BARRIERS TO GROWTH AND DEVELOPMENT OF LOWER CIDB GRADE CONTRACTORS

Research Report

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Declaration

This research report (course code BUQS 7027) is submitted as part of meeting the requirement to fulfill Master of Science in Building (Construction Project Management) at the Witwatersrand University.

I declare that this report is entirely my own work except for specified acknowledged references to the published work of others.

I confirm that no part of this report has been submitted to any other institution for academic award of any kind.

Signed at Johannesburg

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Date Adetayo Kuju

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Abstract

Literature is replete with what constitutes barriers and challenges to the development of small, mid-sized and micro enterprise (SMME) contractors, often referred to as emerging contractors. The International Labour Organization (1987) proposed three solutions geared towards contractor development in developing countries. This research alludes to the importance of understanding the South African context wherein these proposed solutions are operational. The research begins with efforts made by the new democratic government, post 1994, to addressing the institutionalised inequalities - legacies of the previous regimes (colonization and apartheid) - via black economic empowerment, preferential procurement and construction industry development board (CIDB) legislations amongst others. The CIDB was instituted to promote amongst others the sustainable participation of emerging contractors in the construction industry; it is in this context that the national contractor development programme emerged. This research concerns itself with matters of knowledge or lack thereof as the underlying factor responsible for underdevelopment of emerging contractors. To do this, it looks at knowledge theories including its creation and transfer mechanism vis a vis organizational learning in an attempt to answer the question of nature and characteristics of learning in a specified contractor development programme (CDP).

This research is a cross-sectional study that lends itself to an interpretivist paradigm and inductive logic with qualitative methods (semi-structure interviews). This research does not cover mentorship and its theories. It also does not cover issues of improvements to knowledge transfer between emerging contractors and mentor-engineers.

The research concluded that much as knowledge transfer was observed within the contractor development programming, it occurred within a context and was content specific. However it is difficult to describe knowledge transfers in its entirety as it is multi-layered in nature and complexity of the make-up of emerging contractors and their interactions

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List of Acronyms

BBBEE	Broad-Based Black Economic Empowerment
BCI	Black Construction Industry
BER	Bureau of Economic Research
CDP	Contractor Development Programme
CETA	Construction Education and Training Authority
CIDB	Construction Industry Development Board
GEAR	Growth Employment And Redistribution
GDRT	Gauteng Department Of Roads and Transport
HDI	Historically Disadvantaged Individual
ILO	International Labour Organisation
IMF	International Monetary Fund
LIC	Labour Intensive Construction
MIN-MEC	Minister-Member of Executive Committee
NCDP	National Contractor Development Programme
NQF	National Qualification Framework
PE	Potentially Emerging
POE	Portfolio of Evidence
PPPF	Preferential Procurement Policy Framework
RBT	Resource Based Theory
RISFSA	Road Infrastructure Strategic Framework for South Africa
SA	South Africa
SACPCMP	South African Council for the Project and Construction Management Professions
SECI	Socialization Externalization Combination Internalization
SMME	Small Medium Micro Enterprise
StatsSA	Statistics South Africa
TDP	Targeted Development Programme
TRH	Technical Recommendation for Highways

1 Introduction

1.1 Background and context of study

This research examines the contractor development programme of the Gauteng Department of Roads and Transport with a view to reviewing the programme components, currently experienced nature of knowledge transfer (between learner contractor and consultant mentor-engineers) to better understanding, in other to achieve desired results of growth and development of emerging contractors in the construction industry with an emphasis on the civil engineering sub-sector.

The South African economy has, post 2009, been on a slow economic recovery following the 2008 global financial meltdown, with an economic growth rate of 1,3 % reported by Stats SA for 2015 and less than 1 % projected for 2016 (BER, 2016). This is a sharp decline compared to the 4, 8 % average growth achieved from 2003 - 2008 (Martin, 2010). It is within this economic context that the construction industry is located. Subsequent to the attainment of the post-1994 democratic dispensation, the South African government has tried to address racially based inequalities (in income, education & training, social services etc.) - a characteristic of the society which was a legacy of the past apartheid government - through legislation, policies, and regulations, (Construction Charter BBBEE 2007). Individuals previously marginalised by the apartheid regime referred under post-1994 legislation as Historically Disadvantaged Individual (HDI) consist of non-white racial groups, peoples with disability and women with low skills levels (Martin, 2010), to this effect the South African Constitution gives effect to redressing historical inequalities (via provisions of Section 9) and preferential procurement (Section 217). The Preferential Procurement Policy Framework Act (PPPF Act 2000) allows for 90:10 or 80:20 points scoring system on public procurement where 90 or 80 points are for price and 10 or 20 points for preferential points subject to the value of the public project, and more recently preferential points were amended (in 2011) by the Broad Based Black Economic Empowerment (BBBEE) Scorecard - as envisaged under the PPPF Act 2000 and BBBEE Act 2003.

Freund (2007) indicated that consequent upon governments' development initiatives post 1994 including but not limited to Growth, Employment and Redistribution-GEAR 1996 and its willingness to use fiscal benefits and generous budgets to address problems of poverty in the country, many new small and mid-sized (SMME) construction entities emerged. Around 2000 the Construction Industry Development Board (CIDB) was established under act of parliament to provide strategy for growth and development in the construction industry, as many of these small

entities struggled to develop (CIDB 2004). To further strengthen its capacity to deliver, the CIDB more recently was charged with monitoring and assessing levels of expenditure (through main contracts) on black, women and youth-owned construction enterprises (CIDB Compliance Monitor, 2014).

The importance of small and mid-sized contracting entities (such as 'emerging contractors') to the socio-economic development of any country cannot be over emphasized; as such literature is replete with consequences of a lack of development of small and mid-sized contractors and factors responsible for such underdevelopment (*e.g.* Eyiah and Cook, 2003). Adams (1997), Ofori &Chan (2001), Eyiah & Cook (2003), Martin (2010), and CIDB (2012), further list some of these factors as lack of knowledge in terms of managerial skill and technical capacity; inability to obtain contracts; persistent delayed payment by major clients; lack of access to finance / deliberate refusal to repay loans. The ILO (1987) cited in Adams (1997) suggested three proposals necessary for small contractor development in developing countries:-

- Policies promoting access to work;
- Policies promoting favourable work environment;
- Programme and policies for training and technical advice.

Much of the first two proposals has been alluded to previously. The CIDB's Contractor Development Programme seeks to address the third; however it's important to state the context of the development programme. In order to tender in South Africa for public projects, contracting companies must register with the CIDB. The CIDB register is divided into work categories (civil, building, electrical, mechanical *etc*.) and groups' contractors in these categories under nine grades according to project size and complexity expressed in Rand value such that only contractors on a particular grade may tender for projects identified for that grade or lower. Thanks to low entry barrier to the industry as initiated by CIDB the number of CIDB grade 1-2's registered contractors is substantially greater when compared to higher grade registered contractors of grade 8-9 (CIDB, 2012). Martin & Root (2012) allude to the reasons why shortage of skills persist in the South Africa construction sector on the one hand, and, the effects of the ravages of economic meltdown post 2009 resulting in liquidations / insolvency and inactive entities – all of which speaks to the sustainability or lack thereof of emerging contractors, on the other hand. Consequently in 2008 the Public Works MIN-MEC (Minister-MEC forum) mandated the CIDB to design and implement a National Contractor Development Framework applicable to all registered contractors in the country.

In 2011 the National Contractor Development Programme (NCDP) framework was established by CIDB in conjunction with National Public Works Department.

The NCDP Summary Framework 2011 defines Contractor Development as a deliberate and managed process to achieve targeted developmental outcomes that improve contractors;

- Grading status;
- Performance and quality;
- Equity and targeted ownership.

The objectives of the programme are to promote equity ownership of contracting entities (across the grades and categories) and improve skill and performance in the delivery and maintenance of capital projects in the public sector. The main components of NCDP consist of:

- Learnership programme for new entrants or start-up targeted at grade 1-2 contractors;
- Enterprise Development targeted at grade 2-6 contractors, and;
- Performance improvement targeted at grade 4-7 contractors.

In partnership with National Public Works Department, the Gauteng Department of Roads and Transport's (GDRT) Contractor Development Programme (Vukuphile Learnership Programme) commenced in October 2013 upon selection of pairs of 29 learner supervisors and learner contractors entities on CIDB 1 and 2 CE for a 36 months duration, (27 nos. on grade 1 and 2nos. on grade 2) for routine road maintenance activities on provincial RISFSA Class 5 & 6 roads. (TRH 26, 2012).

The contractor development programme aimed to:

- Provide class room training and construction site assessment (in the first 12 months of the programme) with a view to obtaining CETA approved NQF level 4 certificate upon completion;
- Achieve higher grading status for all participants with a view to exiting programme at CIDB grade 4 - 6 by embarking on multiple projects in the last 24 months of programme, and;
- Profit saving for entire programme duration to be shared between each pair of learner supervisor and contractor on completion.

To this end; the following services were procured as additional capacity to the Department's to ensure implementation of programme:-

- Civil Engineers appointed by GDRT act as principal agent for quality works supervision;
- Consultant Mentors to be appointed by public works department as mentors to impart knowledge and transfer skills to each learner contracting entity (managerial and technical). These consulting mentors were eventually not appointed to mentor the learner contractors, resulting in civil engineers appointed to supervise performing mentorship duties;
- Training service provider appointed by public works to conduct classroom training and subsequent on-site assessment, and;
- Nedbank in partnership with programme to provide initial capital (for site establishment) and profit savings investment product.

Martin (2010) reported in his research that the pervasive and persistent lack of knowledge was underlying most of the factors listed earlier as causing underdevelopment amongst emerging contractors, thus resulting in business failures. These lacks of knowledge includes amongst others, pricing knowledge, contractual rights and obligation, law, management techniques and technical deficiency etc. As such any meaningful effort (such as the NCDP) at capacity building of emerging contractors intended to transform the industry must address the issue of knowledge.

Gould & Powell (2004) indicated in their paper that knowledge is best described in terms of its characteristics rather than by definition that expresses the value and characteristics that make it difficult to manage: "*fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knowers. In organizations, its often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms." (page185).*

Explicit and tacit knowledge as explained by Nonaka & Takeuchi (1995) popularised the understanding of how knowledge is managed. Explicit knowledge is formal and can be specified in rules and procedures and can be easily communicated. Tacit knowledge is less specifiable and is held by individuals or collectively as shared experiences – the nature of tacit knowledge makes it less easy to transfer. The theory of knowledge creation as explained by Nonaka & Takeuchi's SECI model will be further discussed under literature review – it essentially explains people sharing tacit knowledge which is converted and combined into individual tacit knowledge through "learning by doing". The content and context of learning are important to consider when investigating how knowledge is created (Lang, 2001). Nonaka & Takeuchi's use of explicit and tacit knowledge is one of many of characteristic used to define knowledge (Gould & Powell, 2004).

Martin (2010) surmised that literature around knowledge and its creation can be divided into four major groups of organizational learning; learning organization; organization knowledge and knowledge management. Emerging contractor companies are by definition at the start of their organizational development often lacking not only knowledge, but also resources – being typically understood to be small start-up entities with the owner as core member – organizational learning becomes key for them to survive.

1.2 Problem statement

Substantiation

Much of the discussions in the preceding paragraphs alludes to steps taken by the South African government towards transforming the construction industry - from the PPPF Act & BBBEE Act which allows for preferential points on public construction tenders for HDI's, to the CIDB mandate of compliance monitoring. According to CIDB (2012) report on Contractor Development and Transformation:

- The industry is characterised by few large (Grade 7-9) companies with substantive financial and technical resources and thanks to low barrier to entry, a host of smaller enterprises (Grade 1-6) who often face financial and managerial difficulties;
- Over 70% of cidb registered contractors are located in the lower level of Grade 2-4 with project value of R650, 000 – R4m;
- Over 80% of government infrastructure spend is on Grade 7 and higher (with project value of R13m and larger) and about 30% of which is on Grade 9 (R130m and larger) -these projects are typically larger, complex, requiring financial resources, technical and management skills;
- Only 20% is spent on projects less than R13m (Grade 6 and lower) and 6% of which is spent on projects less than R4m (Grade 4 and lower), and;
- Whilst majority of enterprise are black owned (75% of Grade 1-6 and 55% of 7-8) in the lower grades, less than 20 % is black owned in the Grade 9) suggesting the problem of development or lack thereof of emerging contractors still persist.

It's important to acknowledge that studies have been done on contractor development including studies on cooperation and mentorship between emerging contractors and established contractors as a means of transferring knowledge and skills. However cooperation between established and emerging contractors might also just be a business relationship where no sustainable knowledge is

gained (Martin, 2010). Not much has been documented and written in terms of the knowledge transfer within a specific intervention programme such as the contractor development programme in South Africa. As such, possessing a description of current knowledge transfer would contribute to the better understanding of the interaction (between consultant mentor-engineers and emerging contractors) and their potential to advance emerging contractors. Descriptions and understanding of knowledge transfers could then be used to develop more suitable contexts for knowledge transfers, by capitalizing on the already existing interactions (Martin, 2010).

It is an accepted fact that emerging contractors are faced with varying challenges, wherein training and development is identified as one required and necessary intervention amongst many. The Contractor Development Programme's targeted vehicle for delivery of learnership programme - direct incubator - allows for consultant 'mentors' – who's practitioners are regulated by the statutory body; SACPCMP. Consultant mentors were not appointed under the GDRT contractor development programme. Consequently it is vital to know what is the nature of knowledge transfers as its might hold interesting insight on how it's currently being transferred.

The following is thus the question for this research:-

> *What is the nature and characteristics of learning (knowledge transfer) under the contractor development programme and how can the learning experience be enhanced?*

1.3 Research aim and specific objectives

By adding to the body of knowledge and in consideration of the South African context of emerging contractors (Martin, 2010) this research aims to:

> *Describe the context of knowledge transfer between learner contractors and consultant mentors-engineers and actual transfers of knowledge thereof (ie to contribute to a better understanding of currently experienced knowledge transfers).*

Ofori & Chan (2001) assert that literature suggests the process of contractor development should include various initiatives that range from those relating to the contractors entities themselves, their resources and rest of industry to contractors operation environment. The bulk of earlier discussion centres on emerging contractors prevalent HDI status, persistent lack of resources, and CIDB's regulatory environment. CIDB 2012 report suggests not much gain is made towards objective of attaining status of 'serious industry players' for emerging contractors. With knowledge been

identified as one key problem areas the following objectives assist in asserting the aim of this research.

