

CAPACITY BUILDING IN EMERGING ECONOMIES THROUGH INTERNATIONAL CONSTRUCTION VENTURES- CASE STUDY OF THE NMPP PROJECT

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Although International Construction Joint Venture (ICJV) projects are believed to be beneficial with regard to aiding capacity building in the local construction industry, it is still debatable, whether such skills and technology transfer effectively occurs in the hosting companies in emerging economies. Substantial research on technology and skills transfer from developed country construction companies to emerging counterparts reveals worrying trends. South African construction companies are therefore not immune to these undesirable trends. Three main issues are dealt with in this paper: whether foreign partnering company have knowledge and technology that the local partner is lacking; how international construction joint venture projects are structured at delivery stage; and what are the key strategic elements of expertise transfer in an international construction joint venture project relating to organisational structure. The study used case studies to identify, analyze and establish the relationship between interaction in the work place and collaboration in job tasks. Finally, the paper proposes a conceptual project delivery structure that can accelerate the transfer of expertise in the South African Construction Industry (SACI).

Keywords: capacity building, knowledge transfer, international construction, joint venture, organizational learning, knowledge based views, South Africa

INTRODUCTION

A scrutiny of technology development across the world reveals interesting dynamics. According to Ray (2012), there are strong indications to suggest that the transfer of technology (TT) from developed economies to the emerging economies plays an important role in meeting the technological needs of the latter. He argues that a strict patent regime adopted by an emerging country encourages the transfer of the latest technology from the developed countries. When this scenario is taken at industry level, the specifics and dynamics of the industry influence the strict patent regime

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adopted at country level. The results reported in this paper focused on the South African construction industry (SACI).

According to the Construction Industry Development Board (CIDB) (2004), the performance and capability of the industry is pivotal to transport and communication, import and export, industry development, and to all the logistics of a growing economy that increasingly supports an integrated and economically active population. The SACI is considered to be one of the few African advanced construction industries and thus its role extends beyond the borders of South Africa to other countries across the continent, and the current African infrastructure backlog suggests that the SACI's role is more prominent across the continent today than ever before.

The findings of the Infrastructure Consortium for Africa (ICA) (2010) strongly suggest that inefficient and insufficient infrastructure holds back Africa's economic growth per capita by 2% each year, and reduces firms' productivity by as much as 40%. Thus, Africa will need to invest approximately 40 Billion US Dollars of annual investment in infrastructure over the coming decade and a further 40 Billion US Dollar worth of upkeep on existing networks [Organization for Economic Co-operation and Development (OECD) (2008)].

In order to meet the South African and African infrastructure demands, the SACI needs to possess sufficient competent skills, technology and resources capacity. According to Rwelamila (2006) and Merrifield (2006), the SACI is lacking experience, skills and technology to meet the demand for successful delivery of these projects both within South Africa and across the continent. Unless serious efforts are made to address capacity constraints, cost escalations and poor quality are likely to stifle growth going forward. Hence, the need to overcome the shortage of domestic skills and technology through joint ventures with overseas partners (Sewapaul 2007).

This paper aims to shed some light on the relationship between interaction in the work place and collaboration in job tasks. Although knowledge could potentially come from within the project or country, this paper focuses on international transfer of knowledge through joint ventures. It looks at how the relationship within the JV companies affects the sharing of knowledge and technology. To achieve this, the paper reviews theory and practice of TT and discusses the role played by the international construction joint ventures (ICJV) in the acquisition of knowledge and technology. Finally, the paper presents a case study to demonstrate how the gap identified through the synthesis and analysis of theory and practice of TT literature can be filled.

THEORY AND PRACTICE OF TT – EMPHASIS ON INTER-FIRM TT

According to Bessant and Francis (2005), studies on TT have primarily adopted “the economic trade approach” in developing a linear technology transfer model. Reflecting on the early 1980s research on TT, Hope (1983) observed that most research on TT emphasized the effectiveness of specific technologies that were being transferred within a broader context of economic development. Wahab, Rose and Osman (2012) further observed that the same emphasis dominated the 1980s research on TT from the strategic management perspective.

Post 1980s research took TT research to the next level with an emphasis on the significance of learning at the organizational level (Figuereido, 2001). Figueredo (2001) argued that learning at the organizational level should be considered as a key element in facilitating technology transfer. Thus TT models started to absorb the

principles of the organization development movement advanced by French and Bell (1995).

According to Wahab, Rose and Osman (2012), strategic management researchers have further contributed to the development of TT frameworks centred on the knowledge-based view (KBV) of the firm and organizational learning (OL) perspective. These perspectives have quite similar dimensions, in terms of the outcomes, processes, barriers and facilitators and have significantly contributed to the expansion of TT models. This is supported by the literatures from both KBV and OL perspectives that appear to subsume most of the contributions of the TT literatures (Daghfous, 2004).

