Knowledge Creation: A Case Study of International Construction Joint Venture Projects in Thailand

Achara Khamaksorn, Joseph H. M. Tah, and Esra Kurul

***Abstract*—In recent years, companies around the world are trying to expand internationally through collaborative agreements. 'International Construction Joint Ventures' (ICJVs) have become of significant interest as the global construction market continues to be integrated into a more competitive business environment. Moreover, ICJVs can be a mechanism for creating, transferring and improving knowledge and skills between partners. Knowledge creation has also been recognized as the successful mechanism of creating knowledge between local and foreign partners. Therefore, local partners who wished to enter into the emerging market needed to quickly develop the required resources. Thus, it is especially important to understand how new knowledge in ICJV projects can be transferred and adopted. Therefore, the purpose of this study is to investigate and characterise the knowledge creation process in ICJV projects and explore to what extent projects facilitate the process. A case study approach is adopted using three ICJV projects. As a result, this research provides the establishment of specific knowledge creation processes through an empirical investigation of ICJV projects in Thailand.**

***Index Terms*—International construction, knowledge creation, SECI model, Thailand.**

I. Introduction

Globalisation has particularly strengthened since the 1983s [1]. Ref. [2] indicates that there has been an unprecedented change like the global business environment and the key to sustainable competitive advantage in today's knowledge economy is the ability to deliver new products and services to the market ahead of competitors. Joint Ventures (JVs) have been one of the contractual forms most frequently used in strategic alliances. It is considered that strategic alliances have been widely discussed in the context of international businesses [3]. JVs are a special type of strategic alliance that offers a unique opportunity to combine the distinctive competencies and complementary resources of the participating firms and this enables them to offer new products and services. In recent years, companies around the world are trying to expand internationally through a collaborative agreement between them. International Joint Ventures (IJVs) are defined as joint ventures with at least one partner headquartered outside the joint venture's country of operation [4]. IJVs are considered to be a business arrangement for companies to enlarge their international activities and business. The trend towards forming IJVs has become increasingly common since the 1970s [4] and [5]. Thus, it is clear that construction firms can exploit business opportunities and enter new markets abroad through the formation of IJVs. They are also recognised as a latent means of enhancing construction firms' international competitiveness [3], [4] and [5]. IJVs can be a mechanism for transferring knowledge between partners and a way of improving the knowledge and skills of the local partner(s) [6]. International Construction Joint Ventures (ICJVs) has become of significant interest as the global construction market continues to be integrated into a more competitive and turbulent business environment. A critical review carried out by [7] highlighted that an ICJV often faces a highly complex and dynamic environment. Nowadays, ICJVs have increasingly become a notable form of international market growth for multinational organisations attempting to exploit opportunities in both developing and developed businesses [8] and [9].

As global competition continues to intensify, knowledge is increasingly becoming a crucial strategic resource and is regarded as a key factor, not only for the successful completion of projects but also as a critical asset of an organisation's competitive advantage [10] and [11]. The success of an organisation in today's competitive business environment is strongly related to its ability to utilise the knowledge and build its capacity. The effective management of its knowledge and capacity may help an organisation to sustain its competitive position in the constantly changing business environment [10]. It is regarded as the most valuable resource and its transfer within and between organisations. Thus, Knowledge Creation is an important process whereby an organisation identifies and learns from specific knowledge that exists in another organisation or its different parts [12]. Creating knowledge effectively has long vied as an important indicator for an organisation to acquire knowledge and competence [13].

The purpose of this study is to investigate and characterise the knowledge creation process in ICJV projects in Thailand and explore to what extent projects facilitate the process. This paper is divided into five main sections, including this introduction. The relevant literature related to ICJV Projects and Knowledge Management (KM) are examined in the second section with an explanation of how it was addressed in prior studies. The research design and methodology of this study are provided in the third section. Analysis and findings are presented in the fourth section, while the fifth section contains a summary of the discussion and conclusion of the paper.