- Describe the characteristics of participating learner contractors entities;
- Outline the organizational interactions of the participating learner contractors' entities;
- Identify and describe nature of actual learning experience (knowledge transfer) under the programme, and;
- Description of the characteristic of organizational interactions wherein knowledge transfer occurred.

1.4 Limitations and assumptions

This study examines the contractor development programme of the Gauteng Department of Roads and Transport with a view to reviewing the programme components, currently experienced nature of knowledge transfer (between learner contractor and consultant mentor-engineers) to better understanding, in order to achieve desired results of growth and development of emerging contractors in the construction industry; as such:

- The study is limited to the 29 pairs of participating learner contractors and supervisors of the Gauteng Department of Roads and Transport's Contractor Development Programme – CDP - (Incubator Model);
- The nature of works undertaken under the CDP was civil engineering related (routine road maintenance activities) as such less complex when compared to building. Additionally the lines of communications, and thus opportunities to interact, are expected to be less layered in the civil engineering as opposed to the building sector. The civil engineering sector poses a clearer demarcation of the respective roles within contracts and interaction thus appears to be simpler allowing the knowledge transfers to be more easily isolated for description. Possible extrapolations of reported research findings to the building sector must be carefully scrutinized for their validity and applicability. (Martin, 2010);
- Consultant mentors were not appointed, resulting in appointed supervising engineers performing some mentorship duties;
- Actual improvement to knowledge transfer needed between emerging contractors and consultants mentor-engineers in a CDP is beyond the scope of this study. This research also does not cover mentorship and its theories, and;

- It is assumed that some form of selection criteria was embarked on, in choosing participants at start of CDP, thus alluding to characteristic of participating learner contractors entities.

1.5 Structure

This research will be presented in 5 Chapters:

Chapter 1 consists of the introduction to the study alluding to the background and context of the study, the research problem and research question including aim and objectives.

Chapter 2 entails the literature review with the objective of reviewing existing literature and theoretical framework in research that underscores the topic of knowledge creation and organizational learning such that its findings are affirmed in the conclusion. (Nkojo, 2012). It reviews literature regarding South Africa's construction industry constituent (established / emerging contractors / cidb / consultant mentor), its background, history, current legislation and status quo.

Chapter 3 describes and justifies the research paradigm, research design and methodology, including ethical considerations.

Chapter 4 present the survey findings, with conclusion of the findings presented in *Chapter 5.*

2 Literature Review

2.1 Objectives of literature review

The main objective of this section is to review existing literature and theoretical framework in research that underscores the topic of knowledge creation and organizational learning such that its findings are affirmed in the conclusion. (Nkojo, 2012). Initially this research would review literature regarding South Africa's construction industry constituent (established / emerging contractors / cidb / consultant mentor/engineer), its background, history, current legislation and status quo.

Grant (1996) hinted that knowledge is central to the research tradition of organizational learning (amongst others), as such, this review will move to further address knowledge creation and transfer mechanisms vis a vis organizational learning and its applicability thereof to the emerging contractors, consultant mentor-engineer construct, bearing in mind its unique characteristics. Concepts of knowledge creation; knowledge application; knowledge transfer & sharing leading up to a summary of the varying views espoused by scholars will be reviewed, in an attempt to show the import and necessity of knowledge creation, transfer and organizational learning to the research problem discuss.

2.2 Introduction

Martin (2010) posited that the South African construction industry needs to be viewed within a historical background. This background consist previous Apartheid Government's systemic disenfranchisement of the majority black population resulting in lack of opportunities in education & training, income & finance and social services. The dawn of the new constitutional democracy in 1994 ushered in change and transformation via economic empowerment of HDI's. Construction industry development and the drive to transform the construction sector are part of an ongoing transformation and expansion process across the whole of South Africa's economy. Economic empowerment of HDIs companies is at the core of this process, in an effort to address the wrongs of the past; this however might not be sustainable without addressing systemic 'carry overs' of the past, such as lack of knowledge and skill base of the empowered HDI companies. The research problem area is thus located within this background.

The literature review was done by narrowing in on particular subject areas via journals in search for relevant contribution. Access to these sources was sought through online catalogues and databases

available through the libraries of the University of Witwatersrand. In cases in which direct access to sources was not possible inter-library loans were requested. The internet served as a secondary source of information. From here access to South Africa-specific information, such as government publications, was achieved.

2.3 Contractors in South Africa

Background

Martin (2010) suggested that it was important to delve into a brief history of South Africa that has relevant bearing on the research. To this end, it was narrated that in 1652 western societies (Dutch East India employees) set up a station in today's Cape Town, eventually colonising the Cape in their bid to sail around the Cape of Good Hope on their journey to the east. Along with colonization by the first European settlers came the concerted effort to segregate the various races in the Cape by the planting of the almond and thorn-bush hedge "to ensure safety". Gevisser (2007) indicated that the subsequent Native Land Act of 1913 forbade tenant farming and did away with individual tenure, thus forcing black people into cheap and manipulative migrant labour system – setting the tone for decades of economic disenfranchisement.

Formalised racial segregation began after 1948 when apartheid was institutionalized by the coming into power of the National Party (Gevisser, 2007). Non-whites such as Native Africans, Coloureds and Indians were classed in different groups, and land for their respective settlements was allocated through the Group Areas Act (South Africa, 1950). Alongside segregation came pass laws. Building upon pass laws already designed in colonial times these laws were designed to foster and manage a pool of cheap black labour and control the flow of this labour (Siebert, 1986). Although Apartheid ideology tried to find justification by referring to racial differences, economic reasons to advance the white minority are seen as key drivers of Apartheid policies (*ibid*.). Martin (2010) indicated that laws were designed to exclude non-white entrepreneurs from the formal economy – enforced through the pass laws – making the labour force exclusively available to the white economy. It was only in 1979 that black people were again allowed to manufacture goods, albeit restricted to their designated areas.

Education was another cogent policy of the Apartheid state, through the Bantu Education Act 47 of 1953 (South Africa 1953) the then Minister of Native Affairs, HF Verwoerd, introduced an education system which would see differing levels of education and funding of schools for the different races in South Africa - 6 times more funding was provided for white schools. (Gevisser

2007, Southall 2016). Bantu Education was opposed by the non-white population, and by some non-racist whites, throughout its existence. This resistance as suggested by Martin (2010) resulted in strikes and turmoil across the country, which further enhanced the mal-education of the masses as often no teaching took place at all. These education laws were only fully repealed through the introduction of a single education system in 1995. Thus their legacy is still part of many South Africans' lives with a divide in educational levels amongst the various races. The years of racial segregation, racial oppression and racism have left behind a country with enormous inequalities

Construction Industry

Post 2008 global financial crisis, the South African economy like many developing countries' economies is currently confronted by severe difficulties owing to a combination of lower commodity prices, higher energy costs, falling exchange rates and rising inflation. At the same time the country is faced with immense social problems (inequality, poverty and youth unemployment) putting pressure on the nations resources and capabilities. The construction industry in SA is facing reduced level of demand post 2010 world Cup infrastructure build, due to slowdown in government infrastructure projects. The challenge is that construction industry should do well despite the severe constraints in its operation environment. Moreover the industry must help the SA economy recover and contribute to easing the social problems (Ofori, 2000). This fact is not lost on Gordhan (2016), when he stated in his article that yet again the IMF and World Bank have lowered economic growth forecasts for major economies and the global economy, highlighting just how challenging the global growth climate is. Prompting the IMF & World Bank to develop a multi-pronged potential solution – one of which includes; implementation of structural reforms needed to lift economic growth. These include investment in infrastructure – to this effect, over the medium term R180 billion is budgeted for energy investment. This includes the build programme of Medupi, Kusile, and Ingula power plants alongside strengthening transmission and distribution grid. Ofori (2000) suggested that avenues must be found to take advantage of the special features of construction which offers unique opportunities to create jobs, stimulate growth and development

Established & Emerging Contractors Features

Murray & Appiah-Baiden (2000) observed that globalization of the South African economy and improvement in transport and communication; large international contractors are able to operate in any country. This evidently is not helpful to the economies of the developing countries as it means bleeding off of scarce foreign currency, on one hand and local established contractors been unable to compete with the large international contractors due to their superior human, material and

financial resources. They described a contracting entity in two extremes - one, as a former artisan who organises a group of colleagues to build a house and the other as an international organization that employs 100,000 people with an annual turnover of US$ 15billion. Either way, all contractors should have knowledge (know-how) of management, personnel, materials, plant & equipment, and finance. International contractors often leverage this exposure for advantageous prices. They further reiterated that a number of well-established South Africa contractors existed and expanded in a closed, booming home market which was not exposed to external competition, but are now sourcing work outside South Africa in competition with larger international contractors, albeit with its own set of challenges.

Emerging contractors fall under the wider, often used description of Small Micro Medium Enterprises (SMME). The National Small Business Amendment Act of 2003 classifies Small Micro Medium Enterprises (SMMEs). Table 1 illustrates how SMMEs in the South African construction industry are classified based on employee numbers and turnover.

Table 1 National Small Business Amendment Act, 2003

Size	**Total Full time, Equivalent of Paid Employees**	**Total Annual Turnover**
	Less than	***Less than***
Medium	200	R26 m
Small	50	R6 m
Very small	20	R3 m
Micro`	5	R0.2 m

Martin (2010) argued that an industry which traditionally has a high number of small businesses, a differentiation based on size, expressed by number of employees and/or turnover, is insufficient to make a judgement on the established or emerging character of the organization, a view reflected in the CIDB (2014), Construction Industry Development Board Regulations attempt to identify potentially emerging (PE) contractors according to the following criteria:

- Ownership (previously disadvantaged individuals);
- Equity (majority held with previously disadvantaged individuals – minimum 50 per cent);
- Level of authority of previously disadvantaged individuals in daily operations, and;
- Level of authority of previously disadvantaged individuals in directing the general operations of the company regarding financial and managerial.

As stated earlier emerging contractors globally are faced with similar diverse challenges as enunciated by Adams (1997), Carradine & Logie (2000), Murray & Appiah-Baiden (2000), Ofori & Chan (2001), Eyiah & Cook (2003), Martin (2010), and CIDB (2012), these include but not limited to, lack of knowledge in terms of managerial skill and technical capacity; lack of experience, inability to obtain contracts; persistent delayed payment by major clients; lack of access to finance / deliberate refusal to repay loans. The ILO (1987, cited in Adams, 1997), suggested the following proposals necessary for small contractor development in developing countries:-

- Policies promoting access to work;
- Policies promoting favourable work environment, and;
- Programme and policies for training and technical advice.

Earlier in 1996 the Black Construction Industry (BCI) - an organization of emerging contractors formed in 1995 carried out a national survey (1500 sample size), to ascertain the make-up of its members and challenges faced at the dawn of new democracy. The report can be seen as a snap shot of the status of emerging black contractors at the time. It indicated amongst others that levels of formal education were low with only 13% of emerging contractors had matriculated, and 30% had a Standard 5 (Grd 7) education. (BCI, 1996)

The new SA has encouraged the development of SMME contractors by HDI entrepreneurs, who are mainly non-whites that was marginalised under the *Apartheid* regime and excluded from participating in the main stream of construction industry. The advent of a new democratic government ushered in transformation policies that encouraged development of emerging contractors. (Murray & Appiah-Baiden, 2000). Martin & Root (2012) allude to the reasons why shortage of skills persist in the South Africa construction sector and the effects of the ravages of economic meltdown post 2008 resulting in liquidations / insolvency and inactive entities – all of which speaks to the sustainability or lack thereof of emerging contractors.

2.4 Empowerment

It's vital to highlight current empowerment and affirmative action legislation environment in SA in light of the foregoing discuss. Equality for all was the major tenet of new SA democratic government ushered in 1995 (South Africa 1996a). The Constitution allowed for correcting inequalities and injustices of the past by making provisions for preferential procurement (Section 217 of Constitution relates to the procurement policies for any organ of state and specifies that governmental procurement needs to be *"fair, equitable, transparent, competitive and cost-*

effective"). The Preferential Procurement Policy Framework Act (PPPF Act 2000) derived from Section 217 makes provision for 90:10 or 80:20 points scoring system on public procurement where 90 or 80 points for price and 10 or 20 for preferential points subject to the value of the public project. Individuals previously marginalised by the Apartheid regime referred to as Historically Disadvantaged Individual (HDI) consist non-white racial groups, peoples with disability and women with low skills levels. The South African Government has subsequently implemented the Broad-Based Black Economic Empowerment (BBBEE) Act of 2003. Together with this Act various affiliated documents were promulgated; documents such as codes of conduct published by the Department of Trade and Industry, as well as various industry charters. (Martin, 2010). 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…"* (South Africa, 2003a). While both the PPPF Act and the BBBEE Act are designed to address the inequalities existing within South Africa, their combination is the main tool used by the South African government for addressing this issue.

2.5 Construction Industry Development Board

The Construction Industry Development Board is a Schedule 3a of the Public Finance Management Act 1 of 1999 (South Africa, 1999) public entity. The Board is appointed by the Minister of Public Works on the basis of their knowledge and expertise with the objectives as defined in the CIDB Act 38 of 2000 to provide strategic leadership in the construction industry, provide regulatory framework for social and economic development and promote sustainable participation of the emerging sector in the industry amongst others. (South Africa, 2000). To this end, as stated earlier a register of contractors is maintained - since 2005 all contractors engaging in public contracts are by law compelled to register with the CIDB. However some exemptions exist, such as registered homebuilders, and contractors who predominantly supply labour only services. The CIDB register is divided into work categories (civil, building, electrical, mechanical etc.) and groups' contractors in these categories into nine grades according to project size and complexity expressed in Rand value. Thanks to low entry barrier to the industry as initiated by CIDB the number of CIDB grade 1-2's registered contractors is substantially greater when compared to higher grade registered contractors of grade 8-9 (CIDB, 2012). The registration of contractors per grade however is not fixed, as they can move to a higher grade designation subject to their proven track record on existing grade. Martin (2010) suggested this system makes room for targeting of contractors with requisite knowledge and experience by public agencies, resulting in a more reliable and efficient public procurement. .

Contractor Development Programme

As indicated earlier the Public Works MINMEC (Minister-MEC forum) mandated CIDB in 2008 to design and implement National Contractor Development Framework applicable to all registered contractor in the country. In 2011 a National Contractor Development Programme (NCDP) framework was established by CIDB in conjunction will National Public Works Department. NCDP Summary framework 2011, defines Contractor Development as a deliberate and managed process to achieve targeted developmental outcomes that improve contractors;

- Grading status;
- Performance and quality;
- Equity and targeted ownership.

