Emerging contractors in South Africa: interactions and learning

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Abstract

Purpose – The South African construction industry is undergoing transformation. Part of this metamorphosis is the explosion in the number of “emerging contractors”. However, emerging contractors have a tendency to fail to develop into sustainable enterprises due to inadequate construction knowledge and lack of experience. These shortfalls can be potentially overcome by learning through appropriate interactions with others who possess the required knowledge and experience but there is an absence of comprehensive data about the form and frequency of such interactions and reliance has tended to be on small scale samples or anecdotal reports. The paper aims to address these issues.

Design/methodology/approach – A survey amongst emerging contractors on interactions in the civil engineering sector was carried out, collecting mainly quantitative but also qualitative data for analysis.

Findings – Significant relations between particular forms of interactions and knowledge perceived to be held by the respondents exist. Interdependencies between interactions and knowledge levels are present. Yet, the findings indicate that these interactions are not fully capitalised on in terms of knowledge gains by the respondents.

Originality/value – Using the conceptual framework of the Basho, as introduced by Nonaka, the knowledge of patterns of interactions with indicators of knowledge-interaction interdependencies are of interest. Mapping these allows for the relevant existing learning contexts and knowledge transfer mechanisms to be explored and described.

Keywords Learning organizations, Construction industry, South Africa

1. Introduction

Over the past two decades South Africa has undergone fundamental change. Not only is its society transforming from one segregated along racial lines to a more open and inclusive society, but also its economy is reflecting these social changes. Under apartheid the formal economy was controlled by white South Africans. In the post-apartheid democratic dispensation, emerging companies, owned and managed by historically disadvantaged individuals (HDIs), are increasingly engaging in the formal economy (Construction Industry Development Board (CIDB) and CETA, 2005). HDI is a collective term for those who were repressed under the apartheid regime – including non-whites, female, as well as disabled persons. This trend of an increased participation of HDI owned
companies entering the formal economy is primarily fostered through two governmental interventions.

First, the Broad-Based Black Economic Empowerment (BBBEE) Act of 2003 (Parliament of South Africa, 2003a) established a legal framework to empower HDIs. Together with this Act various affiliated documents were promulgated; such as codes of conduct published by the Department of Trade and Industry, as well as various industry transformation charters. At the heart of BBBEE is the intent to implement “[...] economic transformation in order to enable a meaningful participation of black people in the economy [...].” Specific goals under the BBBEE Act in relation to the construction sector have also been stipulated in the Construction Industry Empowerment Charter (CTCG, 2006). This includes the fostering of emerging HDI owned companies by means of mentoring, staff development, preferential use as suppliers, etc.

Second, the Preferential Procurement Policy Framework (PPPF) Act of 2000 (Parliament of South Africa, 2000b) regulates the award of contracts by use of a points system. This Act sets rules for public procurement processes and introduced, over and above price considerations, “specific goals” that have to be considered when awarding contracts. Such goals include contracting with HDIs. Thus, through the implementation of the PPPF Act access to governmental contracts was prioritised for HDIs, as a measure to address the imbalances created through the past.

By accessing this previously untapped entrepreneurial potential, South Africa is in a good position to further grow an economy that has grown in average by 5.1 per cent per annum in the years 2004-2007 (StatsSA, 2008). The construction industry in particular has seen tremendous growth in output of up to 21.3 per cent year on year (Mafu, 2007). Predictions based on expected infrastructure investments demands suggest that growth of the industry will remain at around 10 to 15 per cent (CIDB, 2007). This high demand on construction services in return translates into a high demand for skills and capacity to deliver these goods, with an construction industry already lacking these (Sunday Times, 2006; CIDB, 2007; Lawless, 2005).

Newly formed enterprises often fail to turn into sustainable companies with many failing during their first five years of existence (Legum, 2006) and the South African construction sector is no exception (CIDB and CETA, 2005; Phaladi and Thwala, 2008). This high failure rate adds to the pressure on the sector and infringes on its overall capacity; capacity required to satisfy the country’s needs for built infrastructure.