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II. Literature Reviews

A. International Construction Joint Venture Projects

Globalisation together with the information revolution and the improved knowledge-based economy has fundamentally altered the market in the construction industry [14]. Thailand's economy and infrastructure development have significantly and rapidly risen in recent years. The construction industry continues to play a major role in the country's development as many construction projects are being commissioned to meet the high demands of the expansive market. Thailand made significant steps toward economic and infrastructure development after the financial crisis of 1997 and has thus become one of the newly industrialised countries or 'NICS' in Asia, together with Hong Kong, South Korea, Singapore and Taiwan [15]. Construction joint ventures in Thailand are becoming increasingly popular with multinational construction companies, local construction firms, and local governments forming a JV to achieve their objectives. The government of Thailand is encouraging and supporting local contractors to participate in regional and global markets based on their expertise and experience of building construction, infrastructure projects, and airport construction. As a result, many international construction firms from other countries have entered Thailand to complete these sophisticated projects. Therefore, local contractors who wish to enter the emerging market and achieve sustainable long-term competitiveness in this new environment need to quickly develop the required resources. Moreover, the importance of international trade agreements and the steady expansion of the construction industry have led to a huge increase in the number of foreign contractors in Thailand, which has a significant effect on Thailand's construction industry. Thai construction companies have already formed joint ventures with firms from China, Taiwan, Korea, Japan, and the European region and Thai construction contractors have gained extensive experiences by working on international construction projects during the past decade.

This proposes that a government and private "partnership" will be the key development network to overcome any inadequate and ineffective control strategies or construction and project management problems that are likely to have a negative effect on construction projects in Thailand and other developing countries. As mentioned above, there has been a huge increase in the number of foreign construction contractors operating in Thailand due to the importance of international trade agreements and the expansion of the construction industry.

B. Knowledge Management (KM) and Knowledge Creation

The concept of KM has been center stage in the literature related to construction management for more than a decade [16] and it is an ever-evolving practice in construction firms. In the construction context, the KM process has been perceived as the combination of a series of activities for identifying, capturing, sharing and using knowledge. KM is recognised as a vehicle through which innovation and improved business performance is possible and it has also been defined as the establishment of a management system of cognitive flows, the use of which enables all components of an organisation to enrich corporate knowledge. Therefore, KM enables knowledge in the firm to be located, formalised, shared, enriched and developed, specifically knowledge with critical and strategic characteristics [17]. In today's knowledge-based economy, effective KM can reduce the cost and time of a project and, improve the quality: as such, it is a major source of competitive advantage for construction firms. Knowledge plays an important role in organisations and knowledge-based theory identifies knowledge as the main source to develop and sustain a competitive advantage [18].

KM enablers demonstrate the organisational tools, techniques, and mechanisms that stimulate the creation and development of knowledge within an organisation. A firm need to find and access the knowledge within it to retain and sustain its competitive advantage. KM revolves around the concept of the firm as a social institution and the kind of problem-solving that accompanies day-to-day operations. To make the most effective use of its knowledge, an organisation needs to ensure that it 1) finds knowledge, 2) shares knowledge, 3) receives knowledge and 4) applies knowledge, and these actions will result in an increase of its competitive advantage. [16] argue that KM provides important benefits and the opportunity to establish standard for processes, services, and products. Evaluating KM practices is considered to be one of the key important challenges facing organisations today.

According to [16], KM processes have four specific conversions, namely, knowledge creation, knowledge conversion, knowledge utilisation, and knowledge protection.

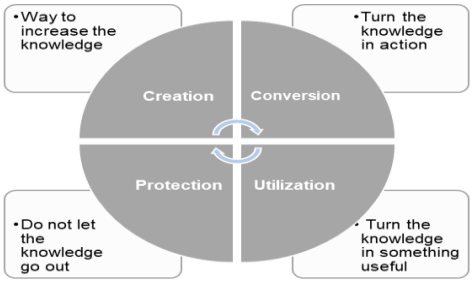

Fig. 1. Knowledge management processes.

It can be seen from Fig 1 that, the KM process involves searching for and finding entirely new knowledge or creating new knowledge from existing knowledge. The knowledge conversion process involves the transfer of knowledge among social actors and the knowledge utilisation process involves the utilisation of knowledge to improve the efficiency and effectiveness of activities and operations. The knowledge protection process involves securing knowledge from inappropriate and illegal use. When knowledge is being shared, it is communicated between members of the firm. Therefore, sharing knowledge is the most critical process within knowledge management because it can also be most easily interrupted. KM tools are often difficult to understand and there is no incentive to share intellectual assets within corporations. The issue of KM in cross-national alliances has engaged the attention of many academic scholars in recent years. Many organisations are seizing the opportunity to acquire new knowledge and the ability to seek, absorb and transfer knowledge through these collaborative arrangements

has become a crucial skill leading to the suggestion that a strategic alliance should be regarded as a learning arena [19]. As a result, knowledge creation is the process that underlies all stages of knowledge management and this study aims to investigate and characterise the knowledge creation process in ICJV projects in Thailand. In summary, it can be said that successful knowledge creation leads to competitive advantages for multinational corporations.