The objectives of the programme are to promote equity ownership of contracting entities (across the grades and categories) and improve skill and performance in the delivery and maintenance of capital projects in the public sector. The main components of NCDP consist:-

- Learnership programme for new entrants or start-up targeted at grade 1-2 contractors;
- Enterprise Development targeted at grade 2-6 contractors, and;
- Performance improvement targeted at grade 4-7 contractors

Figure 1:-Showing Components of NCDP (Source: CIDB)

Two models for delivery of CDP are recommended by the CIDB (2014). The first is the Direct Targeting Model (incubator) and is the Contractor Development Programme (of GDRT) under review. The second is the Indirect Target Model wherein under the Targeted Development Programme (TDP) potentially emerging status contractor are procured via open tender for a project

one grade above their current status. The common denominator between the two models is the provision of support mechanism to emerging contractors in the form of training and mentorship. It is within this context of CDP that emerging contractors interact with mentor-engineer.

2.6 Consultant Mentor-Engineer

To get an understanding of "mentorship", a brief intro into what constitutes mentorship will be dealt with in this paragraph, without going into detail of mentorship theories and school of thought as this is not what this research is primarily concerned with.

Njoko (2012) traced the roots of mentorship to the ancient Greece, as an honourable duty leading up to the medieval trade guilds, where guild masters were responsible for the professional skills of protégés including social, religious and personal habits. He surmised that mentorship is a theme prevalent in human resource management used to serve different purpose – career development to affirmative action, usually related to situations in which formal learning outcomes are neither absent nor unstated.

Kleovoulou (2007) defined mentoring as the process that is about enabling and supporting major change in people's life and work. This process should encourage new perspectives, changed ways of thinking and deeper self-knowledge. Stanz & Mosoeunyane cited in Njoko (2012) defined mentoring as a process involving a dynamic and reciprocal relationship in a work environment, whereby more advanced and wiser career incumbent assists a less experienced person to develop in some specified category. Furthermore, mentors guide, support and counsel. Parsloe cited in Njoko (2012) views the purpose of mentoring as that of helping and supporting people to manage their own learning in order to maximise their potential, develop their skills, improve their performance and become who they want to be. The common thread in the above definitions is the emphasis on knowledge transfer, motivation, support, level of trust and communication with mentees.

It is against the foregoing backdrop that the consultant mentor under this Contractor Development Programme was designed to function. As allude to earlier, the consultant mentors were eventually not appointed by the client bodies that undertook the CDP, consultant civil engineers and training service providers were however appointed and performed duties as highlighted previously - as such this research shall show the nature and characteristics of learning that persisted under the 3 year Contractor Development Programme. Suffice to state that the South African Council for Projects and Construction Management Profession maintains and updates a register of Professional

Construction Mentors legally permitted to render the construction mentorship service (SACPCMP Act 48, 2000).

2.7 Knowledge

Stenmark (2000) indicated that the managing of knowledge has been employed by masters training their apprentice and parents teaching their children from long ago and that knowledge in recent times has become more important to business and industry, shifting from being one resource amongst many to being the primary resource, ever since man first shared the knowledge of how to make fire with his fellow human beings, as such knowledge management as a concept has become a hotly debated topic. Gould & Powell (2004) alludes to the value in organisations' stocks of knowledge and a need for researchers to step back and try to understand the nature of organisational knowledge. Spender cited in Stenmark (2000) stated that in the knowledge management discourse the positivistic view of knowledge as an objectified and monistic absolute truth have been abandoned for a pluralistic epistemology, acknowledging that there are many forms or types of human knowledge.

Knowledge Creation & Typologies

Davenport *et al* cited in Gould & Powell (2004) offer a description of knowledge in terms of its characteristics rather than by definition that expresses the value and the characteristics that make it difficult to manage: "*fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knowers. In organizations, its often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms."(ibid:185)*

Grant (1996) explains that understanding the characteristics of knowledge and their implications for management is more important than a definition of knowledge. Machlup cited in Grant (1996) listed thirteen different 'elements of knowing' including; being acquainted with, being familiar with, being aware of, remembering, recollecting, recognizing, distinguishing, understanding, interpreting, being able to explain, being able to demonstrate, being able to talk about, and being able to perform.

The 'knowledge-based' theory of the firm derives from resource-based theory (RBT). RBT emphasises the role of capabilities and competences and attempts to explain why some firms are able to gain competitive advantage. RBT perceives the firm as a collection of resources and

capabilities. Those that are inimitable, offer access to markets and add value to the product are source of sustainable competitive advantage. Exponents of RBT agree that knowledge is strategically a most important resource as it is scarce, difficult to replicate and transfer, and gives rise to complex appropriability issues (Grant, 1998). Grant (1996) argued further that the issues with which the knowledge-based theory concerns itself are to address some other fundamental concerns of the theory of the firm, notably the nature of coordination within the firm, organizational structure, the role of management and the allocation of decision-making rights, determinants of firm boundaries, and the theory of innovation.

Meng & Gao (2003) observed that the knowledge dichotomy of explicit and tacit dimension was proposed by Polanyi in the 1950s, Nonaka in 1991 made use of the concept in his theory of knowledge creating company that highlighted role of tacit dimension of knowledge in the process of organizational knowledge creation in Japanese companies. Nonaka (1994) and Nonaka & Takeuchi (1995) contend that the theory of organization has long been dominated with a view that organization processes information or solves problems imposed by the environment *i.e.* 'input – output process sequence of hierarchical information process – in terms of what is given to the organization, without consideration for what is created (information and knowledge) by the organization. Otherwise how do we explain innovation (which is organizational knowledge creation) in light of the information processing or problem solving view point? They further described innovation as a process in which organization create and defines problems and then actively develops new knowledge to solve them – buttressing that organization should be viewed from how it creates information and knowledge rather than how it processes it.

Nonaka & Takeuchi (1995) indicated that organizational knowledge creation is a continuous spiral process of interaction between knowledge building blocks of explicit and tactic knowledge. *Explicit knowledge* articulated in formal language including grammatical statements, specifications, manuals etc. This type of knowledge can be transmitted across individuals formally and easily and has been the dominate form of knowledge in western tradition. A more important knowledge type responsible for Japanese companies competitiveness is *Tacit knowledge*, this kind of knowledge is hard to articulate with formal language. It's a personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective and value system.

They further surmised that knowledge creation takes place at three levels: the individual, the group and the organizational level. Organizational knowledge creation consists of two components, a) form of knowledge interaction b) levels of knowledge creation. Two forms of knowledge

interaction (between tacit & explicit and between individual & organization) bring about four major process of knowledge conversion, all of which constitute knowledge creation. 1) tacit to explicit, 2) explicit to explicit , 3) explicit to tacit and 4) tacit to tacit – the basis of the SECI model of organizational knowledge creation.

The SECI model of knowledge conversion as developed by Nonaka & Takeuchi (1995) entails explicit and tacit forms of knowledge in a continuous spiral as follows;

Socialization (from Tacit to Tacit) is the process of sharing experiences and thereby creating tacit knowledge such as technical skills ie. learning by observation, imitation and practice. An individual can acquire tacit knowledge directly from others without using language. The key to acquiring tacit knowledge is experience.

Externalization (from Tacit to Explicit) is a process of articulating tacit knowledge into explicit concept. It is a typical knowledge creation process in that tacit knowledge becomes explicit taking the shapes of concept, metaphors, models, analogies etc. When attempt is made to conceptualise an image, its essence is mostly expressed in language - writing is an act of converting tacit knowledge into articulable knowledge. Amongst the four modes of knowledge conversion, externalization holds the key to knowledge creation in that it creates new explicit concept from tacit knowledge.

Combination (from Explicit to Explicit) is a process of systemizing concepts into knowledge system. This involves combining different bodied of explicit knowledge. Individuals exchange and combine knowledge through such media as document, meeting. Knowledge creation carried out in formal education and training at schools is another good example.

Internalization (from Explicit to Tacit) is a process of embodying explicit knowledge into tacit knowledge – it is closely related to learning by doing. When experiences through socialization, externalization and combination are internalised into individuals tacit knowledge bases in the form of shared technical know-how, they become valuable assets. For organizational knowledge creation to take place, however, the tacit knowledge accumulated at the individual level needs to be socialized with other organizational members, thereby starting a new spiral of knowledge creation.

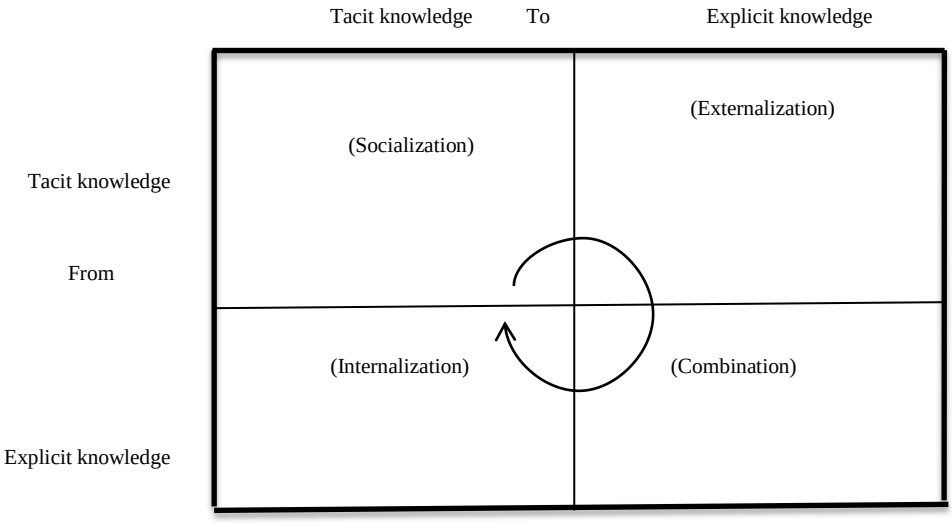

Figure 2 : Content of knowledge created by four modes (Source : Nonaka & Takeuchi 1995)

Grant (1996) argues that knowledge creation is an individual activity and that concentrating on organisational knowledge obscures the processes by which individuals create, store and utilise it. Production requires the input of a wide range of specialised knowledge and co-ordination, rather than co-operation, is the firm task. Efficient production is not achieved by the transfer of knowledge through cross-learning of individuals, but by integrating the knowledge of individuals through interaction.

The SECI model has received criticism for using categories that are not discrete, separable and stable (Tsoukas, 1996). For example, it is argued that tacit knowledge is a foundation of explicit knowledge and the latter cannot be separated from the former. Similarly, an individual cannot be separated from the collective, since we are products of our social environments. Gourlay (2006) further flawed Nonaka's proposition that knowledge is created through the interaction of tacit and explicit knowledge involving four modes of knowledge conversion. He opined that three of the modes appear plausible but none are supported by evidence that cannot be explained more simply. The conceptual framework omits inherently tacit knowledge, and uses a radically subjective definition of knowledge: knowledge is in effect created by managers. A new framework was proposed suggesting that different kinds of knowledge are created by different kinds of behaviour.

In contrast to Nonaka & Takeuchi (1995), Polanyi cited by Stenmark (2000), does not make such a distinction between tacit and explicit knowledge. Instead, he envisions tacit knowledge as the backdrop against which all understanding is distinguished. Tacit knowledge is thus a cultural, emotional, and cognitive background, of which we are only marginally aware. Polanyi's view has

sometimes been criticized for being overly concerned with the tacit aspects and thus becoming almost monistic (*ibid.*). On the other hand, Polanyi's opinion that the tacit and the explicit are mutually constituted and should thus not be treated as two separate types of knowledge is supported by, Tsoukas (1996) who argues that trying to split these two inseparably related entities is to miss the point. Although acknowledging the many nuances that exist between these two stances. Spender (1996) provides a matrix of different types of organisational knowledge that combines explicit and tacit (implicit) with the individual and social forms to produce four types of knowledge - automatic, collective, conscious and objectified.

Matusik & Hill (1998) provide a taxonomy of knowledge that includes tacit and explicit; individual and collective; private versus public; and component versus architectural. Individually held knowledge is simply the total of individuals' knowledge. Collective knowledge is principles and routines widely diffused and held in consensus. Private knowledge is unique to a firm and can lead to competitive advantage, whereas public knowledge resides in the public domain. Public knowledge cannot be a source of competitive advantage. Component knowledge relates to discrete parts of an organisation often defined by subroutines, held individually or collectively by a subgroup. Further, it can be private or public. Architectural knowledge relates to the whole and is contained in organisation-wide routines. It is collective, and since no two firms are the same, it is private. It is tacit, since it is difficult to articulate and imitate. Architectural knowledge is most likely to lead to a sustainable competitive advantage.

Organizational learning

Zhao *et al* (2009) contend that organizational learning involves both individual and collective learning and that innovation occurs at both levels. The need for organizations to change continuously has long been the central concern of organizational learning theorist. The need for organizations, just as humans to confront aspects of their circumstance is growing especially in an era of turbulent economy and swift technological change. It is widely agreed that learning consist of two kinds of activity. The first kind of learning is obtaining know-how in order to solve specific problems based upon existing premises. The second kind of learning is establishing new premises (i.e. paradigms, perspective, mental model, schemata) to override the existing ones. These two kinds of learning have been referred to as single-loop learning and double-loop learning (Argyris & Schon cited in Nonaka & Takeuchi, 1995). The creation of knowledge certainly involves interaction between these two kinds of learning. Many organizations suffer from 'learning disabilities'. To cure this disease a 'learning organization' is proposed as a practical model – the learning organization

has the capacity for both generative learning (active) and adaptive learning (passive) as a source of competitive advantaged. Five steps must be taken to build a learning organization:

- Adopt systems thinking;
- Encourage personal mastery of own lives;
- Bring prevailing mental models to surface and challenge them;
- Build a shared vision, and;
- Facilitate team learning.

Organizational learning theories is not without its limitation found in literature, Nonaka & Takeuchi(1995) contend that most of them are trapped in behavioural concept of stimulus-response, the use of metaphor of individual learning *etc*.

Martin (2010) surmised that organizational learning is a complex mechanism within organizations, which connects the individual's learning and its outcomes to the organization. Organizational learning is thus a social phenomenon. It sees information processed at the level of individuals, shared with others and stored – transformed to knowledge – in the collective. Learning can occur as reactions to arising needs or circumstances, and it can be fostered through interventions.