Previous work by others (Shakantu et al., 2006; Van Wyk, 2003) has investigated external barriers to growth for emerging companies. External barriers explored include difficulties in accessing finance, in securing contracts due to a highly competitive market for smaller contracts, and legal barriers (Shakantu et al., 2006). However, through government intervention some of these external barriers are being addressed (CIDB and CETA, 2005). The establishment of the CIDB through the CIDB Act (Parliament of South Africa, 2000b) forms part of the effort to assist emerging contractors to develop into sustainable entities. Contractor development is at the core of the CIDBs function. In particular the CIDB introduced a contractors register, which sees contractors registering in certain categories of work (civil, building, electrical, etc.) and capability depending designation grades. On this register a designation grade 1 contractor would be a contractor with low capabilities, financial and technical, and a grade 8 contractor would represent a highly capable contractor. Using this register public contracts in South Africa are now allocated only to companies which fulfil given criteria showing
the capability to perform a contract. The large amount of competing companies for contracts is thus being reduced through a pre-qualification process; lowering the overall risk of project failures through the engagement of over-ambitious contractors.

Factors internal to emerging contractors that contribute to failure have also been identified (Cattell, 1994; Forrest and Osborn, 2006; Phaladi and Thwala, 2008) and these include, *inter alia*, unprofitable tender prices, abuse by main contractors, poor general management, technical difficulties as well as “fronting”. Fronting in a South African context is understood to be a contravention against the purpose of BBBEE (Parliament of South Africa, 2003b), in which companies appear to be owned and managed by HDIs, but are essentially managed and owned by white South African – a form of window-dressing. Underlying most of these factors is the problem of a general lack of knowledge; deficiencies in the knowledge of pricing procedures, contractual rights and obligations, management techniques and principles, technology, as well as general law. Thus, the factors observed that contribute to these business failures can be seen as symptoms of a more entrenched issue around the level of knowledge possessed within an enterprise and any deficiencies within that knowledge. Any meaningful intervention to build the delivery capacity of contractors thus has to address “knowledge”.

Mentoring schemes, government-funded workshops and short-courses are just a few of existing interventions that have been employed to assist emerging contractors to gain knowledge (CIDB and CETA, 2005). These schemes rely to a large extend on learning within a framework of instructivism. Instructivism sees a teacher-type entity holding knowledge and transferring in particular the explicit knowledge through formal instructions to the student. However, with many of the required skills and understanding of processes being tacit rather than explicit (Polanyi, 1966) these efforts are likely to fail to transfer the entire bouquet of knowledge required which comprises both tacit and explicit elements. Yet the transfer of knowledge can also occur in more subtle ways, with a lesser degree of instruction and a higher degree of interaction, learning-while-doing and working alongside others (Styhre, 2006). These transfers allow for explicit and tacit knowledge to pass between parties (Patriotta, 2003).

The promulgation of the PPPF Act and the Construction Industry Empowerment Charter (CTCG, 2006) created a legislative environment that encourages established contracting entities to work alongside emerging enterprises. Such arrangements could be utilised for knowledge transfer from established to emerging contractors. With the creation of a suitable framework for the learning process by the emerging party, these learning opportunities could be enhanced. A wider research project, of which the presented data here forms part, is currently underway investigating contexts of learning as well as mechanism of knowledge transfers involved. The objective of the study reported upon here is to investigate, map and describe current forms of interactions of companies within the industry which might facilitate knowledge creation. The results presented thus relate to companies in the South African construction sector and how they interact. As such it seeks to provide a solid foundation for subsequent investigations into the learning environments in the South African construction sector, founded a scientific systematically collected data set, rather than relying on anecdotal evidence and small scale studies. In doing so the focus is on the wider context of possible knowledge transfers, as opposed to the actual mechanisms of knowledge transfer. The more direct contexts of knowledge transfer mechanisms form part of the subsequent phase of the wider research project, which
utilises qualitative methods and is not reported here. The findings provide a better understanding of the current wider contexts of learning on a macro level – contexts which already exist and within which learning takes place.

2. Organizational learning

Emerging contractors need to gain knowledge that will foster their sustainability and competitiveness in the marketplace. The mechanisms of learning are somewhat different depending on whether an organizational (Argote et al., 2000) or an individual (Maschke, 2005) approach is taken. Small and micro emerging contractors typically employ only a few permanent staff members and a cohort of project-based hired employees. It is thus the owner who is often the key player and who is acting as an individual in the marketplace. As with any other business activities, the impact of this (key) individual on organizational learning ought to be of significance and must be addressed (Dodgson, 1993).

Reviews of organizational learning have been done by Fiol and Lyles (1985), Levitt and March (1988) and Dodgson (1993). Argyris and Schön (1978) developed the concept of “loop-learning”; comprising learning and a degree of reflection on the lesson learnt. Levitt and March (1988) are often cited and provide a widely accepted approach to organizational learning, namely; “learning by experience”. In the field of construction, organizational learning is often addressed through research in innovation (Suresh and Egbu, 2006; Hartmann, 2006) and knowledge management (Palaneeswaran et al., 2004).