According to [20] theory of knowledge creation, four distinctive models attribute the success of companies to their effective creation of knowledge, the so-called 'SECI Model'. The spiral of knowledge (Exhibits in Fig. 2) represents the dimensions of tacit and explicit knowledge and also symbolises the number of people involved in the process. The model not only explains knowledge creation but also describes the process of transferring knowledge [15].

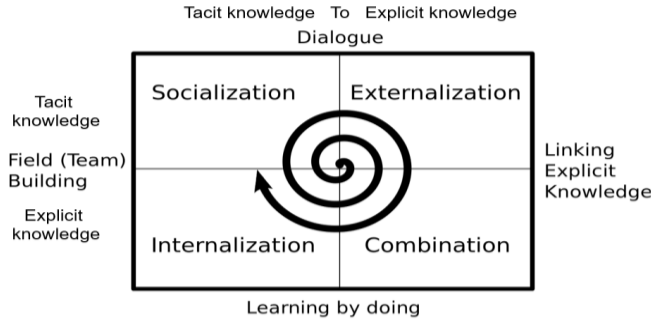

Fig. 2. The knowledge spiral.

Socialization is the process of sharing tacit knowledge, including skills and ideas, through face-to-face communication, dialogue or shared experience, often through joint activities, observation, imitation, and practice rather than written or verbal instructions. Socialisation may also occur during an informal gathering outside the workplace. For example, in the context of the ICJV project, a simple discussion about a project during a business lunch between individuals from local staff and a foreign staff may yield knowledge creation and transfer.

Externalisation is the process by which an individual attempt to present his or her tacit knowledge and makes it accessible to others. It refers to converting and articulating tacit knowledge into new explicit knowledge and the success of this process depends on the sequential use of metaphors, analogies, and models. An example of externalisation in the context of the ICJV project is when the technical expert of a foreign partner writes down step-by-step instructions for the local partners on how to troubleshoot a particular technical problem.

The combination is the process of converting explicit knowledge into more systematic sets. The creation of new explicit knowledge is conducted by merging, categorising, reclassifying and synthesising existing explicit knowledge. This is often achieved using large databases and computerised communication networks. An example of the combination in the context of ICJV project is when different types of new knowledge collected from various foreign partners consolidated and categorised in more systematic reports.

Internalisation refers to the creation of new tacit knowledge from explicit knowledge. An example of internalisation in the context of the ICJV project is when the partners provide training programmes and workshops for the local staffs of the local company at different stages of the ICJV project.

Successful knowledge transfer is considered to be the key to the success of projects and organisations [19]. The 'SECI Model' of [20] represents the dimension of tacit and explicit knowledge and symbolises the number of people involved in the process. Four specific conversion processes are identified: Socialisation, Externalisation, Combination, and Internalisation. Various KT methods and mechanisms that can be used to transfer and adopt knowledge between partners in ICJV projects are described in this section and these will be utilised to collect data to identify the methods and mechanisms that are currently used between the actors in the studied ICJV projects. The KT methods and mechanisms identified in the literature are illustrated in Table I.

TABLE I: KNOWLEDGE TRANSFER METHODS AND MECHANISMS (SOURCE: [16], [20]-[25])