Knowledge transfer & sharing

Zhang & Ng (2012) surmised that the unique (temporary) nature of construction projects make recording and sharing personal tacit knowledge, lesson learnt and good practices difficult. Temporary alliance, deadline pressures, pursuit of short term goals, knowledgeable client and project complexities are impacting negatively on innovative activities in construction. It is agreed that huge amount of valuable knowledge is embedded in the construction team members who create and apply knowledge in the construction processes. Researchers have increasing awareness that promoting knowledge sharing would significantly contribute to the improvements of project performance and organizational performance in the construction industry. However, there are few studies that explore how to motivate people to engage in knowledge sharing within the construction industry. This knowledge gap makes organizations in the construction industry uninformed about how they should manage employees' knowledge sharing practice. Foss *et al* cited in Zhang & Ng (2012) comprehensively review recent knowledge sharing research, and claim that existing knowledge sharing literature is preoccupied with constructs, processes and phenomena defined as macro (collective, organizational) level and pay comparatively little attention to micro (individual) level constructs.

From an organisation perspective the willingness or unwillingness of individuals to share information and knowledge has been documented many times. Unwillingness to share information, as indicated by Martin (2010) creates a learning vacuum. Not sharing information leaves organizational members in a situation in which they cannot confront policies and procedures in the same manner due to a lack of information available to some. This unwillingness to share can also be related to the arduousness of the relationships needed for learning.

Zhao *et al* (2009) opined that knowledge transfer is prevalent and critical to a firm's survival and competitiveness. Existing empirical studies of knowledge transfer generally adopt one of three approaches: archival research with patent data, survey research and case study. Those that use patent data focus mostly on the transfer of explicit knowledge, whereas those studies that adopt survey and case methods have more flexibility to study the transfer of implicit knowledge and provide richer details in the process of knowledge transfer, albeit often with the restriction of limited samples. Zhao *et al* (2009) opined further that research has established that a firm's capabilities involve both individual and collective knowledge. Two gaps in the extent of knowledge transfer research were thus found:

1. Lack of empirical studies on the transfer of individual and collective knowledge as two distinct, yet parallel, outcomes. Collective knowledge is more valuable because it recombines individual knowledge and is the key to the value creation process. However, because collective knowledge is predominantly implicit and embedded among the norms and routines of multiple organizational members (Spender, 1996), it's transfer is more challenging and prone to failure. There is a difference in the nature, importance, and level of transfer difficulty of collective versus individual knowledge, as such, it is imperative to study the transfer of these two types of knowledge separately.

2. The lack of studies pertaining to the key influencing factors of knowledge transfer such as teaching and absorptive capacity, which needs to be studied at both the individual and collective levels. To fill these two gaps, Zhao *et al* (2009) studied both the outcome of knowledge transfer and the factors, such as teaching and absorptive capacity, that affect knowledge transfer.

They found that collective teaching activities and collective absorptive capacity are more effective than their individual counterparts in ensuring the transfer of both collective and individual knowledge

2.8 Summary

In summary the literature review began with an introductory contextualization of the history of South Africa pre and post colonization including its apartheid past and the legacies thereof, current economic realities and role of construction, the distinctive feature of established and emerging contractors with their peculiarities. Consequent empowerment legislation enacted to bridge the gap due to apartheid legacy issues, including setting up of the construction industry development board (CIDB). It proceeded to review the resultant NCDP framework and its components, the consultant mentors-engineer make up and finally wrapped up with the knowledge management debate.

The knowledge management debate spanned issues around characteristics vs definition of knowledge, knowledge base theory vs knowledge creation theory and SECI model of knowledge conversion, organizational learning and knowledge sharing peculiarities to construction projects.

3 Research design and methodology

3.1 Research paradigm

With the number of research methods increasing particularly in the social and applied science field in the last couple of years, it has become relatively more complex to define research argued O'Leary (cited in Mackenzie & Knipe, 2006). Consequently, Mackenzie & Knipe (2006) describe research as a systematic investigation or inquiry whereby data are collected, analysed and interpreted in some way in an effort to "understand, describe, predict or control an educational or psychological phenomenon or to empower individuals in such context". Mertens cited in Mackenzie & Knipe (2006) suggested however, that the "exact nature of the definition of research is influenced by the researcher's theoretical framework", with theory being used to establish relationships between or among constructs that describe or explain a phenomenon by going beyond the local event and trying to connect it with similar events. It is this theoretical framework as distinct from theory that is sometimes referred to as paradigm. Paradigm influences the way knowledge is studied and interpreted. It is the choice of paradigm that sets down the intent, motivation and expectation for the research. Without nomination a paradigm as the first step, there is no basis for subsequent choices regarding methodology, methods, literature or research design.

The important issue as indicated by Saunders *et al (*2012) is not whether or not this research is philosophically informed, but the defendable reasons for making a philosophical choice amongst alternatives is important, to this end, it will be wrong to think that one research philosophy is better that another – because research philosophy are 'suited' to achieving different things *i.e.* to align with research question(s). Saunders *et al* (2012) surmised that the research philosophy adopted in a research underpins the research strategy and methods chosen. Through the choice of research strategy, a commitment is made to a particular philosophy or paradigm.

Literature confirms there exists a number of perspectives in which research philosophy can be examined as discussed by Easterby - Smith *et al* (2006) - these include ontology, epistemology and methodology - Saunders *et a*l (2012) enunciated on these further as follows:-

Ontology is concerned with the nature of reality, it raises questions of the assumptions researchers have about the way the world operates and the commitment held to particular views. The two aspects of ontology accepted as producing valid knowledge include Objectivism and Subjectivism. Objectivism portrays the position that social entities exist in reality external to social actors

concerned with their existence. Subjectivism holds that social phenomena are created from the perceptions and consequent actions of social actors.

Epistemology however, is concerned with what constitutes acceptable knowledge in a field of study. The underlying questions from an epistemological point of view are how one sees the world and what constitutes admissible knowledge about the world (Bryman, 1989). Two main paradigms as indicated by Saunders *et al* (2012) - positivism and interpretivism - governing research methodology can be distinguished.

Positivism

A philosophy of positivism adopts the philosophical stance of the natural scientist. It prefers collecting data about an observable reality and searches for regularities and causal relationships in data to create law-like generalisations similar to those produced by the physical and natural scientists. Only phenomena that can be observed will lead to the production of credible data. To generate a research strategy to collect these data it may use existing theory to develop hypotheses. These hypotheses will be tested and confirmed, in whole or part, or refuted, leading to the further development of theory which then may be tested by further research. However, this does not mean as positivist you have to start with existing theory. Natural sciences have developed from an engagement with the world in which data were collected and observations made prior to hypotheses being formulated and tested. Typically positivists follow a deductive logic (Martin, 2010). Saunders *et al* (2012) opined that an important component of the positivist approach to research is that the research is undertaken, as far as possible; in a value-free way ie the researcher is external to the process of data collection, in that it does not alter the substance of data collection

Gill & Johnson cited in Saunders *et al* (2012) further argued that positivism advocates the use of highly structured methodology to facilitate replication. Saunders *et al* (2012) furthermore emphasised on quantifiable observations that lead themselves to statistical analysis. Mackenzie & Knipe (2006) submitted that positivist research is most commonly aligned with quantitative method of data collection and analysis.

Interpretivist

Interpretivist (synonymous to constructivist) approach, to research according to Mackenzie & Knipe (2006) have the intention of understanding the world of human experience, suggesting that reality is socially constructed. The interpretivist research philosophy relies upon the participant's view of the situation being studied and recognises the impact on the research of their own

background and experiences. (Creswell, 2003). The focus of research grounded in interpretivism is to describe individuals' situations. These situations ought to be complex and rich with many interdependencies making up the situation and the interaction of the individuals within the situation. Typically such research thus follows inductive logic in which, through the understanding and interpretation of the descriptive qualitative data stemming from studied situations, theories can be induced (Martin, 2010). Saunders *et al* (2012) argued that researchers critical of positivism indicate that rich insights into the unique and complex world (for instance, of construction projects & contractor development programme) are lost if such complexity is reduced in total to series of law-like generalisation. Interpretivist emphasises the difference between conducting research among people rather than about objects – crucial to this philosophy is that researcher has to adopt an empathetic stance. Phenomenology (how humans make sense of world around us) and Symbolic interactionism (humans are a continual process of interpreting the social world around us by interpreting actions of others we interact with leading to adjustment of our own action) are the two bedrock of interpretivism stemming from intellectual tradition.

Table 2 Language commonly associated with major research philosophy (Mackenzie &Knipe 2006)

Positivist	**Interpretivist**
Experimental	Naturalistic
Quasi-experimental	Phenomenological
Correlational	Hermeneutic
Reductionism	Interpretivist
Theory verification	Ethnographic
Causal comparative	Multiple participant meanings
Determination	Social and historical construction
Normative	Theory generation
	Symbolic interaction

As stated earlier the aim of researchers following the paradigm of interpretivism is to depict the complex reality as it actually is. Martin (2010) acknowledged that reality can appear to differ depending on the standpoint. This implies that it is also possible to find cases of interpretivism research in which the initial focus shifts, as more important or overruling findings emerge. The role and standpoint of the observers themselves influence the collection and interpretation of data. These implications raise the question of the reliability of the research conducted. However, typically the aim of such research is to rather ensure a high level of insights into the different perspectives, with a strong emphasis on the validity of the particular explanations given. The

choice of the participants or situations under scrutiny is governed by '*typicality*', which aims to depict a typical situation in order to learn from this. Findings are not necessarily meant to be generalized yet the aim is to depict particular situations and to ensure that in-depth explanations and arguments given for a particular situation would also be valid for other similar situations

The design of this research project is governed not only by the epistemological underpinning but more importantly by the research question and setting. As indicated by Martin (2010) the actual improvements to knowledge transfers needed between emerging contractor and consultant engineer-mentor, in specific intervention programme as the contractor development programme in South Africa is beyond the scope of this study. The aim of this research is limited to contribute to a better understanding of currently experienced knowledge transfers. This understanding can then be used for subsequent work on improvements of knowledge transfers. The complexity of knowledge transfers is highlighted in many publications, and prior knowledge of particular South African construction based transfers is largely anecdotal. The aim of describing complex knowledge transfers, with a particular emphasis on their contexts, and little prior empirical knowledge of the South African setup, recommends itself to an interpretative approach.

The research addresses the question of the actual transfer mechanism involved in knowledge gains by small emerging contractors. In order to adequately address the questions concerning the contractor's agents, considering their surroundings, their own make-up, and their contribution towards the organization they work in, the correct paradigm needs to be selected.

This research looks at small organizations and their learning experiences. This might result in learning situations that are possibly less complex and intertwined; yet the actual learning mechanisms involved remain the same. Factors concerning the learning environment as well as concerning the individuals involved need to be considered if a description of typical transfer mechanisms of knowledge are to be given. Assuming that organizations of a particular type will learn in a similar manner, depending on just a few external factors would oversimplify the matter. It can rather be expected that the individuals involved engage in particular manners, react to stimulus, based on their own antecedents, and it is thus the individuals who will create their own realities with regards to learning – clearly a social perspective. It is this knowledge and the experiences of the individuals involved which will inform the researcher on the actual mechanisms in place. The aim of the research is to describe these mechanisms with their feature and possible irregularities in depth, rather than finding correlations between exterior or interior factors to

learning and their effect on the actual learning experience. The envisaged explorative, analytic, rich description of knowledge transfer mechanism calls for an interpretive approach (Martin, 2010).

Saunders *et al* (2012) points out the importance of an interpretivist epistemology, (*i.e. c*oncerned with understanding meanings that participants ascribed to various phenomena) *vi- a-vis* the use of semi-structured interviews. They described semi–structured interviews as providing the opportunity to probe answers and understand reasons for attitude and opinions of research participants, thus adding significance and depth to data obtained. Semi-structured interviews may lead to discussions into areas not previously considered but significant to addressing research question and objectives. Semi–structured interviews of the learner contractors' entities and consulting engineer-mentors within the specific contractor development programme was conducted for this research. It was primarily concerned with describing the current state of learner contractors; their interactions within programme, descriptions & characteristics of knowledge transfers; the typical characteristics of learner contractors' entities within context. *etc*. As an internal researcher (Saunders *et al*, 2012) the issue of negotiating research access to the contractor development programme is diminished as such a census survey (of all 29 participants) of the CDP is proposed.

The researcher is aware that the manner of asking questions and interactions with participants impacts data collected in a semi-structure / in-depth interview (Saunders *et al*, 2012), thus, prompting quality of data issues of reliability, generalisability and validity:

- *Reliability:* - relates to lack of standardisation in these types of interviews; it is concerned with whether alternative researcher would reveal similar information. The concern about reliability also relates to issue of bias – which includes interviewer and interviewee bias - ie whether or not the data collected is biased due to posturing of lack thereof by the former and latter.
- *Generalisability:* - deals with the extent to which the findings of a research study are applicable to other settings. This is questioned in relation to statistical generalisability of qualitative research studies based on a small sample; it does not mean a qualitative study is intrinsically less generalizable than a quantitative study. The generalisability of each will depend of on nature of sample.
- *Validity:*- deals with the extent to which researcher has gained access to participant's knowledge and experience and is able to infer meanings as intended by participant. (Saunders *et al*, 2012)

The responses to these issues in relation to this research are; a) regarding reliability, findings from using semi-structured interviews are not necessarily intended to be repeatable since they reflect reality at time of collection ie current interactions and practices of knowledge transfer in a specific programme, as such replicability is not feasible without undermining strength of this type of research. b) generalisability, albeit the data collected is from the entire specified CDP population, statistical generalisation for all CDP programmes nationally cannot be made. c) high level of validity is planned to be achieved, and this is ensured by the calibre of semi-structure interview questions ie are the questions really helping to answer the research question and objectives.

Justification

In line with Martin's (2010) work, this research lends itself to management subfield of organizational learning. Organizational learning, as a more recent view on management, can be defined as '*…the process of improving actions through better knowledge and understanding*' (Fiol & Lyles cited in Martin, 2010). However the very improvement process and required gain in knowledge by junior partners in project settings, *i.e*. emerging contractors, is furthermore related to educational research regarding the individuals involved. The description of these knowledge transfer processes is central to this study. Although Fiol & Lyles cited in Martin (2010) state that consensus exists that organizational and individual learning are separate matters, in fact a debate amongst writers on organizational learning exists about the possibilities of distinguishing between the two. Indeed, the role of the individual *'as* [an] *active agent'* is broadly accepted.