Love et al. (2000) review learning in construction but focus on total quality management and the need to learn from mistakes. Regardless of whether one is dealing with an individual or an organization, or whether learning is innovation or quality driven, it is widely accepted that the context in which learning takes place plays an important role (Dodgson, 1993). Thus, a first step in enhancing learning is to ensure an understanding of the existing contexts within which learning currently takes place so that a suitable framework for such learning, considering the circumstances and characteristics of emerging contractors, can be established.

2.1 Learning vs improving

The level of learning required for developing emerging contractors needs to be considered. Love et al. (2000) focused on highly formalised construction companies, where the aim of ongoing learning and quality is to improve existing systems and knowledge. In contrast, emerging contractors, who often lack pre-existing knowledge (and experience) that can act as a resource to be questioned and improved upon, would be unable to rise to the same, high level of learning. Similarly, it can be argued that deliberate proactive actions, as proposed by Argyris (1977) and Argyris and Schön (1978), where the main intention is to remain competitive, are also beyond the immediate aims of emerging contractors; namely to learn and reach a stable point on the “Survival stage” of Churchill and Lewis’ (1983) model of small business growth.

Neither the approaches of Levitt and March (1988) nor the approach of Argyris and Schön (1978) address learning circumstances comprising of situations of interaction with others. However, it is these interactions where a highest potential for learning experiences by the emerging contractor reside. Thus, learning models that look at internal learning exercises, such as self-evaluations for quality purposes, are not suitable to examine the learning processes expected in established-emergent
interactions as these processes are induced from outside the enterprise. A more appropriate approach to investigate the characteristics of knowledge transfer though interaction is the SECI model of Nonaka and Konno (1998). Here the socialization and externalization in a setting, called the “Ba”, which includes both role-players holding the knowledge and others not holding this knowledge as yet, is key to learning. In this model the various distinguished Ba’s rely on interactions of mainly individuals. In fact, the very notion of the Ba with its various levels, including individuals, groups and organizations, make this theoretical framework of learning ideally suited to examine the learning situation experienced by emerging contractors in project settings. The Ba is the first level of the context of learning, directly linked to the learning process itself, with interactions on individual levels.

2.2 The context of learning
The context of learning is crucial in order to foster a high quality learning experience. As for the main determinant for the success of co-operations or partnerships (Cheng et al., 2000), the context will determine the success of learning (Argote et al., 2000; Nooteboom, 2001) too. The predominant management culture and similarities (Darr and Kurtzberg, 2000; Booyse, 2000), the stage of development (Argote and Ingram, 2000), the role of individuals (Starbuck, 1992), the existing (social) network (McEvily and Zaheer, 1999; Fu et al., 2006) and articulated goals (Lyles and Salk, 1996) all play a critical role on how (well) organizations learn. Learning must be seen in a context and needs a platform. Levitt and March (1988) focus on the “ecology of learning”. The ecology of learning can be equated to the environment in which learning takes place. Levitt and March specifically emphasise the competitive environments of the learner and their willing or unwilling interactions with other competing firms. In construction this context could be made up of projects and networks within the industry, e.g. supply chains (Agapiou et al., 1998). In the words of Nonaka and Konno (1998) this environment or context can be described as the “greater Ba” or “Basho”, which is the market environment of the (learning) organizations, here interactions on an organizational level occur. The greater Ba might be suitable and promote learning by the organizations involved, or it might inhibit learning. The context might advance particular role players in terms of knowledge, or it might not.

Collaborations, one form of interactions on the level of the Basho, between an established contractor and an emerging contractor may contribute to capacity building by means of acquisition of knowledge and skills by the junior partner (Nooteboom, 2000), or it may merely be a business relationship without any sustainable advancement of the junior partner. The result is highly dependent on multiple factors and in particular on the context of learning (Nonaka, 1991). The types of collaboration, with their respective contractual frameworks, and thus the contexts of learning can vary and might influence the learning experience. While there are various types of possible collaborative agreements (Kululanga et al., 1999), the following types of collaborations are typical for emerging contractors to engage in CIDB (2004) – forming the Basho:

- joint ventures (JV);
- subcontracting – being the subcontractor; and
- subcontracting – using subcontractors.