(S) Socialisation (Individual to Individual)	(E) Externalisation (Individual to Group)
1. Face-to-face communication 2. Socialising out-of-hours 3. Video/Telephonic communication 4. Storytelling 5. Visiting colleagues/ other projects/ companies 6. Visiting a foreign company 7. Visiting plants or manufacturers	1. Brainstorming 2. Memoranda and letters 3. Project History/ Case Writing 4. Knowledge sharing board 5. Web-based discussion group 6. Chat rooms/ 'Toolbox' talks 7. Personal intranets 8. Blogs/ Websites 9. Team collaboration tools 10. Expert systems 11. Computer-aided systems/ 3d-models) 12. Simulation and games 13. Decision support systems 14. Problem-solving technology 15. e-Learning 16. Communities of Practices (COPs) 17. Group/ Team meetings 18. Ad hoc/ Minute Meetings 19. Regular meetings and continuous meetings
(I) Internalisation (Individual to Group and organization)	(C) Combination (Group and Organization)
1. Learning-by-doing/ Workshop/ Apprenticeships 2. On-the-job training 3. Special Training/ Training in concentrated courses 4. Induction Training 5. Hand-on training/ Formal Training 6. Training with a foreign company 7. Mentoring and coaching 8. Lesson-learned Meetings	1. Sharing best practice/ Best practice/ A share best practice database 2. Knowledge Databases 3. Web-based access to data 4. Intranet and internet pages 5. Lesson Learned Database

III. RESEARCH DESIGN AND METHODOLOGY

The data was collected from a case study in Thailand with three main ICJV projects. A multiple case study approach was adopted to facilitate the investigation within the context of the projects. The data was collected in Bangkok, Thailand. A combination of quantitative and qualitative data was utilised in this study and the selected research methods are described below.

A quantitative questionnaire was developed for use during the study. The data collection began when the questionnaire was finalised and key management experts, such as general managers, project managers, and key construction workers from the three ICJV projects were invited to complete it. The questionnaire was divided into three main sections, the first of which was designed to collect data regarding the 'actors' attributes', such as name, gender, age, nationality, educational qualification, years of experience in the construction industry and in the ICJV project, position, primary discipline, and experience of delivering ICJV project. The second section of the questionnaire was designed to identify the methods and mechanisms used by the participants to obtain and share knowledge within the project. On the other hand, qualitative interviews based on an interview schedule were conducted with the key participants and experts involved in transferring knowledge in the ICJV projects.

This research was based on a multiple case study design. Another issue that researchers should consider when using multiple case studies is the number of cases [26]. Various researchers suggest using a different number of cases to enable the findings to be extracted [27]. Ref. [28] argues that the fewer the number of cases, the greater the opportunity for an in-depth observation. The selection of the number of cases is necessarily influenced by the research aim and question. To fulfill the research aim and objectives, the data for this study was collected from three ICJV projects of a case study. A case study has an excellent performance record in infrastructure construction projects in Thailand and has joint-venture agreements in Thailand with foreign companies from countries such as France and Japan. The data for these three ICJV projects were collected from a sample of managerial and professional staff from July 2016 until August 2017 in Thailand.

Since it was mentioned in this section that a case study was adopted as an approach to conducting this research, the key findings or the empirical work from a case study with three ICJV projects will be presented and discussed in the next section.

IV. Analysis and Findings

The purpose of this section is to present the findings from an analysis of the three ICJV projects from a case study. The case study company was initially established on the 15th of August 1958 with a registered capital of 2,000,000 Thai Baht. It became a Public Company Limited on the 24th March 1994 and was listed on the Stock Exchange of Thailand on the 9th of August 1994 of that same year. Its turnover was 18,330 million Baht at the year-end of 2003, making it one the largest infrastructure construction companies, not only in Thailand but also the whole of Southeast Asia. The case study has completed the construction of many mass transit projects, the first of which was the 23.5 km Bangkok Transit System (BTS) when it entered into a joint venture with two Japanese companies to complete the construction of the 10.5 km northern part of the underground Mass Rapid Transit (MRT) project. This contract comprised the construction of 10.5 km long and 5.7 m diameter twin tunnels, 9 underground stations, and associated buildings (car parks, etc.). In addition to the domestic market, case study one has expanded its business overseas to many countries, such as India, Bangladesh, Cambodia, Lao PDR, Indonesia, Maldives, Myanmar, the Philippines, Madagascar, Taiwan, Vietnam, Australia, and Hong Kong.

The projects are analysed following the case descriptions' strategy suggested by [26]. The first project, ICJV Project-1A, was a Track Rehabilitation Project (Phases 1 and 2), while the second one, ICJV Project-1B, was a Track Rehabilitation Project (Phase 5) and the third, ICJV Project-1C, was the Construction of the Extra doses 6-lane Chao Praya River Crossing Bridge with a 460-metres long and 200 metres wide (Maha Jessada Bodin Bridge) at Nonthaburi I Road.