Recognizing that recordable knowledge transfers would show a level of variety, made up not only by the context, but also by the content, some common forms and features of interaction and their qualities had to be established. Based on observed common forms of interaction, in-depth descriptions of knowledge transfers shall be derived.

3.2 Research Methodology

The research design is the general plan of how this research shall answer the research questions, it contain objectives derived from research question, specify source of data collection, how to collect and analyse data, ethical issue discussion and constraints encountered (Saunders *et al*, 2012). We shall thus refer to research design as the overall organization and planning of the research, incorporating and addressing questions of methodology.

Martin (2010) stated that some authors see a link between predominant research design and its methods; some label the actual research designs as being either qualitative or quantitative

depending on the commonly used methods within designs. He emphasised the point that while there are some uniquely interpretivist or positivist methodologies, in reality some methodologies are employed by both traditions. One must be reminded that, methodologies employed, and thus the designs incorporating these, are governed by the underlying epistemological philosophy.

Literature is abound with the notion that interpretivist paradigm lends itself to the qualitative research. Qualitative research is interpretive because researchers need to make sense of the subjective and socially constructed meaning expressed about a phenomenon being studied. Qualitative research is sometimes referred to naturalistic as researchers need to operate within a natural setting or research context so as to establish trust, participation, access to meanings and in depth understanding (Saunders *et al*, 2012)

Table 3 Paradigm, methods and tools (Mackenzie &Knipe 2006)

Paradigm	**Methods (primarily)**	**Strategies**	**Data collection tools (examples)**
Positivist	Quantitative. "Although qualitative methods can be used within this paradigm, quantitative methods tend to be predominant.	Experiment Survey (Case study and Archival - Mixed method)	Experiments Quasi-experiments Tests Scales
Interpretivist/ Constructivist	Qualitative methods predominate although quantitative methods may also be utilised.	Ethnography Action Research Grounded theory Narrative	Interviews Observations Document reviews Visual data analysis

As posited by Martin (2010) following in the argument that research requiring an interpretivist approach, has the following commonly used strategies affiliated to this paradigm which might assist the researcher to achieve the overall aim, these description highlights each's strategy's suitability or lack thereof.

Action research

Action research's purpose is to promote organizational learning to produce practical outcomes through identifying issues, planning action, taking action *etc*. It is research in action rather than research about action largely because it focuses on addressing worthwhile practical purpose and organizational issues. It is emergent and iterative – commencing with a specific context and may change due to process of iteration- hence it is an intense and demanding strategy requiring adequate time (longitudinal time horizon). (Saunders *et al*, 2012)

Ethnography

Ethnography is one of the earliest qualitative research strategies with origins in colonial anthropology. The purpose is to describe and explain the social world the research subjects inhabit in the way in which they would describe and explain it. This is obviously a research strategy that is very time consuming and takes place over an extended time period as the researcher needs to immerse herself or himself in the social world being researched as completely as possible. Ethnography emphasise that an ethnographic strategy is naturalistic. This means that in adopting an ethnographic strategy, you will be researching the phenomenon within the context in which it occurs and, in addition, not using data collection techniques that oversimplify the complexities of everyday life. Given this, it is not surprising that most ethnographic strategies involve extended participant observation. (Saunders *et al*, 2012)

Case study

Case study strategy for doing research involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence'. Yin (2003) also highlights the importance of context, adding that, within a case study, the boundaries between the phenomenon being studied and the context within which it is being studied are not clearly evident. The data collection techniques employed may be various and are likely to be used in combination within one study in order to ensure that the data are telling you what you think they are telling you. According to Yin (2003) four case study strategies based upon two discrete dimensions exist:

- single case v. multiple case;
- holistic case v. embedded case.

A single case is often used where it represents a critical case or, alternatively, an extreme or unique case. A single case may be selected because it is typical or because it provides you with an opportunity to observe and analyse a phenomenon that few have considered before. Inevitably, an important aspect of using a single case is defining the actual case. (Saunders *et al,* 2012)

Survey

Survey strategy is usually associated with the deductive approach. It is a most frequently used to answer who, what, where, how much and how many questions. It therefore tends to be used for exploratory and descriptive research (in this research to give an understanding of current interactions). Surveys are popular as they allow the collection of a large amount of data from a sizeable population in a highly economical way. Often obtained by using a questionnaire administered to a sample, these data are standardised, allowing easy comparison. In addition, the survey strategy is perceived as authoritative by people in general and is both comparatively easy to explain and to understand. Using a survey strategy gives more control over the research process and, when sampling is used, it is possible to generate findings that are representative of the whole population at a lower cost than collecting the data for the whole population.

The questionnaire, however, is not the only data collection technique that belongs to the survey strategy. Structured observation, of the type most frequently associated with organisation and methods (O&M) research, and structured interviews, where standardised questions are asked of all interviewees, also often fall into this strategy. (Saunders *et al,* 2012)

Selection of Interpretivist methodology

As previously indicated Saunders *et al* (2012) argued that researchers critical of positivism indicate that rich insights into the unique and complex world are lost if such complexity is reduced in total to series of law-like generalisation. Interpretivist emphasises the difference between conducting research among people rather than about objects.

The aim of this report following the paradigm of interpretivism is to depict the complex reality as it actually is (*i.e.* to determine nature and characteristics of knowledge transfer by describing context and content of such knowledge transfers in an *ad-hoc* programme as the CDP). In other to do this, semi–structured interviews are an appropriate tool which provides the opportunity to probe answers and understand reasons for attitude and opinions of research participants, thus adding significance and depth to data obtained, and thus links up with the theoretical framework of knowledge creation and transfers. The subsequent analysis of data was governed by the overarching research question,

using the SECI model by Nonaka & Takeuchi (1995) with its four stages as a basis and theoretical framework

Protocol for data collection

Consent was sought and signed off on by respondent before proceeding with interviews. Semi–structured interviews of the learner contractors & supervisors entities and consulting mentors-engineer within the specific contractor development programme was conducted for this research. The interview agenda was developed along two broad layouts:

- Characteristic of learner contractor entity, and;
- Determining interaction within CDP

The first portion of face-face interviews dealing with characteristic of learner contractor's entity seeks to inform on context in terms of age, gender, race, years of experience in construction, education and training, company turnover, number of employees *etc.* This portion was analysed quantitatively for description and comparison of current state (context) of contractors. The second portion of the interview was analysed qualitatively for insights, explorative, analytic and rich description of interaction and relationship within the CDP such that knowledge transfer mechanism are explained and revealed. Furthermore, a question on existing stock of knowledge was asked interviewee's (excluding mentor-engineers) to gauge their knowledge of five fields of tendering, site planning and organization, finance management, technical abilities and dealing with supply chain. The self-assessment utilised a 5 point Likert scale (1= no experience to 5= a lot of experience) to assess knowledge before enrolment and after some time spent in CDP.

Additionally mentor- engineers were interviewed to capture their perspective with regards to description of relationship with contractors & supervisors, the context thereof and actual mentorship duties performed within the CDP, considering engineers were initially appointed as quality supervisors for GDRT but later assumed mentorship duties.

Summary

The semi-structured interviews with Gauteng Department of Roads and Transports Contractor Development Programme participants will give an overview of the emerging contractor's interactions, with in-depth knowledge of current practices regarding learning (Martin, 2010).

The method for the data collection was semi-structured interviews (face to face) with all participants. For convenience, the roads department's five regional offices, where all 29 participants are based will serve as location for the interviews. As indicated by Martin (2010) the construction industry is a construction site-driven industry, and owners / managers of small contractors are often involved in the on-site activities. It is thus expected that most of the contractors would be available during office hour for interviews. The approach of questions asked (avoidance of non-complex questions), appropriateness of researchers appearance, behaviour of researcher, demonstration of attentive listening skills, summarising and test of understanding are some of the issues to contend with to avoid forms of bias that will affect reliability and validity of data.

Ethical Considerations

Ethics refers to standard of behaviour that guides researchers conduct in relation to the rights of research subjects or are affected by it (Saunders *et al*, 2012). From the foregoing definition the research's ethical consideration shall include in the main:

- Issue of research access;
- Informed consent of those taking part;
- Confidentially of data and anonymity vis a vis research subjects and the Gauteng Dept. of Roads and Transport;
- Voluntary nature of subjects and right to withdraw including right to absence of coercion,
- Avoidance of harm and material disadvantage – physical and psychological harm in terms of stressful interrogation;
- Respect for others and privacy of research subject;
- Integrity and objectivity, and ;
- Responsibility in analysis of data and reporting on findings.

As an internal researcher (Saunders et al, 2012) the issue of negotiating research access (to organization and individuals) is diminished as researcher is an employee of the Department and deployed as project manager of the unit wherein the contractor development programme is hosted, this also gives researcher an added advantage of first-hand knowledge of the programme. However

this advantage warns Saunders *et al* (2012), carries with it a significant disadvantage - to be conscious of assumptions and preconceptions which might prevent exploration of issues that enrich the research.

Another important consideration is the issue of objectivity – of researcher and participants, largely because of the existing 'power' relationship between researcher and participants. The issue has to be managed well during data collection so as not to jeopardise the research integrity as this goes to the heart of the quality of research. This means researcher must act openly, truthful and promote accuracy (Saunders *et al*, 2012) and that participants shall not feel the need to impress researcher.

4 Data Presentation and Analysis

4.1 Emerging contractors and their context

The aim of the structured portion of the face-face interview was to inform the research about the nature of the context in which emerging contractors act and thus the anticipated transfers of knowledge and skills that took place within the contractor development programme (CDP). The sections below draw a picture of emerging contractor's entity, members of these organizations and interaction within their context. The first portion was used to describe current settings and make up of contractors within an *ad-hoc* programme as the CDP, depicting commonalities shared between contractors and understanding of interactions. Whilst the structured portion presented data that was quantitative in nature, the second portion of interview allowed for collection of qualitative data. However prior to engaging with the collected data from the participants of the CDP, 29 pairs of learner contractors and learner supervisors were enrolled onto the CDP programme under the mentorship of 5 mentors–engineers, of these 14 learner contractors, 12 learner supervisor and 5 mentor- engineers consented to be interviewed.

4.2 Characteristic of Sample Respondents

The first portion of the interview dealt with characteristics of the contractors / supervisors as follows:- racial and gender distribution of the interviewee's, classifying into the South African common denominators of Black, White, Coloured and Indian as shown in Table 4 below. This distribution clearly does not mirror the country's demographics (79% Black, 9% Coloured, 2.5% Indian and 9% White) according to Stats SA (2012), neither the 80% black ownership structure of Grade 2-4 GB & CE (CIDB, 2012).

The race and gender distribution as indicated in Table 4 could be as a result of targeted screening and selection criteria of the GDRT for enrolment into the programme at commencement. The data on women entity ownership is however encouraging (27 %) compared to men (73%).

The age of the respondents range from 25 – 55, with 73% of the respondent in the age group 30 – 45 years. The respondents have an average of 7 years personal experience in the construction industry. More than a quarter (27%) of the respondent have 10 or more years of experience in the industry, with a majority (38%) of respondents having less than 5 years' experience and 35% within the 5-10 years bracket of experience. According to Martin (2010), regardless of the 2 years spent in

the CDP programme to date, the low levels of experience held within the CDP participant may make them vulnerable to failure within the a competitive marketplace outside of the programme.

Table 4 Race and gender of respondents (contractors & supervisors)

		Race				Total
		Black	White	Coloured	Indian	
Gender	Male Count	18	0	1	0	19
	% of Total	69.2	0	3.8	0	73.1
	Female Count	6	0	1	0	7
	% of Total	23.1	0	3.8	0	
	Count	24	0	2	0	26.9
	% of Total	92.3	0	7.7	0	100

The educational qualification attained by respondents as indicative of training received was also surveyed. Half of the respondent (50%) had not received any construction related training (trained mostly in management, marketing, and others). A little over a third (35%) of the respondents had received formal training for works in construction industry and 15% with some occupational health and safety training in addition to their non-construction diplomas. Various types of training mentioned are show in Table 5 below. A very high number (about three quarters) of respondent received tertiary education with the highest level being Honours degree and National Diplomas being the most frequent response (46%). A low number (8%) of teacher-theologian turned contractor was also observed.

Table 5 Training received by respondents

Diploma	**Dip/Deg/Cert(Constr. related)**	**Degree**	**Certificate**	**Matric**	**Grade 10**
46%	35%	27%	8%	15%	4%

Martin, (2010) suggested that for development initiatives through knowledge transfer, the existing stock of knowledge is expected to determine the stickiness of new knowledge. It further determines the receivers end of what is called the cognitive distance between sender (mentor-engineers) and receiver (emerging contractor). The knowledge of the existing levels of experience, skills, and knowledge are crucial to tailor-making suitable transfer mechanism for knowledge. Based on data on training and experience - the training levels received are relatively high and construction

experience of respondents is low - a unique situation, consequence of the pre- CDP programme selection process. This according to Martin (2010) might affect the cognitive distance (between senders and receiver) likely making transfer of knowledge problematic as mutual understanding might be difficult.

The assessment of the existing stock of knowledge requested interviewee's (excluding mentor-engineers) to gauge their knowledge of five fields of tendering, site planning and organization, finance management, technical abilities and dealing with supply chain. The self-assessment utilised a 5 point Likert scale (1= no experience to 5= a lot of experience) to assess knowledge before enrolment and after 80% time spent (30 months) in CDP program. The average assessment for all fields was on the better side, ranging from 2.8 for SCM and 3.4 for planning and organization

Table 6 Knowledge levels- self evaluation

	Tendering	**Planning and Organising**	**Financials**	**Technical abilities**	**Supply chain management**
Mean	3.25	3.40	3.03	3.10	2.77

Table 7 Character of learner contractors

Contractor	**Age of Company (Years.)**	**Company Turnover (million)**	**Permanent employees (No.)**	**Latest contract size (million)**	**Current CIDB grading**	**Start CIDB grading**
A	13	R9	7	NIL	4CE	1 CE
B	9	R3	3	NIL	4CE	1CE
C	5	R8	5	R6	6CE	1CE
D	6	R1	10	R1	4CE	1CE
E	6	R4	5	R5.2	4CE	1CE
F	11	R7	3	R9	5CE	1CE
G	8	R6	5	NIL	5CE	1CE
H	10	R3	3	NIL	5CE	1CE
I	6	R3	5	NIL	4CE	1CE
J	8	R0.5	4	NIL	5CE	1CE
K	6	R7	10	R1.5	5CE	1CE
L	5	R1	5	NIL	4CE	1CE
M	11	R0.5	3	R7	4CE	1CE
N	5	R1	5	R0.3	4CE	1CE

The year of company establishment, annual company turnover, number of employees, latest contract size and current CIDB grading (at 30 month of 36 month programme) vs grading at

programme entry point was surveyed to ascertaining leaner contractors' characteristics. In total, all learner contactors interviewed indicated a Grade 1CIDB level at entry of programme versus Grades 4-6 CE at month 30 of 36 months contractor development programme (Table 7)

About 80% of the companies were founded less than 11years ago with the average company age at time of interview being 7.8 years, with most common age being 5 - 6 years (50 % of contractors), and more than a quarter (28%) have 10 or more years of experience. Comparing the years of personal experience versus company experience shows similarities in the average company experience (7.8 years) to average personal (7 years) experience in construction industry, and the modal company and personal experience was the 5 -10 years bracket. Implying that experience held by contractors match the length of time they've operated their company, thus, individuals without prior experience in construction frequently open shop in the industry.