Furthermore, plant hire arrangements should be added to this list. Anecdotal evidence suggests that many established companies work as plant hire companies for smaller
companies often supplying trained operators in addition to plant, but not in a subcontractor capacity. Here also a high potential of learning from experienced partners exists alongside opportunities of fronting.

3. Methodology

3.1 Approach

In order to achieve the objective of mapping and describing patterns of forms of interactions amongst contractors, a broad-based survey amongst CIDB registered civil engineering contractors was conducted. Civil engineering contractors were targeted because civil engineering contracts typically involve a lower number of specialised trades and subcontracts. By focussing on the civil engineering sub-sector with inherently fewer interactions it was expected that greater clarity would be possible on the actual interactions that occurred within this sub-sector. Furthermore, since the bulk of civil engineering work is public in nature, the database is a realistic proxy for the civil engineering industry as a whole. The objective to describe current patterns of interactions of companies within the industry at a macro level, the Basho for knowledge creation, demanded a descriptive approach based largely on quantitative data. Through descriptive statistics, patterns of interactions as well as parallels of particular findings can be presented. However, some aspects and supporting information for the study were better captured through qualitative data. Data sought were in respect of existing knowledge levels amongst emerging contractors as well as their use of particular forms of collaborations with other companies. The former yields insights on knowledge and knowledge creation, whilst the latter provides an overview on patterns of interaction amongst contractors – describing the Basho. Emerging contractors were here defined as construction companies owned and managed by HDIs, which have not yet succeeded in developing into major companies showing all signs of maturity as defined by Churchill and Lewis (1983). The knowledge of existing patterns and relationships to knowledge already held by the interviewees will enable the researchers to identify and analyse typical interdependencies. Knowing these typical settings also allows the researchers to further explore these in a subsequent phase of the above briefly described wider research project.

3.2 Method

A computer assisted telephonic survey was carried out. The sample selection was in accordance with a proportional stratified sampling method comprising CIDB registered civil engineering contractors in the designations Grades 1 to 4 (work up to ZAR 3 m). At this level of registration a high number of emerging contractors could be expected. At the time of the survey a total of 2,638 contractors were registered in these designations in the civil engineering category. In order to ensure that the survey was representative a sample size of 20 per cent was selected. Thus, a total of 528 contractors were randomly selected and contact attempted. A maximum of three attempts, during differing times of consecutive days, were made. Approximately, 25 per cent of the contractors could not be reached using the registered telephone numbers and a further 22 per cent were unwilling to participate in the survey. Some respondents were not compliant with the used definition of emerging companies or were also not listed as potentially emerging within the CIDB register. These cases were excluded from the analysis. The vast majority of respondents were the owners of
the respective companies (93 per cent). Where this was not the case assurance was
given that the respondent, typically administrative staff, had sufficient insight into the
companies’ history. The response rate after adjustments was 50 per cent.

Following a literature review on organizational learning, addressing mechanisms
and contexts of learning, a questionnaire was developed. The questionnaire was put
through a number of iterations and trial runs. An initial questionnaire was tested using
academic staff and contractors known to the research team. Following this a computer
interface to the database for data entry was developed. Thereafter a further pilot
sample of ten contractors were contacted telephonically and the questionnaire,
interface and database tested before the survey tool was finalised. The trials ensured
that questions asked were clear, yet capturing the required information, and that the
flow of the interview was appropriate.

The questionnaire was structured in four sections. An introductory and consent-
to-participate section was followed by a section capturing the particulars of the
interviewee. A third section dealt with the developmental status, size and
experience, of the company. Here, the respondents were also asked for a self-evaluation
of knowledge and experience, based on a five-point Likert scale, in five fields, namely
tendering, planning and organizing, dealing with supply chain, financial management
and technical abilities. The final section concentrated on co-operations and interactions
with other entities and completed the interviews. The results of the later two sections
and their analysis form the basis of this paper.

The type of data collected was primarily quantitative, but allowance for qualitative
data arising from some open-ended questions was made. Further, interview summaries
written by the trained interviewers were encouraged. Here problems with interviews,
particular information given by interviewees beyond the structured questionnaire were
recorded. Some of the qualitative data were later grouped, coded and categorised in
order to analyse this together with the quantitative data using SPSS Version 15.0.

4. Results and interpretation
In the following section, results of the survey are presented. First the existing,
perceived knowledge levels, based on a self-evaluation by the respondents are
presented. This section is followed by the description of existing patterns of
interaction. In the last section, knowledge levels and interactions are combined and
interpretations of these findings are made.