It is important to note from a review of literature that the relevant theories and practices, which are found to be related to intra and inter-firm technology transfer, are the international trade theory, foreign direct investment (FDI) theory, resource-based theory, knowledge-based view of the firm perspective and organizational learning perspective. Some scholars apply the terms 'technology' and 'knowledge' interchangeably to establish a close association between technology transfer and knowledge transfer (Kogut and Zander, 1993; Sazali and Raduan, 2011). Due to a lack of space and brevity, only theory and practice literature within the research theme – inter-firm technology transfer is reviewed under this section from a selected few researchers. These were selected for their connection with organizational learning and knowledge based views, which are the focus of this paper.

Inter-firm technology transfer

Liao and Hu (2007) found that inter-firm technology and knowledge transfer are viewed as a process of inter-organizational learning. This view is consistent with Huber's (1991) work on organizational learning perspective, which emphasized knowledge acquisition by the organizations. There are strong indications to suggest that for some time, knowledge acquisition of new capabilities through organization learning has been recognized as conferring a sustainable competitive advantage on the firms (Bontis, Crossan, and Hulland, 2002).

A number of studies (for example Eisenhardt and Schoohaven, 1996 and Harrigan, 1988) have confirmed that the important tool for organization learning is through strategic alliance formed between different organizations. The formation of strategic alliances is motivated by a variety of technical and economic objectives. These may include the need to spread the costs and risk of innovation, economies of scale, access to new markets, the search for legitimacy and the acquisition of new technical skills or technological capabilities from alliance partners (Contractor and Lorange, 1998; Harigan, 1988).

Furthermore, researchers (for example Kogut, 1988) have argued strategic alliance provides an ideal platform for organizational learning, giving access to knowledge, skills and competencies of their partners. This is particularly true when two or more organizations are brought together because of their different skills, knowledge and strategic complementarities and in this way the inter-organizational learning process can occur through vicarious learning and grafting.

According to Huber (1991), vicarious learning occurs when organizations acquire knowledge through learning from the experience of other organizations. On the other hand, the grafting process enables the organizations to increase their store of knowledge by acquiring knowledge not previously available within the organization through mergers, acquisition and alliance (Huber, 1991).

From the knowledge-based perspective, Inkpen (2000) argued that organizations gain competitive advantage when they are able to acquire and transfer new knowledge from outside their boundaries. In their study on knowledge management processes and International Joint Ventures (IJV), Inkpen and Dinur (1998) suggested that strategic alliance offer organizations learning opportunity to the partners through several organizational arrangements such as JVs, licensing agreements, distribution and supply agreements, research and development partnerships and technical exchanges. They categorized organizational arrangements into two broad categories:

- Equity alliances - the transfer or creation of equity ownership either through direct investment or the creation of equity JV
- Non-equity alliances - where no equity transfer or creation of new organization is involved

Based on organizational theory, Kogut (1988) argued that strategic alliance through inherent long term partnering provides the partners opportunities to transfer embedded knowledge between them. Hence, strategic alliances create a cooperative, shared and mutual learning environment and effective transfer of knowledge.

In his work on learning through JVs, Inkpen (2000) suggested that strategic alliance act as a mechanism for competitive advantage where partners mutually aspire to achieving the individual and collective objective of the relationship. Pak and Park's (2004) empirical study on cross border knowledge transfer in international joint ventures with Korean partners found a positive relationship between equally shared JV and knowledge transfer. This was also confirmed by Lin's (2007) work in China, which found that the U.S management control on JV had a positive impact on the acquisition of managerial knowledge by Chinese partners.

A reflection on theory and practice of inter-firm TT

The reviewed literature above provides a sound cross-section of a plethora of dynamics in inter-firm TT, but clearly confirms the objectives of this paper: to address the gap and contribute to knowledge on inter-firm TT through ICJCV. There is no formally reported research conducted in South Africa, across the African continent or other developing countries on knowledge and technology acquisition and specifically on international construction joint venture projects. The research reported in this paper, which focuses on international construction joint venture (ICJV) projects, is thus considered the first in South Africa, Africa and within developing countries.

CAPACITY BUILDING IN ICJVS – THE CASE STUDY OF NEW MULTIPRODUCT PIPELINE PROJECT (NMPP)

The New Multiproduct Pipeline Project (NMPP) comprised the construction of approximately 700km of welded steel pipeline with new pump stations and storage terminals throughout the KwaZulu Natal, Free State, Mpumalanga and Gauteng provinces in the Republic of South Africa.

The Client (Employer) of the NMPP project was Transnet Pipelines, a division of Transnet Ltd which currently operates over 3,000km of pipelines in the Republic of South Africa. Transnet Pipelines' primary business involves the provision of infrastructure (pipelines, pump stations, storage tanks etc) for the transporting of petroleum products from various manufacturing facilities to the South African market places for its clients which include BP, Caltex, Engen, Sasol Gas, Shell and Total. At the time of this study, the NMPP project was valued at approximately 5 billion rands (625 million US dollars).