In evaluating the size of company of interviewed contractors, the number of employees and company turnover was used as shown on Table 8 below.

Table 8 SMME Classification and responses (classification according to National Small Business Amendment Act)

Size	**Total Full time, Equivalent of Paid Employees**	**Total Annual Turnover**	**Respondent Turnover**	**Respondent Permanent Employees**
	Less than	***Less than***		
Medium	200	R26 m	35%	nil
Small	50	R6 m	14%	nil
Very small	20	R3 m	42.9%	100%
Micro`	5	R0.2 m	14.3%	

Whilst a few indicated a very high number of employees (ie 55 EPWP Participants), due to the labour intensive projects undertaken within the programme, these were only temporarily employed staff and are not considered as permanent employees. The average number of employees permanently employed by the contractors was thus 5.2 with the highest number of employees employed by any contractor being 10, well within less than 20 employee threshold for classification as Very Small Enterprise. The reported financial turnover of the contractors follows a similar trend to the number of employees. About two third (64%) of respondent indicated an annual turnover of less than R6 million – threshold for classification as Small Enterprise - with reminder 35 % reporting R6 million - R9 million turnover, which is within the less than R26 million classification

for Medium Enterprise. Accordingly, in-line with Table 8, these contractors can be classified as Small Medium, and Micro Enterprise (SMME contractors)

The CIDB register is based on companies' abilities to perform contracts of which key criterion is the monetary value of contracts, ie the contract size (Martin 2010). The learner contractors interviewee's reported an average contract size embarked on outside the CDP as R2 million, and a vast majority (71%) reported R0 – R 1.5million contracts. Furthermore, the figures for annual turnover and average contract size do not correspond possibly due to a number of reasons such as lack of knowledge about company financials, multiple small contracts, delayed project completion etc. The data on employees, turnover, contract size and age of companies interviewed suggest a majority of these contractors are residing in the Existence Stage (Churchill and Lewis in Martin 2010). This is supported by the statement made by the respondents during the interview that they *struggle to get jobs; they're surviving on the CDP income, and wished for the CDP period be extended beyond 36 months as "exit programme" for soft landing into real world.*

Interactions within Contractor Development Programme

Contractor / Supervisor

The second portion of the interview dealt with issue of interactions within the CDP ie. determining the organizational interactions within the CDP. As this was a contractor training and development programme, where the Direct Targeting Model (CIDB, 2014) was employed, emerging contractors and supervisors were enrolled via advertisement in media calling for interested participants and upon assessments, 29 pairs contracted via Learnership Agreements for a period of 36 months with the GDRT. The mentor – engineers acted on behalf of GDRT as principal agent. The usual forms of interactions within the construction sector, such as collaborations with main contractors via joint ventures, partnerships or subcontracting was not applicable here. The use of subcontractors / suppliers was however present but not surveyed (e.g. suppliers of cold and hot mix asphalt for surface failure repairs, bituminous tack coat, road marking subcontractors etc.). These forms of interactions are the most likely forms of interactions of emerging construction companies within the construction sector, that are likely to form the basis for the required socialization needed for knowledge creation. Martin (2010), suggested that identifying types of interaction, distinguishing between interactions with mentor-engineer and relating interaction to knowledge levels hold some clue to knowledge creation within the contractor development programme.

All the interviewees indicated a contracted employee / employer relationship existed between contractors and supervisors even though a few supervisors were co-directors/owners of same

contracting entity. It emerged that contractors, were mainly company directors, and were responsible for overall management of contracting organization with the supervisors responsible for day to day technical site attendance. Whilst describing the kind of relationship with mentor-engineers, contractors and supervisors citied such phrases as supportive, professional, very good, good, proactive, ok, helpful, informative& enlighten , growth, matured, clear instructions given, fair, and good communication to describe their relationship.

Having identified interactions, the context within which these interactions occurred was required for clarity. As such interviewees were asked question on typical problems that occurred during interaction with mentor-engineer, as well as comments on what worked well. The common cause of problems in the above relationship (between mentor-engineer and contractors / supervisors) was wide ranging with few repetitions, even though some interviewees indicated no problems were encountered. Table 9 below summarises problems encountered. Furthermore, comments on what worked well in their relationship with mentor-engineer gave more insights to relationship - as with the earlier description of kind of relationship (Table 10).

Table 9 Common cause of problem with mentor-engineer

Contractors Report	• **Non availability of mentor-engineer resulting in time pressures** • **Conflicting roles of mentoring & technical supervision by engineer** • **Lack of team effort at times** • **Top–down management style of some mentor-engineers** • **Site instruction clarity or lack thereof** • **Site Instructions and delivery timelines** • **Mismatch of task allocated and time given for completion** • **Site communication management**
Supervisors Report	• Assertive site attendance for late entrant supervisors • Top-down site management style of some mentor-engineers • Re measurement of quantities for payment • Mismatch of task allocated and time given for completion • Delayed information between contractor and supervisor • Not always agreeable with mentor-engineer instruction • Non availability of mentor-engineer resulting in time pressures

Table 10 Good relation with mentor-engineer

Contractors Report	• **Payment certification turnaround time was good** • **Training on claims procedure was good** • **Application of NQF 4 training knowledge onsite** • **Communication was good with mentor-engineer** • **Lots of lessons learnt – willingness to learn, get it right first time, maturity** • **Mutual respect resulting in good quality of workmanship** • **Company Performance vs Company Reputation** • **Availability and readiness to teach & demonstrate** • **Clarity of instruction and good communication** • **Pro-activeness and encouragement** • **Professional relationship**
Supervisors Report	• Mutual respect and understanding • Good communication • Rapport • Proactive • Learning environment • Cordial • Availability and clarity of instruction • Supportive • Skills transfer and teaching method • Informative and experienced • Solution driven • Good relationship vis a vis site productivity/task accomplishment

Mentor-Engineers

Similarly interviews were also conducted with mentor-engineers to capture their perspective with regards to description of relationship with contractors & supervisors, the context thereof and actual mentorship duties performed within the CDP, considering engineers were initially appointed as quality supervisors for GDRT but later assumed mentorship duties. Mentor-engineer's description of their relationship with contractors' organization includes; cordial, productive, difficult and interesting, hands on approach, good & professional. Regarding context, common causes of problems alluded to includes (Table 11 and Table 12):-

Table 11 Common cause of problem with contractors' organization

Mentor-engineers Report	• **Some contactors struggled to implement and carry out instruction to perform works on site** • **Some contractors struggled with compliance issues on site regarding occupational health and safety** • **Engineer was assertive at commencement thus no problems experienced during programme** • **Due to a guaranteed financial reward for contractors on this CDP, at times this, affected contractors' attitude toward work and learning ie lacking wiliness to learn as they're sure of invoicing and receiving payment monthly.** • **Some contractors delayed completion of task assigned with no consequence as this was a training and development programme**

Table 12 Good relation with contractor organization

Mentor-engineer	• **Follow up required by mentor-engineer to ensure site instruction are carried out correctly** • **Proximity of mentor-engineers and availability of contractors as they shared same site offices** • **Communication was good with contractors organization and availability of mentor-engineer as contractors were inexperienced at commencement of programme** • **Mutual respect between mentor-engineer & contractor, availability & proactiveness of mentor-engineers worked well** • **Timeous task completion**

The mentor-engineers further alluded to the following as typical mentor duties (billed as additional duties) performed on contractors and supervisors within the CDP:-

- Financial Management – this includes monitoring and controlling of contractors bank accounts as co-signatories (actual transfer of operations and savings investment at local bank branch), opening of business & investment bank accounts, overdraft application.
- Site Training- this includes but not limited to log book maintenance including sign off upon completion of classroom training by training service provider, site training and demonstration.

- Daily Mentoring- Preparation of interim payment certificate, site management and administration, preparation of works programme and subsequent tracking of programme, preparation of progress report, CIDB upgrade application and follow up.

4.3 Transfer mechanism

Upon developing a clearer picture of contractors and supervisors within the CDP from the foregoing sections (characteristics of respondents and interactions within CDP), this section narrows down to matters of knowledge and skills transfers per regional area within the CDP, to aid and assist in arriving at an overall conclusion for the programme. Contractors and supervisors pairs were based in one of five regional areas of Gauteng Province with each region supervised by a mentor-engineer. The focus here is to report on qualitative data obtained from interviews with a view to describing the make-up of knowledge transfer between mentor-engineers and contractors. As knowledge transfers are expected to be dependent on the context and content, specific content will be highlighted also. The qualitative analysis of data itself is governed by the overarching research question, using the SECI model by Nonaka & Takeuchi (1995) with its four stages as a basis and theoretical framework.

4.3.1 Vereeniging Regional Area

Three contractors, three supervisors and a mentor–engineer were interviewed at the Vereeniging Region. All three contractors were graded 1 CE at programme commencement, two were graded 5 CE and one 4CE at the time of interview. All contractors had a minimum diploma qualification with one having a construction management degree, with varied years of experience in construction industry (0-5; 5-10 and 15-20 years' experience bracket). At the time of interview (30 months into the 36 months programme) all contractors rated themselves 5 points, versus 2 points at commencement for the two contractors, on the self-assessment 5 point Likert scale for gauging existing knowledge. The one contractor with a construction management degree rated self highly on both periods (at commencement and at time of interview). Five fields of tendering, site planning and organization, finance management, technical abilities and dealing with supply chain was assessed.

In contrast, the supervisors had one matric certificate, N6 certificate in civil engineering and a diploma, with lower years of experience in the construction industry (0-5 years for two contractors and the other 5-10 years' experience bracket). At time of interview a lowly 2 points was reported (except for site planning & organization - 4 points) on the 5 point Likert scale, in the knowledge

areas of dealing with supply chain, tendering and financial management possibly due to lack of exposure and learning opportunity for supervisors.

The mentor-engineer for Vereeniging Region reported the followings as training and know- how given to contractors organization within the CDP:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. Though classroom training was conducted by external service provider, mentor engineers assisted with compiling log books and POE's.
- Routine road maintenance activities demonstration and training by mentor-engineer eg pothole patching, edge break repairs, surface failure repairs, guard rail installation, erosion protection etc.

The six contractors and supervisors in this region on their part reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).
- Hands on site training conducted by mentor-engineer in pothole patching, guard rail installing etc.

Reported knowledge gained by contractors and supervisors includes:-

- Ability to complete tender document without assistance;
- Dealing with suppliers and subcontractors;
- Site planning, organization and control;
- Site management and technical drawing knowledge;
- Safety file compilation;
- Management of task teams on site;
- Measurement for payment certification, and;
- Ability to undertake routine road maintenance activities (technical).

Reported enhancement to learning experience required under the programme

- Contractors indicated an exit programme with projects "ring-fenced" for all CDP participants as a means to enhance lessons learnt under the CDP;

- Supervisors indicated they could be contracted as new learner contractors in the next round of CDP;
- Pursuit of further academic training and development;
- To be a future emerging contractor by registration of own CIDB graded company by supervisors who were not co-directors / company owners;
- Initiative for development and improvement of local communities, and;
- Targeted technical training requirement.

4.3.2 Krugersdorp Regional Area

Three contractors, three supervisors and a mentor–engineer were interviewed at the Krugersdorp Region. All three contractors were graded 1 CE at programme commencement, two were graded 5 CE and one 4CE at the time of interview. The contractors each had an N6 certificate in building & civil engineering, Architecture diploma with professional registration with SACPCMP, and Honours degree in non-construction related field. Two contractors have same years of experience in industry (5-10 years) and the other 15-20 years' experience. At the time of interview two contractors rated themselves an average 4.7 points, versus 2.5 points at commencement on the self-assessment 5 point Likert scale for gauging existing knowledge. The one contractor with an N6 certificate, in building & civil engineering rated self highly on both periods respectively (4 points and 5 points).

The three supervisors had a matric certificate, post matric certificate and a diploma in theology, with 5-10, 10-15 and 5-10 years' experience respectively. Similarly a lowly average of 1 point was reported at programme commencement versus 4.7 average points at time of interview on the self-assessment question gauging existing knowledge.

The mentor-engineer for Krugersdorp Region reported the followings as training and knowhow transferred or given to contractor's organization within the CDP:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. Though classroom training was conducted by external service provider, mentor engineers assisted with compiling log books and POE's.
- Site demonstration and classroom training given by mentor-engineer includes technical procedures, basic principles of construction, planning & control of site activities, site office administration, budget control, safety and environmental compliance.

The six contractors and supervisors in this region on their part reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).
- Hands on site training conducted by mentor-engineer on routine road maintenance activities.

Reported knowledge gained by contractors and supervisors includes:-

- Ability to undertake routine road maintenance activities (technical);
- Business and financial management;
- Stakeholder engagement & management;
- POE compilation for work done;
- Pricing and submission of tenders, and;
- Site planning, organization and control

Reported enhancement to learning experience required under the programme:

- Explicit contract conditions should be allowed for in future agreements with emerging contactors for application of remedies to defects as is obtained in real world;
- Supervisors should be empowered by contracting them to be the new learner contractors in the next round of CDP;
- Upgrade to higher CIDB grade by looking for opportunities in partnership and subcontracting jobs;
- Pursuit of further academic training and development, and;
- Contractors indicated an exit programme with projects "ring-fenced" for all CDP participants as a means to enhance lessons learnt under the CDP.