4.1 Knowledge
Interviewees were asked to assess their knowledge in five fields of tendering, planning and
organizing a site, dealing with the supply chain, financial management and technical
abilities. The self-assessment utilised a five-point Likert type scale (1 ¼ no experience to
5 ¼ a lot experience). The average assessment for all fields was on the better side, ranging
from 3.3 for financial management to 3.7 for supply chain management (Table I).

A chi-square goodness-to-fit-test for a uniformed distribution was made for each of
the assessments. All the p-values for this test showed values of less than 0.05. It is
evident that a trend towards the mean across the respondents existed, rather than a
uniform distribution of answers. This indicates that the contractors were consistently
assessing themselves across the five field of knowledge as being slightly on the
better side of the scale (means ranging from 3.26 to 3.69 with overall mean of 3.45).
Further a reliability test across the assessments of the different fields of knowledge showed a homogenous result with a Cronbach’s alpha of 0.706 which is deemed to be acceptable (George and Mallery, 2003). This indicates that the contractors were viewing their capabilities across the five fields of knowledge fairly consistently.

A test of independence between the variables, using the Pearson chi-square test, was conducted between the assessments of knowledge across the five fields of knowledge. The chi-square test can be used for different types of data (Leedy and Ormrod, 2005), since the order of the variables in the used contingency table does not affect the result. In this case the various counts (frequencies) of the given answers were used for the calculations. If the chi-square test reveals no significant event (p-value greater than 0.05), it can be assumed that the underlying null-hypothesis — data represented in row and columns are unrelated — is true. If significant events are detected this null-hypothesis can be rejected.

For the contingency table to show the required minimum number of five entries in each cell, the five-point Likert scale was reduced to a three-point Likert scale. This reduction procedure is generally accepted to avoid small frequencies in contingency tables used for the chi-square test (Chase, 1967). The lower two and the higher two scores were combined, respectively. The resulting p-values for the chi-square test are shown in Table II, values of less than 0.05 are considered to be significant and are marked italic in the table. The p-values generally follow a homogeneous pattern of being less than 0.04. The underlying null-hypothesis that the various knowledge fields are unrelated can thus be rejected. This indicates that the contractors thought of themselves as fairly well-rounded contractors. However, one exception was noted: no significant event was computed for the combination between the assessments of the ability to plan a project and of the ability to manage the finance of a company (p-value of 0.363). This suggests that a large number of the contractors interviewed had not been able to combine their planning knowledge with the financial side of running their company; two business disciplines that are crucially interdependent.

<table>
<thead>
<tr>
<th></th>
<th>Tendering</th>
<th>Planning and organizing</th>
<th>Supply chain management</th>
<th>Financial management</th>
<th>Technical abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.34</td>
<td>3.57</td>
<td>3.69</td>
<td>3.26</td>
<td>3.41</td>
</tr>
<tr>
<td>SD</td>
<td>1.298</td>
<td>1.297</td>
<td>1.335</td>
<td>1.347</td>
<td>1.302</td>
</tr>
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</table>

<table>
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<tr>
<th>Chi-square test p-values</th>
<th>Planning and organizing</th>
<th>Supply chain management</th>
<th>Financial management</th>
<th>Technical abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendering</td>
<td>0.000</td>
<td>0.000</td>
<td>0.002</td>
<td>0.000</td>
</tr>
<tr>
<td>Planning and organizing</td>
<td>–</td>
<td>0.000</td>
<td>0.363</td>
<td>0.000</td>
</tr>
<tr>
<td>Supply chain management</td>
<td>–</td>
<td>–</td>
<td>0.034</td>
<td>0.000</td>
</tr>
<tr>
<td>Financial management</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.039</td>
</tr>
</tbody>
</table>

Table I. Knowledge levels – self-evaluation

Table II. Pearson chi-square test: p-values for independence test amongst knowledge fields
4.2 *The existing Basho*

The interviewees were asked about their links to other companies and if they have worked in any of the described collaborations (e.g. JV, etc.) before. To further gauge the nature and extent of the collaboration, contractors were asked to classify the status of their most recent partners as either established or emerging companies (Table III). No definition of emerging’ or “established” partner was presented to respondents, as it was expected that respondents would know how to differentiate between the two using their own criteria. This was confirmed during the interviews where some respondents asked for affirmation of their correct interpretation. A total of 50 contractors had no experience with any type of collaboration described above, suggesting that they may not have engaged in any kind of projects as of yet. A total of 214 contractors (81 per cent of total) had experiences in engaging with other companies.