The construction of the NMPP project was undertaken by an integrated international construction joint venture partnership, involving Group Five (Pty) Ltd, a local South African engineering & construction company and Spiecapag, a French construction company. The joint venture was known as the Spiecapag/G5 JV. The joint venture was established so that the partnering companies could assist one another in their field of expertise in order to deliver the NMPP project, which is technically challenging. Spiecapag provided its technical expertise in pipeline installation, while Group Five (Pty) Ltd provided its local knowledge of South Africa, and the administration and financial support necessary in facilitating a project of that scale. The construction of the NMPP project commenced in August 2008 and at the inception of the study, progress was at 60% with final completion expected in May 2011.

While Spiecapag boasts a strong presence in the West African countries like Cameroon, Nigeria etc, it does not have previous operational experience in South Africa and the Southern African region as a whole. The NMPP project marks Spiecapag's first presence in the Southern African region and therefore a joint venture partnership with a well established South African company, Group Five (Pty) Ltd, acted as a facilitator for entry into new geographical market. Although Group Five (Pty) Ltd has previously been involved in pipeline construction projects via local joint ventures, it is still developing its standalone capabilities in pipeline construction, especially petrochemical pipelines. Therefore teaming up with a renowned international pipeline contractor like Spiecapag provided G5 with learning opportunities to build such capacity.

Case study analysis

The main hypothesis

Hmain: The ICJV structure that promotes joint participation of local personnel with expatriates in shared activities of the international construction joint venture project is positively correlated with the local company's level of skills and technology acquisition from the foreign partner.

Sub-hypotheses

Two sub-hypotheses were formulated from the main hypothesis and tested. The first sub-hypothesis is on the relationship between interaction in the work place and collaboration in job tasks:

H0: There is no significant relationship between collaboration in job tasks and the foreign employees' willingness to share their knowledge and technology with local employees

H1: There is a significant relationship between collaboration in job tasks and the foreign employees' willingness to share their knowledge and technology with local employees.

The second sub-hypothesis is on the relationship between collaboration in job tasks and sharing of knowledge and technology:

H0: There is no significant relationship between interaction in the work place and collaboration in job tasks.

H2: There is a significant relationship between interaction in the work place and collaboration in job tasks.

Research method design, research instruments and profile of respondents

Design of research method

The case study incorporated both qualitative and quantitative methods via a two-phase design. The research began with a quantitative study to assess the extent to which knowledge and technology acquisition occurs in the ICJV project. It was followed by a qualitative study to describe and analyse in detail the common drivers of knowledge and technology acquisition or lack thereof in the ICJV project in relation to its structure.

Design of research instruments and profile of respondents

A 44 question structured questionnaire was administered to the project participants - the philosophy and details of the instrument (including its administration) were reported in Rwelamila and Mkandawire (2010). Follow-up interviews were conducted to three focus groups each with not more than 20 people, in which open-ended questions were asked.

Profile of respondents

125 randomly selected employees in the Spiecapag/G5 JV within NMPP project were involved in the case study. As expected from a typical construction project in South Africa, the majority of respondents were male (82%). Respondent were categorised by management roles in three levels: non-management, middle management and senior management levels. Among respondents, 58 per cent were non-management, 33 per cent were middle and 9 per cent were senior management. The sample represents a fair distribution of management responsibilities in a typical organisation or project.

Summary of results

Table 1 presents key findings fundamental to understanding the relationship between interaction at work place and collaboration in job tasks. The Spearman's correlation statistics conform that both hypotheses were valid and that collaboration in job tasks is strongly linked to the willingness of the foreign employees' to share their knowledge and technology with local employees. Based on the sample of 125 respondents from this project, we can conclude the following:

1. As interaction among foreign and local employees increases in the work place, collaboration in job tasks also increases. Therefore, interaction of employees in the work place is vital to enhance collaboration in job tasks [Coefficient of Determination (r^2) = 69%; $p < 0.01$].
2. As the collaboration between local and foreign employees in job tasks increases the foreign employees are more willing to share their knowledge and technology with the local employees [$r^2 = 53\%$; $p < 0.01$].