4.3.3 Benoni Regional Area

Unlike previous regions, in the Benoni Region two contractors, two supervisors and a mentor–engineer consented to be interviewed. Both contractors were graded 1 CE at programme commencement, both were 4CE graded at the time of interview. Both contractors have a degree - an MBA and B.Ed, with 10-15 and 0-5 years of industry experience respectively. The MBA holder with 10-15 years' experience rated self highly (4.8 points) at programme commencement and at time of interview on the self-assessment 5 point Likert scale for gauging existing knowledge. The

other contractor with relatively little experience rated self1 point at programme commencement and approximately 4 points at time of interview.

In contrast, both supervisors had matric and grade 10 educational background, with 0-5 and 10-15 years industry experience respectively. The matric certificated supervisor with fewer years of experience (0-5years) rated self 1 point at programme commencement and 3.8 points at time of interview, whilst the other supervisor rated self at 3 points and 4.8 points at commencement and time of interview respectively.

The mentor-engineer for Benoni Region reported the followings as training and knowhow given to contractor's organization within the CDP

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. Though classroom training was conducted by external service provider, mentor engineers assisted with compiling log books and POE's.
- Site demonstration and classroom training given by mentor-engineer includes, site establishment, time and resource management, financial management and payment certification, technical details such as- concrete mix-design, construction material, pothole patching technics.

The four contractors and supervisors in this region on their part reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).
- Hands on site training conducted by mentor-engineer on routine road maintenance activities.

Reported knowledge gained by contractors and supervisors includes:-

- Ability to undertake routine road maintenance activities (technical) versus general building experience previously held;
- Pricing and submission of tenders;
- Business and financial management (appreciate difference between personal and company finance);
- Site planning, organization and control;
- Safety compliance & site administration,and;

- Stakeholder engagement and management (engagement of ward councillors, client and locals in employment of EPWP local labour).

Reported enhancement to learning experience required under the programme

- Contractors indicated a 3 months exit programme with projects "ring-fenced" for all CDP participants as a means to enhance lessons learnt under the CDP;
- Creation of work opportunities to practise knowledge acquired during CDP;
- To be a future emerging contractor by registration of own CIDB graded company by supervisors who were not co-directors / company owners;
- Upgrade to higher CIDB grade by embarking on works including partnerships, joint ventures and subcontracting jobs;
- Investment in plant and equipment;
- Post CDP assessment to find out survival rate of contracting entities outside of the programme, and;
- Explicit contract conditions should be allowed for in future agreements with emerging contactors to spell out contractual rights and obligations as obtained in real world.

4.3.4 Bronkhorstspruit Regional Area

Three contractors, three supervisors and a mentor–engineer were interviewed at the Bronkhorstspruit Region. All three contractors were graded 1 CE at programme commencement, two were graded 5 CE and one 4CE at the time of interview. The contractors each had a NCV 4 certificate in building & civil engineering, matric certificate and marketing diploma with varied years of experience in construction industry of 0-5, 5-10 and 10-15 years respectively. At the time of interview all contractors rated themselves an average 4.3 points versus 2 points at commencement, on the self-assessment 5 point Likert scale for gauging existing knowledge. Of noteworthy is contractor with a marketing diploma, with 10-15 years' experience rating self-5 points on both periods (at commencement & at time of interview) for tendering knowledge field.

Two of the three supervisors had an N6 certificate in building & civil engineering post matric and a business management degree, with 0-5 years' experience for degree holder and one N6 holders and 5-10 years' experience for other N6 holder. Similarly a lowly average of 2 point was reported at programme start versus 4.2 points at time of interview on the self- assessment question gauging existing knowledge

The mentor-engineer for Bronkhorstspruit Region reported the followings as training and know-how given to contractors organization within the CDP.

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. Though classroom training was conducted by external service provider, mentor engineers assisted with compiling log books and POE's.
- Site demonstration and classroom training given by mentor-engineer includes, site establishment, time and resource management, financial management and payment certification, technical details such as- stone pitching, pot holes patching, edge break repairs, wing wall and energy dissipators installation.

The six contractors and supervisors in this region on their part reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).
- Hands on site training conducted by mentor-engineer on routine road maintenance activities.

Reported knowledge transferred to contractors and supervisors includes:-

- Pricing and submission of tenders;
- Site planning, organization and control vis a vis resource management in terms of 52 EPWP local labour management for site productivity;
- Safety compliance & site administration;
- Stakeholder engagement and management (engagement of ward councillors, client and locals in employment of EPWP local labour);
- Ability to undertake routine road maintenance activities (technical);
- Business and financial management (payment certification), and;
- CDP experience was a confidence building experience due to the opportunities created for local labour and programme participants.

Reported enhancement to learning experience required under the programme

- To be a future emerging contractor by registration of own CIDB graded company by supervisors who were not co-directors / company owners;
- Upgrade to higher CIDB grade in building and civil engineering category by looking for opportunities in partnerships, joint ventures and subcontracting jobs, and;

- Pursuit of further academic training and development.

4.3.5 Pretoria Regional Area

In Pretoria Region three contractors, one supervisor and a mentor–engineer consented to be interviewed. All three contractors were graded 1 CE at programme commencement, two were graded 4 CE and one 6CE at the time of interview. Two contractors have a diploma qualification and one have a BCom degree in finance. Two contractors have same years of experience in industry (5-10 years) and the other 10-15 years' experience. At the time of interview all contractors rated themselves an average 4.4 points versus 2.1 points at commencement of CDP on the self-assessment 5 point Likert scale for gauging existing knowledge. Of noteworthy was one contractor with 5-10 years' experience rated self lowly (1point) on both periods (at commencement & at time of interview) on technical abilities field.

Only one supervisor was interviewed in Pretoria, and possesses a diploma qualification which was non-construction related, with lowly (0-5) years' experience. The supervisor rated self-average 4.2 points at time of interview against 2 points at programme commencement on the self-assessment 5 point Likert scale for gauging existing knowledge

The mentor-engineer for Pretoria Region reported the followings as training and know- how given to contractors organization within the CDP.

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. Though classroom training was conducted by external service provider, mentor engineers assisted with compiling log books and POE's.
- Site demonstration and classroom training given by mentor-engineer includes, site establishment, business and financial management, statutory compliance and technical details.

The four contractors and supervisors in this region on their part reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).
- Hands on site training conducted by mentor-engineer on routine road maintenance activities.

Reported knowledge transferred to contractors and supervisors includes:-

- Site planning, organization and control vis a vis resource management in terms of 52 EPWP local labour management for site productivity;
- Safety compliance & site administration;
- Ability to undertake routine road maintenance activities (technical);
- Business and financial management (payment certification), and;
- CDP experience was a confidence building experience due to the opportunities created for local and participants

Reported enhancement to learning experience required under the programme

- Supervisors who were not co-directors / company owners indicated they would like to be a future emerging contractor as such registration of own CIDB graded company was necessary;
- Upgrade to higher CIDB grade in building and civil engineering category of works;
- Pursuit of further academic training and development;
- Explicit contract conditions should be allowed for in future agreements with emerging contactors to spell out contractual rights and obligations as obtained in real world, and;
- Investment and acquire plants and equipment

4.4 SECI model

Having outlined the transfer content and interactions in the foregoing sections, they can be assessed using the SECI model of knowledge transfers (conversion) as developed by Nonaka and Takeuchi 1995. Polanyi as with other authors concerned with knowledge (Nonaka 1994, Grant 1996) all agree that knowledge always entails explicit and tacit parts.

Socialization (from Tacit to Tacit) is the process of sharing experiences and thereby creating tacit knowledge such as technical skills ie. learning by observation, imitation and practice. An individual can acquire tacit knowledge directly from others without using language. The key to acquiring tacit knowledge is experience.

Externalization (from Tacit to Explicit) is a process of articulating tacit knowledge into explicit concept. It is a typical knowledge creation process in that tacit knowledge becomes explicit taking the shapes of concept, metaphors, models, analogies etc. When attempt is made to conceptualise an image, its essence is mostly expressed in language - writing is an act of converting tacit knowledge

into articulable knowledge. Amongst the four modes of knowledge conversion, externalization holds the key to knowledge creation in that it creates new explicit concept from tacit knowledge.

Combination (from Explicit to Explicit) is a process of systemizing concepts into knowledge system. This involves combining different bodied of explicit knowledge. Individuals exchange and combine knowledge through such media as document, meeting. Knowledge creation carried out in formal education and training at schools is another good example.

Internalization (from Explicit to Tacit) is a process of embodying explicit knowledge into tacit knowledge – it is closely related to learning by doing. When experiences through socialization, externalization and combination are internalised into individuals tacit knowledge bases in the form of shared technical know-how, they become valuable assets. For organizational knowledge creation to take place, however, the tacit knowledge accumulated at the individual level needs to be socialized with other organizational members, thereby starting a new spiral of knowledge creation. (Nonaka and Takeuchi 1995)

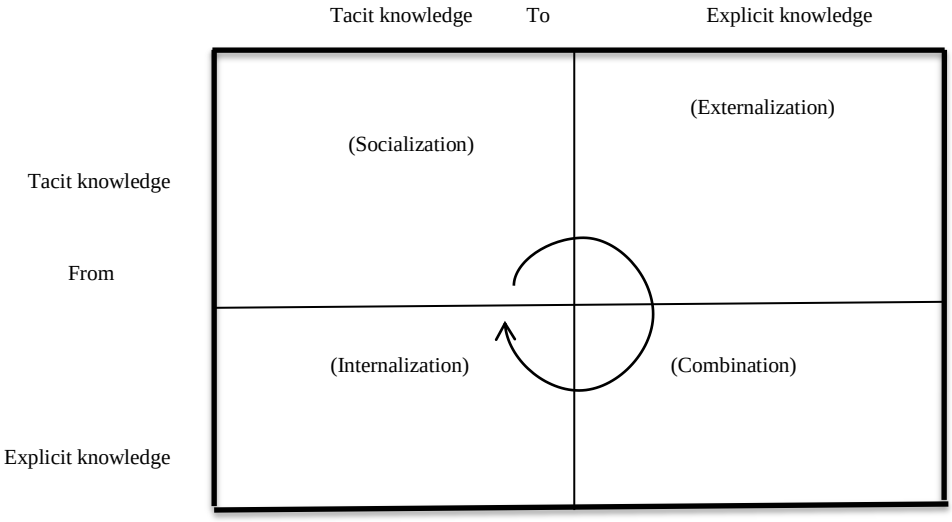

Figure 2 : Content of knowledge created by four modes (Source : Nonaka & Takeuchi 1995)

Based on the forgoing reporting, knowledge transfers commenced in CDP via *Socialization* with on-the job training of contractors/ supervisors and site demonstration by mentor-engineers, *Externalization* involves expressing tacit knowledge in an explicit concept (written form), was evident in the expression of tacit knowledge in written form such as instruction to teams; however, there was no evidence of creation of new concepts. *Combination* involving formal training was reported in the form of NQF level 4 training received in classrooms for about 6 months period, subsequently *Internalization* occurred wherein contractors / supervisor performed activities of what was taught in classroom as evidence from high scores on self-assessment of five knowledge areas at time of interview - 30 months into 36 months programme.

Overarching research question was to determine nature and features of knowledge transfer and enhancement requirements of learning experience thereof. The research aimed to describe context and content of knowledge transfers by describing characteristics of learner contractors, identify & describe interaction of contractor's organization within CDP and identify & describe content of knowledge transferred.

4.5 Summary

In summary, this chapter reveals an eclectic mix of reporting, commencing with analysis of characteristics of CDP respondents with respect to their race and gender – showing a predominantly Black (92%) and 8% Coloured representation, with no Indian / Whites represented on CDP. The data on women entity ownership was encouraging (27%) compared to men (73%).. Majority of respondents (73%) were in the 30-45 age brackets, with an average of 7 years personal experience in the construction industry. Majority (38%) of respondents had less than 5 years' experience and 35% within the 5-10 years bracket of experience. The educational qualification attained by respondents as indicative of training received was surveyed. Half of the respondent (50%) had not received any construction related training. A little over a third (35%) of the respondents had received formal training for works in construction industry and 15% with some occupational health and safety training in addition to their non-construction diplomas. A very high number (about three quarters) of respondent received tertiary education with the highest level being Honours degree and National Diplomas being the most frequent response (46%). A low number (8%) of teacher-theologian turned contractor was also observed.

Data on year of company establishment and years of experience imply that experience held by contractors match the length of time they've operated their company, thus, individuals without prior experience in construction frequently open shop in the industry. Data on size of company of interviewed contractors, the number of employees and company turnover was used to indicate their SMME status in terms of the National Small Business Amendment Act. The data on employees, turnover, contract size and age of companies interviewed suggest a majority of these contractors are residing in the Existence Stage.

In further examining the issue of context, the interactions within the CDP ie determining the organizational interactions within the CDP was reported on. All interviewees indicated a contracted employee / employer relationship existed between contractors and supervisors even though a few supervisors were co-directors/owners of same contracting entity. It merged that contractors, were

mainly company directors, and were responsible for overall management of contracting organization with the supervisors responsible for day to day technical site attendance.

Whilst describing the kind of relationship with mentor-engineers, contractors and supervisors citied such phrases as supportive, professional, very good, good, proactive, ok, helpful, informative& enlighten, growth, matured, clear instructions given, fair, and good communication to describe their relationship.

Having identified interactions, the context within which these interactions occurred is required for clarity. As such interviewees were asked question on typical problems that occurred during interaction with mentor-engineer, as well as comments on what worked well in their relationship. The common cause of problems in the relationship (between mentor-engineer and contractors / supervisors) was wide ranging with few repetitions, even though some interviewees indicated no problems were encountered.

Similarly, the mentor-engineers reported on relationship with contractors & supervisors, as cordial, productive, difficult and interesting, hands-on approach, good & professional. Common causes of problems were also alluded to. The reported typical mentor duties performed on contractors and supervisors within the CDP, included Financial Management, Site Training (Technical) and Daily Mentoring (Managerial)

The matter of knowledge and skills transfers within the CDP was reported on. The report focused on qualitative data obtained from interviews with a view to describing the make-up of knowledge transfer between mentor-engineers and contractors. As knowledge transfers are expected to be dependent on the context and content, specific content was highlighted.

The mentor-engineer reported the followings as training and knowhow transferred to contractor's organization within the CDP:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC. (classroom and site training).
- Site demonstration by mentor-engineers of routine road maintenance activities and classroom training.

All contractors and supervisors interviewed reported that the following training was received:-

- CETA accredited NQF Level 4 Certificate in Supervision of Construction Process, LIC (classroom and site training).

- Hands on site training conducted by mentor-engineer on routine road maintenance activities.