The collected data and the analyses of the three ICJV projects are presented in this section. The use of KT methods and mechanisms in these three ICJV projects were identified. A total of 45 questionnaire surveys were undertaken with selected team members from three ICJV projects as shown in Table II below.

TABLE II: Three ICJV Projects of A Case Study

Description	Case Study		
	ICJV Project-1A	ICJV Project-1B	ICJV Project-1C
Project	Track Rehabilitation Project (Phase 1 and 2)	Track Rehabilitation Project (Phase 5)	Extra doses Crossing Bridge
Completed	2002	2012	2016
Joint Venture Company	Thai-Thai-France	Thai-France	Thai-Japan
(%) of holding	55-10-35	60-40	40-60
Participants	11 (Thai 7, Foreign 4)	19 (Thai 18, Foreign 1)	15 (Thai 9, Foreign 6)

The managerial and professional staff who participated in this study were Thai, French, and Japanese, but most of the research participants were Thai employees. In terms of the knowledge source and reasons to exchange knowledge, the vast majority of the key knowledge actors in these three ICJV projects indicated that 'work colleagues' were more frequently considered to be a source of knowledge in these case study, followed by 'boss', 'partner' and 'subordinate', whereas partners were not considered to be knowledge sources in ICJV Project-1B and ICJV Project-1C. Additionally, the majority of the participants stated that they considered their work colleagues to be a reliable source of knowledge in ICJV contexts. This result correlates well with the research of [10], who found that colleagues were the most important source of knowledge for most employees.

In response to the question of how they communicated with team members, the survey participants indicated that they considered face-to-face interaction as the best mechanism to seek and share knowledge, followed by telephonic communication. This result is supported by [6], who found that personal exchanges and face-to-face communication are important mechanisms for members of an alliance to identify and understand the knowledge that needs to be transferred between them. The participants from these three ICJV projects also provided the reasons for exchanging their knowledge and experience with alliance members to facilitate learning: 1) Sharing knowledge and experience, 2)

Their knowledge and experience, 3) Trust and their knowledge, 4) Responsibility, and 5) Teamwork. Specifically, the participants from ICJV Project-1A and ICJV Project-1B argued that "Their knowledge and experience" was considered to be the most important reason for transferring knowledge. This result is also supported by [10] who found that 'personal experience' is considered to be an important reason for learning.

Moreover, the findings indicate that 'Trust and their knowledge' were regarded as significant reasons for transferring knowledge in this case study. All the respondents considered 'trust' to be an important and fundamental enabler of knowledge transfer. Previous researchers of inter-organisational knowledge transfer suggested that 'trust among individuals (partners)' was considered to be a key factor of the motivation to transfer knowledge. However, the key participants also proposed that trust was not the only factor that influenced KT in ICJV Projects, but teamwork and responsibility had an impact on KT processes. The empirical findings are in line with those of [3] who found that 'teamwork' was the best way to transfer knowledge and technology in an integrated joint venture.

Four KT methods and mechanisms were used to transfer knowledge by the foreign and local partners in this study: socialisation (tacit-tacit), externalisation (tacit-explicit), combination (explicit-explicit) and internalisation (explicit-tacit). They stated that (S1) face-to-face communication, (E1) brainstorming, (E18) ad hoc meetings/minutes of meetings, (E19) regular/continuous meetings, (I1) learning-by-doing and (I7) mentoring and coaching were the KT methods and mechanisms they most used, while (S3) video or telephonic communication, (E2) memoranda and letters, (E17) group meetings/ team meetings, (I2) on-the-job-training and (I8) lessons-learned meetings were the second most-used KT methods.

The KT methods and mechanisms these key actors used to transfer knowledge and experience between the partners in the three ICJV Projects is shown in Table III.

