the ranking of the drivers. The results also showed  
1070 that developed countries/jurisdictions adopt ICJV primarily as a means of adhering to  
1071 governmental/domestic policies as well as hedging potential uncertainties and challenges while  
1072 developing countries/jurisdictions adopt ICJV for operational competencies. Factor analysis of  
1073 the key drivers yielded six clusters, namely, market-penetration and innovation-driven drivers,  
1074 legal and market-driven drivers, sustainable advantage/power drivers, fiscal incentives and market  
1075 expansion drivers, personal branding drivers, and industrial and organizational promotion drivers.  
1076 The agreement analysis also proves some disparities between developed and developing  
1077 countries/jurisdictions on these categories based on their rankings. Based on the findings of this  
1078 study, practitioners and policymakers especially should scale up initiatives towards expanding  
1079 ICJV adoption irrespective of organizational infrastructural elements and industry size,  
1080 respectively. To achieve this, the major drivers with high mean ranks can be focused on to  
1081 effectively and efficiently promote and make decisions regarding the implementation of ICJVs  
1082 within the two contexts. Also, ICJV advocates can widely promote these drivers in society to  
1083 influence the interest industry stakeholders have in ICJVs. This move will successfully drive the  
1084 SDGs.

1085       Aside from the multiple contributions that this study projects, certain limitations, and future  
1086 directions are imperative to clarify and provide, respectively. These limitations not only warrant  
1087 future research but must also be considered when interpreting and generalizing the results. First,  
1088 although the sample is 124, they were collected from ICJV experts in 24 different countries around  
1089 the world. This sample size has been deemed adequate and representative when compared with  
1090 other similar international surveys reported in the construction management literature (e.g., Darko  
1091 et al. 2017; Wuni and Shen, 2020; Adabre et al. 2020). However, it is suggested that future studies  
1092 should employ larger samples from both contexts to validate the findings. Also, with larger sample  
1093 size, having grouped the factors, future studies could confirm these groupings and model the  
1094 interrelationships among them and their impact on ICJVs adoption using more rigorous statistical  
1095 modeling methods such as structural equation modeling. More detailed studies in specific countries  
1096 and among the parties involved are needed. That is, between local/host parties and foreign parties  
1097 to provide a better and deeper understanding of these drivers in this context. More so, while this  
1098 study argues that ICJVs contribute to sustainable development, it is in the remit of further studies  
1099 to go beyond the current capacity and thoroughly evaluate the relationship between ICJVs and  
1100 sustainable development for a more structural understanding of the link between ICJVs and  
1101 sustainable development to enable the generalization of insights and findings. This could be  
1102 achieved via multiple case design by using secondary data from literature and greater volume of  
1103 evidence from ICJVs organizations.

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1112 **References**

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1322 **Appendix 1.** Sample of the survey questionnaire

1323

1324 Please indicate your level of agreement on each of the following drivers for implementing ICJVs. Use the  
 1325 following scale: 1 = strongly disagree; 2 = disagree; 3 = disagree somewhat; 4 = neither agree nor disagree; 5 =  
 1326 agree somewhat; 6 = agree; 7 = strongly agree

No.	Drivers for implementing ICJVs	Level of agreement
		Low <<<----->>>High
1	Reduce project risk/risk or resource sharing	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
2	Advance construction technology acquisition	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
3	Improved managerial expertise	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
4	Increased quality level of projects	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
5	Competition as driving force	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
6	Gain economies of scale	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
7	Promotion of economic growth in the long run	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
8	Demand for value for money	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
9	Better execution of project	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
10	Overcome cultural and political barriers	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
11	Mode of foreign investment	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
12	Enter new construction market	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
13	Satisfaction of client requirement/achievement of pre-qualification conditions	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
14	Increased market share	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
15	Increased productivity at all levels	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
16	Diversification	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
17	Opportunity to work on large and complex projects	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
18	Ensured stability	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
19	Improved company's image	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
20	Attract capital investment	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
21	Growth in construction globalization	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
22	Social support	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
23	Competing interest of national development	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
24	Increased efficiency	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
25	Improved track records	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
26	Overcome the lack of local/foreign knowledge of international firms	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
27	Building reputation	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
28	Increased credibility	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
29	Promote industrial integration	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
30	Prevention of wholly own foreign companies	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
31	Acquire new construction project	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
32	Overcome environmental deficiencies	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
33	Improved existing imperfect mechanism of the construction industry	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
34	Stimulate export-oriented contracting	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
<b>If there are any drivers omitted by this questionnaire, please list and rate them</b>		
1	Click or tap here to enter text.	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
2	Click or tap here to enter text.	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
3	Click or tap here to enter text.	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
4	Click or tap here to enter text.	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7

5	Click or tap here to enter text.	<input type="checkbox"/> 1; <input type="checkbox"/> 2; <input type="checkbox"/> 3; <input type="checkbox"/> 4; <input type="checkbox"/> 5; <input type="checkbox"/> 6; <input type="checkbox"/> 7
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