Collaborations with established companies are of particular interest to the research. A total of 295 incidences of collaborations in the forms of either; JV, being a subcontractor, or using a subcontractor, were identified for which the respective status of the partners were known. A total of 141 (47.8 per cent) of these collaborations were collaborations with established contractors. Given the need for a large capital base to buy and maintain plant, plant hire companies are likely to fit the description of established companies. Thus, the level of interaction between established and emerging firms constitutes a significant proportion, i.e. two-thirds, of all the interactions reported. Additionally, given the relatively small number of established contractors in South Africa, a high degree of interaction between established and emerging contractors undoubtedly exists.

Only 28 per cent of the interviewees stated that they have worked in JV previously. Of these JV 63 per cent were made up by emerging firms partnering with another emerging company, and 37 per cent of the JV formed between emerging and established companies. Asked if the contractors have worked as subcontractors before, 45 per cent of the sample respondent in the affirmative. A high percentage of companies working as subcontractors for established companies (71 per cent of all subcontracting companies, equalling 31 per cent of all interviewed companies) was noted. This high number could be due to BEE policies in which contractors are encouraged to engage with black-owned contractors within their supply chain (CTCG, 2006). Furthermore, the same ratio of subcontracting can also be found for emerging contractors using subcontractors themselves. Out of the 41 per cent of contractors who stated they have used subcontractors before, 71 per cent of the respective subcontractors were emerging companies. More than half of the entities

<table>
<thead>
<tr>
<th>Type of collaboration</th>
<th>In collaboration before</th>
<th>Status of partner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>JV</td>
<td>191</td>
<td>72.3</td>
</tr>
<tr>
<td>Being the subcontractor</td>
<td>144</td>
<td>54.5</td>
</tr>
<tr>
<td>Using a subcontractor</td>
<td>157</td>
<td>59.5</td>
</tr>
<tr>
<td>Using plant hire</td>
<td>118</td>
<td>44.7</td>
</tr>
<tr>
<td>Totals</td>
<td>610</td>
<td></td>
</tr>
</tbody>
</table>

Table III. Collaborations and status of partners

Notes: *Three respondents could not provide details of status of partners; †two respondents could not provide details of status of partners
(55 per cent) use plant hire companies in their contracts – using a form of established “subcontractor”.

Drawing from the frequencies of interactions recorded above, two forms of collaborations would be particularly of interest for targeted initiatives to make an impact on fostering knowledge transfers between established and emerging contractors in their “natural” setting. These are emerging companies working as subcontractors for established contractors, and companies using plant hire services.

4.3 The ontological dimension of learning
In the learning model developed by Nonaka (1994), social interaction is crucial for the learning process. Nonaka refers to this as the “ontological dimension” of knowledge creation. The interaction of individuals is crucial to the knowledge creation process. Such interactions in construction can stem from the four main types of collaborations mentioned above. By testing for independence of the occurrences of the type of collaborations and the level of knowledge of the individuals in the five fields of knowledge and experience mentioned earlier, some significant (Pearson chi-square \( p \)-values, \( 0.05 \)) events were found (Table IV).

A further level of analysis saw the selection of cases in which collaborations were acknowledged; within these cases a Pearson chi-square test between the level of knowledge and the status of the partners were conducted. This was not done for the cases of interaction with plant hire companies, as all these companies can be considered as being established partners. By testing the levels of knowledge against the status of the partner it can be determined if working with an established and working with an emerging partner would reveal a difference in the perceived knowledge levels. For this analysis the previously reduced three-point Likert scale used for the knowledge assessment was used again to enable a valid contingency table and analysis thereof. The \( p \)-values for this Pearson chi-square test is shown in Table IV – listed in parentheses. Significant events (\( p \), \( 0.05 \)) are marked italic.

The events with significant chi-square \( p \)-values point to a relationship between the type of collaboration and the level of perceived knowledge held within the interviewed companies. Where a \( p \)-value of less than 0.05 was noted the chi-square table was examined. All these tables followed a similar pattern. A clear pattern of having been involved in a type of collaboration and the higher ranking on the Likert scale for the perceived level of knowledge exists. The question of “what was first?” can be raised. Does knowledge lead to an increase in the numbers of collaborations engaged in, or vice versa?