TABLE III: KT METHODS AND MECHANISMS

KT methods and mechanisms	A Case Study		
	ICJV Project-1A	ICJV Project-1B	ICJV Project-1C
(S) Socialisation (Individual to Individual)	(S1) Face-to-face communication (S3) Telephonic communication	(S1) Face-to-face communication (S4) Storytelling	(S1) Face-to-face communication (S2) Socialising out-of-hours (Lunch or Coffee breaks) *Social Network Application (e.g. Line)
(E) Externalisation (Individual to Group)	(E1) Brainstorming (E2) Memoranda and letters (E17) Group / Team meetings (E18) Minutes of meeting (E19) Regular/ continuous meetings	(E1) Brainstorming *(E6) Chat rooms/'Toolbox' talks (E19) Regular/ continuous meetings *Daily report	(E1) Brainstorming (E2) Memoranda and letters (E3) Project history/ Case Writing (E9) Team collaboration tools (E17) Group / Team meetings (E18) Minutes of meeting (E19) Regular/ continuous meetings
			*Presentation
(C) Combination (Group and Organisation)	(C1) Best practice		(C2) Knowledge Databases
(I) Internalisation (Individual to Group and Organisation)	(I1) Learning-by-doing (I2) On-the-job training *(I3) Special Training *(I4) Induction Training *(I5) Hand-on training/ Formal Training *(I6)Training with foreign company (I7) Mentoring and coaching	*(I3) Special Training *(I6)Training with foreign company (I7) Mentoring and coaching	*(I1) Learning-by-doing (I2) On-the-job training (I7) Mentoring and coaching (I8) Lesson-learned Meeting

*KT Methods and mechanisms derived from the empirical data

These results are supported by [10] and [29], who found that 'face-to-face interaction' was the main technique used to exchange knowledge. They are also consistent with the results of [6], [10] and [29], who found that meetings play an important role in the knowledge transfer processes across projects. [10] also found that telephone calls and teleconferencing, informal chatting and storytelling were the three mechanisms most used to share knowledge and experience within projects. The results are shown in Tables III also indicate that (S5) visiting colleagues/other projects/companies, (S6) visiting the foreign company and (S7) visiting plants or manufacturers were not used to acquire or exchange knowledge in these ICJV Projects. It is interesting to note that these results do not correlate with the research of [19], who found that 'storytelling' played a vital role and had a strong positive effect on exchanging complex ideas and disclosing knowledge.

Additionally, the findings indicate that some of the actors in these ICJV projects preferred to use (S2) socialising out-of-hours (lunch or coffee breaks), as well as (S1) face-to-face communication, to exchange knowledge, and [21] supports the notion that socialising out-of-hours is an effective mechanism to transfer knowledge. This may be explained by the fact that the hierarchical attitude of the team members disappears when socialising out-of-hours and a more relaxed atmosphere is conducive to a discussion of prior experience.

In terms of the reasons to exchange knowledge, the vast majority of the key knowledge actors in this case study indicated that *'*work colleagues*'* were more frequently considered to be the source of knowledge in these three ICJV projects, followed by 'bosses' and partners'. The majority of the respondents argued that tacit knowledge was relatively difficult to express and transfer via face-to-face interaction; in contrast, explicit knowledge was easier to capture through reports and meeting reports. However, most of the respondents preferred to use these KT methods and

mechanisms to exchange knowledge. The majority of the respondents argued that face-to-face interaction, brainstorming, minutes of meetings, continuous meetings, learning-by-doing and mentoring and coaching were considered as major mechanisms to seek and share knowledge. Staff and experts in this case study tended to transfer knowledge by seeking and sharing is based on experience and trust in work colleagues, bosses and partners in the ICJV projects.

V. Discussion and Conclusion

According to the research findings, it seems that most of the key actors in these ICJV projects were likely to have used (I7) mentoring and coaching as a method and mechanism to transfer knowledge across their companies. [23] and [26] also found that most of their respondents utilised 'mentoring and coaching' as a method of passing on knowledge across projects. In contrast, the key actors in ICJV projects-1A and -1C commented that they preferred to transfer knowledge based on 'learning-by-doing' during the construction process. This correlates well with research conducted in North Africa and South East Asia by [3], as a result of which, [3] reported that all construction contractors praised the merits of '(I1) learning-by-doing' as the most effective KT mechanism, as well as 'on-the-job training' and 'training with the foreign company' ([3] and [23]).

However, another important finding was that the key actors in ICJV project-1B suggested that 'presentations', 'daily reports' and 'performance reports' were also key tools to exchange knowledge. This is supported by [10], who observe that reports and the reporting process are considered as the most frequent tools used to accumulate and store knowledge gained in projects.