Knowledge transferred to contractors and supervisors reported on by contractors and supervisors was centred on - financial management; technical & managerial knowhow. Enhancement to learning experience required under the programme was also reported, and for the most part bordered on extending contractor training and development opportunity to current crop of supervisors; personal and organizational growth and improvement to CDP interactions to reflect real life situation with regard to Learnership Agreement.

On the self-assessment 5 point Likert scale for gauging existing knowledge. Overall, respondents rated themselves highly (4-5 points) at time of interview vs a lowly (1-2 points) at commencement of CDP, except in cases where higher points (5) was rate at both commencement and interview periods for experienced relevant construction degree holding contractor/supervisor. Another exception of note was the lowly 2 points rated at both periods, by supervisors in Krugersdorp region. Five fields of tendering, site planning and organization, finance management, technical abilities and dealing with supply chain was self-assessed.

Finally, having outlined the knowledge transfer content and earlier context issue of interaction within CDP respondents, the subsequent qualitative analysis of data was governed by the overarching research question, using the SECI model by Nonaka and Takeuchi (1995) with its four stages as a basis and theoretical framework.

5 Conclusion and Recommendations

5.1 Introduction

The research report focused on emerging civil engineering contractors (in an ad-hoc contractor training and development programme as implemented by a government department) and the ways they learn through knowledge transfers from mentors & engineers when interacting with them. The issue of knowledge or lack thereof as one of many factors responsible for underdevelopment of emerging contractors cannot be over stated. This report seeks to contribute to better understanding of current knowledge transfers between mentor-engineers and emerging contractors in a specific training programme such as CDP. This understanding is necessary to develop more suitable context for knowledge transfer by capitalizing on knowledge gains.

The research question was thus to determine nature and characteristics of knowledge transfer and enhancement requirements of learning experience thereof. The research aimed to describe context and content of knowledge transfers by describing characteristics of learner contractors, identify & describe interaction of contractor's organization within CDP and identify & describe content of knowledge transferred.

A comprehensive literature review was undertaken for this research. This began with introductory contextualization of the history of South Africa pre and post colonization including its apartheid past and the legacies thereof. Consequent empowerment legislation enacted to bridge the gap due to apartheid legacy issues, including setting up of the construction industry development board – the resultant CDP and its components, the consultant mentors make up and finally the knowledge management debate – spanning issues around characteristics vs definition of knowledge, knowledge base theory vs knowledge creation theory and SECI model, organizational learning and knowledge sharing peculiarities to construction projects.

The interpretive approach of research design was governed by the research question and setting – contributing to better understating of currently experienced knowledge transfer (content) in an ad-hoc training programme by addressing (context) actual transfer mechanism involved in knowledge gains by emerging contractor. Data obtained was used to draw up a picture of nature of the context in which emerging contractors act within the contractor development programme (CDP) and the interaction within their context. A description of the content (make-up) of knowledge transfer between mentor-engineers and contractors was also focused on, as knowledge transfers are expected to be dependent on the context and content. A face-face interview of CDP participants

was conducted and analysed in two sections, the first, quantitative analysis was to indicate characteristic of respondents and subsequent qualitative data was to describe interaction and typical knowledge transfer as they occurred between contractor/supervisor and mentor-engineer within the CDP. These description included aspects of content as well as context of knowledge transfers as currently experienced.

5.2 Work conducted vs aim and objectives

The research aimed to contribute to better understanding of current knowledge transfers between emerging contractor and mentor- engineers in an ad-hoc programme, four objectives for the research report was set as:-

- Describe the characteristics of participating learner contractors' entities;
- Outline the organizational interactions of the participating learner contractors' entities;
- Identify and describe nature of actual learning experience (knowledge transfer) under the programme, and;
- Description of the characteristic of organizational interactions wherein knowledge transfer occurred.

In looking at the work presented in Chapter 4 and 5 the objectives as set above can be evaluated. Section 4.2 - Characteristics of respondents dealt with first objective, in that, the race, gender, age and experience, training and educational background of contactors/supervisors within CDP shows their make-up – albeit, subsequent to a screen and selection criteria at commencement of programme by GDRT.

Qualitative insights into interactions of participating contractors/supervisor and onwards description of such interactions was done under section 4.2.1 – alluding to the existence of contracts between client and contractors and between contractors and supervisors with mentor-engineers acting as principal agent for GDRT.

Typical knowledge transfer reported upon within the five regional areas was presented. The actual knowledge transfers content and context surrounding the transfer was presented, with the reported transfer content differentiated into three areas of financial management; technical and managerial.

Though the objectives appear to have been met through the conducted work, the aim of describing current knowledge transfer was partially met, as it's impossible to describe knowledge transfers in its entirety, due to the multi-layered nature of knowledge transfer, the complexity of the make-up of

emerging contractors and their interactions. However a step has been taken towards understanding knowledge transfer from mentor –engineers to emerging contractor.

5.3 Summary and Conclusion

Literature is replete with what constitutes barriers and challenges to the development of small, mid-sized and micro enterprise (SMME) contractors, often referred to as emerging contractors. The International Labour Organization (1987), proposed three solutions geared towards contractor development in developing countries, these includes, policies promoting access to work; policies promoting favourable work environment; and lastly programme and policies for training and technical advice. This research alludes to the importance of understanding the South African context wherein these proposed solutions are operational. The research begins with efforts made by the new democratic government, post 1994, to addressing the institutionalised inequalities - legacies of the previous regimes (colonization and apartheid) - via black economic empowerment, preferential procurement and construction industry development board (CIDB) legislations amongst others. The CIDB - a schedule 3a public entity – was instituted to promote amongst others the sustainable participation of emerging contractors in the construction industry; it is in this context that the national contractor development programme emerged.

This research, as such concerns itself with matters of knowledge or lack thereof as one of many factors responsible for underdevelopment of emerging contractors. To do this, we look at knowledge theories including its creation and transfer mechanism vis a vis organizational learning in an attempt to answer the question of nature and characteristics of learning in a specified contractor development programme (CDP).

This research is a cross-sectional study that lends itself to an interpretivist paradigm and inductive logic with qualitative methods (semi-structure interviews). The interviews conducted on CDP participants (contactors/supervisors) enabled researcher to shed light on their features and interaction to avoid making wrong assumption about their make-up and setting.

Blacks constituted the overwhelming majority of programme participants, seconded by Coloured with on White or Indian representation. Majority of respondents had less than 5 years' experience, with data on year of company establishment and years of experience implying that experience held by contractors match the length of time they've operated their company, thus, individuals without prior experience in construction frequently open shop in the industry.

Although majority of respondent had received formal qualification (65%) only about a third had formal training for works in construction industry. A low number (8%) of teacher-theologian turned contractor was also observed. Based on data on training and experience - the training levels received are relatively high (65%) and construction experience of respondents is low (about 40% having less than 5 years' experience) - a unique situation, consequence of the CDP programme entry selection criteria. This might affect the cognitive distance (between senders and receiver) likely making transfer of knowledge problematic as mutual understanding might be difficult.

Whilst data on size of company of interviewed contractors amongst others, indicates their SMME status in term of the National Small Business Amendment Act, the figures for annual turnover and average contract size do not correspond possibly due to a number of reasons such as lack of knowledge about company financials, multiple small contracts, delayed project completion etc. The data on employees, turnover, contract size and age of companies interviewed suggest a majority of these contractors are residing in the Existence Stage (Churchill and Lewis in Martin 2010). This is supported by the statement made by the respondents during the interview that they *struggle to get jobs; they're surviving on the CDP income, and wished for the CDP period be extended beyond 36 months as "exit programme" for soft landing into real world.*

Interactions within the programme was reported on as been contractual, far from the usual collaboration with main contractors as this was a Direct Target Incubation programme for emerging contractors. A qualitative description of relationships was also presented, alongside context within which these relationships operated, with regards to what was problematic or worked well in their relationship. The reported transfer content differentiated into three areas of financial management; technical and managerial was corroborated by both mentor-engineers and contractors/supervisors.

According to the SECI model, the four stages of knowledge creation and conversion observed within CDP proceeded with *Socialization* as on-the job training of contractors/ supervisors and site demonstration by mentor-engineers, *Externalization* involves expressing tacit knowledge in an explicit concept (written form), was evident in the expression of tacit knowledge in written form such as instruction to teams; however, there was no evidence of creation of new concepts. *Combination* involving formal training was reported in the form of NQF level 4 training received in classrooms for about 6 months period, subsequently *Internalization* occurred wherein contractors / supervisor performed activities of what was taught in classroom as evidence from high scores on self-assessment of five knowledge areas at time of interview - 30 months into 36 months

programme, and thus the spiral continues. This observations were only for this specific CDP and would need further validation for generalization to be made confidently.

Finally knowledge transfers mechanisms are dependent on the organizational setting and actors involved. Knowledge transfers in the current setting have been described and it is evident that emerging contractors learn while they interact with others.

5.4 Recommendation for future work

The followings are mere suggestions as options for future research are varied and wide. Actual improvement to knowledge transfer needed between emerging contractors and consultants mentor-engineers in a CDP is beyond the scope of this study as such possible work contributing to improvements of these learning experiences can now be put forward.

The work reported in this report was set in the routine road maintenance activities of road maintenance works of the civil engineering sector. Whilst similarities of knowledge transfer might exist between the building and civil engineering sector, further exploration will be required to ascertain and paint a wide picture.

The presented work is based on observation of emerging contractors in a training incubator programme as main contractors with mentor-engineers for support and this induces limitation on the presented results. Other types of non- programme specific open cooperation where knowledge is transferred needs to be studied.

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Appendix A - Survey instrument

General background (to show characteristics of organization)

Personal details:-

Age

25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	>65

Gender

Male :	Female :

Ethnic grouping

Black:	White :	Indian :	Coloured :

Position in Company

Owner:	Employee:

Others_____

Years of experience in construction industry

0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	>40 years

Highest Education Level

Previous construction training

Yes	No

received

If yes please indicate _____
_____
_____

Company Detail

Year of company establishment _____

Number of permanent employee_____

Company annual turnover _____

Latest contract size _____

Briefly describe company structure _____
_____
_____

CIDB grade :-

Current :	At start of CDP:

If not upgraded, why not?

_____
_____

Interactions (determination of interaction within the CDP)

How did you hear / know about Vukupile Learnership Programme

_____
_____

Have you previously taken part in a learnership Programme

Yes	No

if yes provide detail _____

Describe your interaction with your contractor / supervisor (ie is it an employment /partnership relationship)

_____
_____
_____

Have you been a mentoree or a mentor before?

Yes	No

If yes provide detail _____

Describe your working relationship with your mentor –engineer /contractor- supervisor

_____
_____
_____

Common cause of problem in the relationship (briefly describe)

If relationship was good what worked well?

Any projects/contracts undertaken outside of the Vukupile Learnership Programme and value thereof?

Identification of learning practices (to assess existing experience and knowledge)

1 No experience	2 Little experience	3 Experience	4 Some experience	5 A lot experience

Knowledge areas before and during Vukuphile Programme

1) Filling tender document and submission: - Before _____During CDP_____

2)Site organization and planning & control:- Before _____During CDP_____

3) Finance management, prepare payment cert: - Before _____ During CDP_____

4)Understand and read technical drawing:-Before _____ During CDP_____

5)Dealing with suppliers and subcontractors:-Before _____ During CDP_____

Briefly describe training received / given under Vukuphile Programme _____
_____
_____
_____
_____

Briefly describe knowledge gained (knowhow)/transferred under Vukuphile Programme _____
_____
_____
_____
_____

Briefly suggest how to enhance what you've learned/taught under Vukuphile Progarmme _____
_____
_____
_____

Appendix B – Invitation to Participate

PROJECT SHORT TITLE: Barriers to growth and development of lower CIDB grade contractors

Greetings,

I am Adetayo Kuju, an MSc candidate at the University of Witwatersrand, from the School of Construction Economics and Management. I am carrying out research in the area of barriers to growth and development of lower CIDB grade contractors within the context of the National Contractor Development Programme

Small, medium and micro enterprise (smme) contractors, sometimes referred to as emerging contractors are faced with myriad of challenges preventing them from being serious players in the construction industry. Amongst the many challenges emerging contractors are faced with, the issue of knowledge (at an organizational and personal level) or lack thereof among emerging contractors is the question this research is primarily concerned with. The South African government instituted the construction industry development board (CIDB) to amongst others promote the sustainable participation of emerging contractors in the construction industry - to this effect, the national contractor development programme was developed by the CIDB, as a purpose made vehicle for training and development of lower CIDB grade contractors on public infrastructure projects, with the aim that a meaningful impact will be made towards upskilling emerging contractors and ultimately transform the construction industry.

The purpose of the study is to understand Gauteng Departments of Roads and Transports V'ukuphile contractor development programme participants' characteristic & makeup, interactions and existing nature of knowledge currently transferred under the programme. I am therefore inviting you to take part in this research project as a participant, in a semi-structured face to face interview (subject to your consent). The interview will last approximately 30 minutes, which will take place at the regional office for your convenience or your site office (if you will). The interview will take place on a date that will be agreed subsequent upon your acceptance to participate in this study.

Please note the following:

- Your participation is entirely voluntary, and your refusal to participate or withdraw your participation at any time will involve no consequences.
- During the interview you may refuse to answer any question(s) about which you do not feel comfortable
- Your participation is anonymous and confidential. Therefore, your name and identity will not be disclosed or contained in the final report of this study (pseudonyms/aliases will be used instead).
- All data will also be stored in password protected digital form with all identifying features removed. Further, all information gathered through the interview will only be used for research purposes and raw data will be destroyed after 5 years.
- The results of this study will be reported to an academic and professional audience. Its dissemination will be through the thesis report, seminars, conferences and academic journals all of which may be in print versions or electronic repositories accessible through the World Wide Web
- The summary of the research findings may be made available to you upon request

Please do not hesitate to contact me if there are any questions or clarifications you wish to make using the following contact details.

My contact details: Adetayo kuju
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Phone number: 0736839400

My supervisors' contact details:
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Appendix C – Participant Consent

School of Construction Economics and Management
University of Witwatersrand
Private Bag 3
Wits
2050

Dear Adetayo Kuju

Expression of Interest to participate in a survey titled:
Barriers to growth and development of lower CIDB grade contractors

I/ We have received your letter with the date _____on the above caption. I/ We will / will not be able to participate in the survey.

If applicable:
Reason(s) for our inability to participate in the survey include(s)

_____
_____
_____
_____
_____
_____
_____
_____

Thank you for the invitation

_____
Name

_____
Designation

_____
Company