<table>
<thead>
<tr>
<th>Field of knowledge</th>
<th>Type of collaboration (status of partner)</th>
<th>JV (0.532)</th>
<th>Being the subcontractor (0.341)</th>
<th>Using a subcontractor (0.415)</th>
<th>Using plant hire (0.264)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendering</td>
<td>0.097</td>
<td>0.178</td>
<td>0.001</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Planning and organizing a site</td>
<td>0.422</td>
<td>0.288</td>
<td>0.005</td>
<td>0.000</td>
<td></td>
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<tr>
<td>Supply chain management</td>
<td>0.327</td>
<td>0.040</td>
<td>0.009</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Financial management</td>
<td>0.871</td>
<td>0.162</td>
<td>0.061</td>
<td>0.035</td>
<td>0.108</td>
</tr>
<tr>
<td>Technical abilities</td>
<td>0.775</td>
<td>0.025</td>
<td>0.033</td>
<td>0.682</td>
<td>0.054</td>
</tr>
</tbody>
</table>

Table IV. Pearson chi-square: \( p \)-values for knowledge vs collaboration and status of partner.
However, the homogenous pattern in the self-assessments across the five knowledge fields discussed earlier must be considered. Assuming that knowledgeable contractors choose particular types of collaborations, then significant events across a particular type of collaboration (columns in Table IV) can be expected. This is not, however, the case. Thus, although this would require further tests, from the absence of such homogenous significant events within types of collaborations, it can be derived that through particular types of collaborations particular knowledge can be gained. Thus, collaborations lead to an increase in knowledge. It must also be noted that while some links between types of interactions and perceived knowledge exist, no link of these significant events and the status of the partner, emerging vs established, is found in any of the respective instances.

Interestingly, no significant relation between the level of perceived knowledge in any field and engagements in JV can be found. The absence of this might reflect observations of an earlier study by Müller and Martin (2006), who reported that JV between established and emerging companies were often superficial in that the emerging partner was “unimportant to the daily decision making process” – with no learning resulting. The lack of learning opportunities in JV is also echoed elsewhere (CIDB and CETA, 2005) and might explain the absence of any significant relation here. Consulting Table III it must also be noted that 63 per cent of JV are formed amongst emerging contractors, and as such opportunities to learn from the experience of others might be absent due to cognitive proximity (Nooteboom, 2000). This, taken this point to the extreme, could imply that no interaction, in which any knowledge could have been transferred, occurs in any JV partnerships in general.

A significant relation of the experience of being a sub-contractor and dealing with the supply chain exists (p-value of 0.04). Two possible explanations could be given for this. First, it might be that only contractors with a track-record in construction, and thus experience with dealing with any kind of supply chain, get awarded subcontracts. Or second, and more likely in the light of the above discussion, that typical low margins in subcontracting force contractors to develop skills in dealing with their own respective supply chains to ensure profitability; dealing with the supply chain forces contractors to learn.

Noteworthy is the relation of being a subcontractor and the level of knowledge in the technical field (p-value of 0.025). Subcontracts are often awarded for small trade specific portions of the main contracts. Thus, a learning experience could be of a particularly high quality and intensity (Nonaka, 1994) related to the particular technical field. Yet also here testing differences in knowledge due to the status of the partners, revealed no dependency of perceived knowledge level and the status of partner. This could suggest that any main contractor, independent of the respective status, challenges the technical expertise of subcontractors and produced quality; subcontractors are required to cope with the technical challenges presented to them and thus learn.

The statistically significant events in using subcontractors, as well as using plant hire companies, when relating to tendering, planning, and organizing, and management of the supply chain, are not unexpected. First, a degree of understanding contractual relationships, as well as organizational and managerial implications is required in order to engage with other companies in a project. Second, where this knowledge was not present, it would require the entities to engage on a steep learning curve when
interacting with another company. Or put differently one can hypothesise that particularly management knowledge in these three fields gain the most when dealing with the supply chain due to this interaction.

The difference in significance of the relations between technical ability vs subcontracting on the one side, and technical ability vs using plant hire, might reflect the ways in which subcontracts, as opposed to plant hire contracts, are executed. Subcontractors might be more closely followed and checked upon by the main contractors, resulting in more interaction on site. Plant hire companies, often established companies, on the other side might not be monitored as frequently giving less exposure to learning opportunities.

Two significant \( p \)-values for the tests on the status of the partners in the collaborations vs knowledge levels are interesting. Both cases relate to perceived knowledge in financial management. The one case refers to the respondents working as a subcontractor (\( p \)-value of 0.012) and the other case using a subcontractor (\( p \)-value of 0.035). The chi-square tables were examined and showed clear trends. In the former case respondents who worked for established main contractors before rated themselves higher with regards to knowledge in financial management. In the latter case, seeing respondents using subcontractors, the trend showed that a higher rating was achieved in the cases where the subcontractor were emerging companies. This difference can also be seen in Table V, in which the mean scores for the respective cases are listed.