As noted earlier, the most interesting finding was that the key participants in this study did not emphasise the use of ICTs in (E) externalisation (tacit to explicit; e.g. knowledge-sharing boards, web-based discussion groups, chat rooms/'toolbox' talks, personal intranets, blogs /websites, e.g. YouTube), team collaboration tools, expert systems ,computer-aided systems/3d-models, simulation and games, decision support systems, problem-solving technology, learning materials (E-Learning), communities of practice (COPs)) and (C) combination (explicit to explicit; e.g. sharing best practice, knowledge databases, web-based access to data, intranet and internet pages and lessons-learned databases) as key tools to transfer knowledge between them. This seems to contradict many published research papers, in which the role played by ICTs in inter-organisational knowledge transfer is highlighted. Based on this finding, actors in international construction projects need to pay greater attention to the use of ICTs to transfer knowledge. Further proof of the advantages of using ICTs to acquire and transfer knowledge is provided below.

The second factor that was found to be critical in transferring crucial knowledge between partners in ICJV projects was "KT methods and mechanisms". All the participants from the three ICJV projects noted that they had used all four types of mechanisms to transfer knowledge between the partners, but especially socialisation (tacit-tacit) and externalisation (tacit-explicit) to transfer tacit knowledge. The further acknowledged that all four methods had played a pivotal role in the successful knowledge transfer processes in these ICJV projects. The majority of the key participants identified face-to-face communication, brainstorming, ad hoc meetings/minutes of meetings, regular/continuous meetings (especially weekly meetings), learning-by-doing, and mentoring and coaching as the most important KT methods and mechanisms for the transfer of knowledge and experience between the partners. Moreover, some of them proposed that video or telephonic communication, memoranda and letters, group meetings /team meetings, on-the-job-training and lessons-learned meetings were also crucial for the effective transfer of knowledge.

As explained above, KT methods and mechanisms play a vital role in the transfer of knowledge, skills and experience between foreign and local partners in ICJV projects. This correlates well with the research of [6], [10], and [28], who found that 'face-to-face interaction' and meetings played an important role in the process of transferring knowledge across projects. [10] also suggests that phone calls, teleconferencing, informal chatting, and storytelling are the four methods most used for sharing knowledge and experience within projects. Additionally, the findings of this study indicated that actors in some ICJV projects preferred to use socialising out-of-hours (lunch or coffee breaks) to exchange knowledge, especially in projects that were undertaken as a joint venture with a Japanese partner. [3] also argues that socialising out-of-hours is an effective KT mechanism. This may be because socialising out-of-hours offers a more relaxed atmosphere, which is more conducive to a discussion of prior experience since there is no hierarchy of team members in social settings. However, the interviewees in this study indicated that they had not used KT mechanisms such as storytelling, visiting colleagues/other projects/companies, visiting foreign companies and visiting plants or manufacturers in their ICJV projects. Interestingly, these results did not correlate with the research of [20], who found that 'storytelling' played a vital role and had a strong positive effect on exchanging complex ideas and disclosing knowledge.

Another important finding was that the use of ICT collaborative tools (e.g. expert systems, decision support systems, COPs, etc,) to transfer knowledge in these ICJV projects was not mentioned by the actors in this study. This contradicts many published research papers, in which ICTs are acknowledged as being important KT methods and mechanisms in international KT processes. Therefore, this finding highlights the need for greater attention to be paid to the use of ICTs to transfer knowledge in international construction projects as a beneficial mechanism to acquire knowledge, find solutions and make decisions, especially when the knowledge to be transferred is complex.

VI. Recommendation and Future Research

The purpose of this study was to identify and evaluate the processes of creating knowledge in International Construction Joint Venture (ICJV) projects in Thailand. Hence, it provided some new important insights and valuable lessons concerning the process of transferring knowledge in

ICJV projects and some limitations left fruitful avenues open for future research. As mentioned above, the sample in this study was restricted to one country (Thailand). Therefore, future research of other types of projects and environments (i.e. buildings) or other businesses would verify the findings of this study and may yield additional interesting and complementary insights. Conducting future studies into other types of projects or businesses would enable researchers to obtain an overall picture of the phenomenon or compare other areas and aspects for further examination.

Moreover, this study could be extended to investigate KT processes in ICJV projects in other developing and developed countries in the South East Asian region to develop a knowledge creation framework for ICJVs in that region for further examination.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

This study brings together the key concepts that relate to knowledge creation in ICJV Projects. It offers the establishment of specific knowledge creation of knowledge in ICJV projects in Thailand, and makes recommendations on how to use it for ICJV projects in Thailand.

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