Table 1: Pearson's correlation statistics (N=125)

Tested hypothesis		Spearman's correlation (r)	Sig (2-tailed)
H1	Correlation between interaction and collaboration	0.833	$p < 0.01$
H2	Correlation between collaboration and knowledge sharing	0.731	$p < 0.01$

The follow-up qualitative study further found that organization structure was a critical success factor for knowledge transfer to materialize, and that the local partner acquires enough knowledge and technology from the foreign partner if:

- The structure enhances project success. Project success, which is determined by factors such as cost, time, quality, utility, stakeholder management and health and safety, should not be hampered at the expense of knowledge and technology acquisition. JV partners were concerned with this
- The structure helps minimize the cultural shock period. The study established that regardless of whether the employees are foreign or local, they all go through a cultural shock period when mobilized together in a project.
- The structure emphasizes the sharing of the same project objectives. It was found that knowledge and technology sharing might become feasible when employees share the same project objectives. On doing so, employees bear the responsibility of achieving those objectives, and as a result, they find it compelling to collaborate in tasks and share information, knowledge and technology.

CONCLUSIONS

1. The importance of the JV structure: even though the primary rationale for adoption of the section-based structure is to facilitate knowledge and technology acquisition in an international construction joint venture project, the structure is also perceived to be pivotal to enhancing project success.
2. The need for integration: with the integration of local and foreign employees in one project section, the foreign and local employees will feel compelled to collaborate in job tasks and share knowledge and technology.
3. The importance of risk mitigation: in any international JV, the foreign partner is more likely to be risk averse than the local partner and hence will incline more towards adopting a structure that is more capable of mitigating project risks.
4. The importance of local partner commitment to knowledge and technology acquisition: the local partnering company should also show commitment to knowledge and technology acquisition to its employees.

RECOMMENDATIONS

Building on the key findings discussed above, a Section-based joint venture project structure was proposed to facilitate speedy acquisition of knowledge and technology in ICJV projects in South Africa. As indicated in Figure 1, a Section-based structure is recommended for international construction joint venture projects where knowledge and technology acquisition from the foreign partnering company become one of the objectives for a local company.

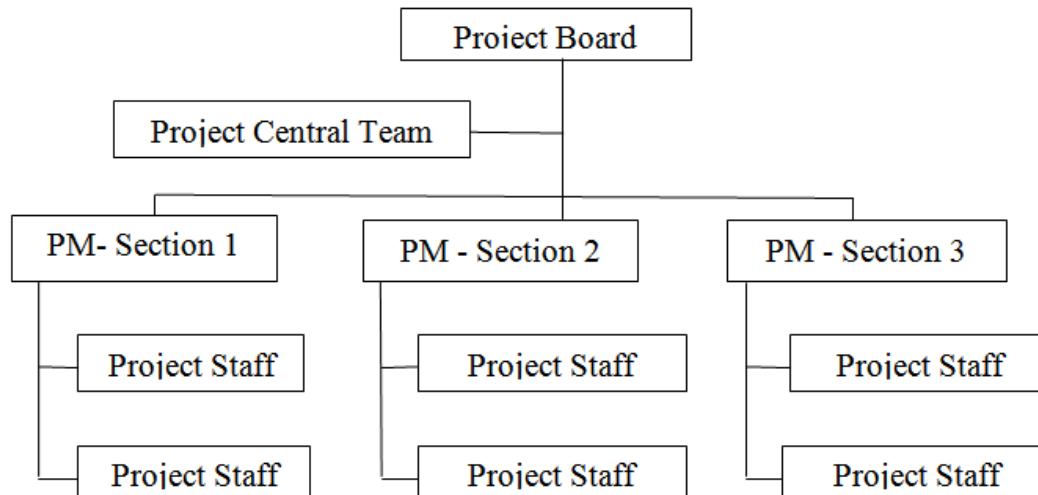


Figure 1: Section-based joint venture project structure

A Section-based structure should follow the establishment of the project's three chief layers:

- The project board will comprise senior management personnel from the head offices of the respective members. Its responsibility is to ensure that the objectives and interests of the partnering companies are well articulated in the ICJV and that the project receives the required support from the parent companies.
- The project central team comprises individuals from various departments (e.g. human resources, commercial, finance, safety, quality, engineering, IT, procurement, etc) who possess relevant qualifications and experience in their disciplines and have sound project management knowledge. Its primary function is to coordinate the various project sections and to execute activities that can be duplicated. The team will also execute other project activities, which could be outsourced from other organizations.
- The whole project is delivered by dividing it into sections. Each of the project sections is managed by a designated project manager, and depending on the size of the project, nature of the project and availability of resources the project sections may comprise full project scope or only specific tasks.

It is recommended that the project structure should be determined at the JV negotiation stage. Since the project is divided into small sections, the project managers have relatively smaller teams to manage and are closer to the teams. The Section-based structure integrates foreign and local employees from various disciplines into one project family. The greater integration in the teams will foster sharing of knowledge and technology - not as a need to teach the local employees but rather as a need to co-adapt. Therefore, this structure enfold and fulfils the principles discussed above, i.e. it facilitates knowledge and technology acquisition without jeopardizing project success, helps minimize cultural shock period, and puts emphasis on the sharing of the same project objectives.

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