Owing to the absence of any statistically significant difference in knowledge levels in this particular field, whether having engaged in subcontracting or not (Table IV), makes it difficult to comment on this. The observed significant differences due to the status of the partners point to differences on how financial matters are dealt with depending on the type of collaboration and the status of partner. However, any reasoning here would be conjecture. The general wide absence of relations between knowledge levels and the status of partners within collaborations is evident. This suggests that although collaborations, particularly between established and emerging partners, are present, these interactions with a high potential for learning are not capitalised on.

By analysing the qualitative data recorded by the interviewers on additional comments made, it becomes evident that the interviewees often deliberately seek out contact with other companies. This is partially reported to be an effort to get access to contracts, but also to access knowledge and experience of contractual partners. In a few cases the willingness of established contractors to assist the interviewees to develop knowledge and “mentor” these were reported upon by the interviewees. In these cases collaborations in form subcontracting and learning form the main contractors, as well as JV partners in particular were mentioned.

<table>
<thead>
<tr>
<th>Financial management knowledge – grouped mean scores</th>
<th>Status of partner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Established</td>
</tr>
<tr>
<td><strong>Type of collaboration</strong></td>
<td></td>
</tr>
<tr>
<td>Working as subcontractor</td>
<td>3.52</td>
</tr>
<tr>
<td>Using subcontractor</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Table V. Grouped mean scores for financial management knowledge
5. Conclusion
If South Africa is to succeed with its ambitious growth targets a broadening of the base of companies supporting such growth is mandatory. This is particularly true of the construction industry if the industry is to meet demand for construction services. Emerging companies can contribute to the expansion of this needed base. However, in order to achieve this expansion the low level of competency amongst new emerging companies needs to be addressed. This survey, with its relatively high response rate and representation of the smaller civil engineering contractors around South Africa provides some valuable insights to this sector of the industry relating to existing knowledge levels and their interactions with and exposure to other companies. It is argued here that learning by the emerging companies can occur during collaborations with other companies, particularly if the other party has knowledge to share. These collaborations form the context of learning mechanisms and such learning mechanism are dependent on the existing contexts.

Existing, frequently occurring interactions between emerging and established companies are the engagement of plant-hire companies by emerging main contractors, as well as emerging contractors working as subcontractors. Significant patterns between perceived knowledge levels amongst emerging contractors to types of collaborations engaged in exist. Owing to the nature of the survey presented, dependencies cannot be fully described. However, the perceived well-roundedness in knowledge of the respondents with a lack of consistent relations to types of collaborations engaged in, are indicators that knowledge can be gained through particular forms of collaborations. It is not one type of collaboration that can address all the fields of knowledge required to become a sustainable company. It is much rather different types of collaborations that appear to yield knowledge creation in particular fields. The collected qualitative data supports the suggestion that a knowledge gain occurred through collaborations with others. Furthermore, drawing upon earlier work (Müller and Martin, 2006) and the literature (Argote et al., 2000), some indication exists that collaboration with others can yield a knowledge gain of the emerging partner. The relations presented here require further in-depth investigations for other possible dependencies. Specifically, the wide absence of a relation between knowledge levels and the status of partners in the various types of collaborations indicates that knowledge transfers, particularly from established companies to the emerging companies, is lacking. Here transfer mechanisms and learning processes may be inhibited despite the fact that these interactions hold the greatest potential for knowledge gains by the junior partners (Nooteboom, 2000).

Having identified the patterns of frequent interactions within the construction sector, it is now possible to target types of frequent collaborations for in-depth qualitative investigations. Of particular interest are cases where a significant relations of perceived knowledge and type of frequent collaboration were observed, i.e. working as a subcontractor and using plant hire companies. Existing transfer mechanism of knowledge and skills within these collaborations can be explored and described, leading to a better understanding of learning processes benefiting the emerging partners. Based on this it may be possible to improve both the transfer mechanism and their immediate contexts, fostering emerging contractors. Together with the knowledge of which type of collaboration can assist contractors to learn in particular fields of knowledge, tailor-made programs fostering such learning by placing contractors into collaborations could be designed in future.
Emerging contractors in South Africa
Emerging contractors in South Africa