Knowledge creation and transfer in construction organisations in Tanzania

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Dedicated to Baby-Ai, Abraham and Krigo
Abstract:

The project-based nature of construction organisations creates a learning opportunity from most of the activities carried by these organisations. Knowledge is being created in the course of carrying core and non-core activities in the organisation. For organisations to make the most of this knowledge, a mechanism for tapping has to exist. Such tapping can occur through the organisation’s various activities and organisations stand to benefit if these activities are done strategically not only to tap, but also to create and transfer knowledge and ultimately enhance performance.

The study has henceforth analysed the knowledge transfer process of construction organisations in the Tanzania construction industry and explored how these organisations facilitate creation and transfer of knowledge. A survey in a pilot study in the year 2001 was conducted to refine and focus the study’s questions and propositions and a case study strategy of inquiry has been adopted for the main study. Four construction organisations in the Tanzania construction industry are studied.

The analyses from findings support the propositions set forth in the study and among others establish: the specificity of the knowledge transfer process in construction organisations, the situational nature of the knowledge being transferred, the ephemeral nature of goals and the “selling of jobs” in construction sites influencing incentives for knowledge management initiatives. The study further establishes that there are inadequate attributes towards knowledge creation in the organisations. That: there is limited practice of on-the-job training, peer assist and learning by imitation; codification of procedures, rules, and checklists is done insignificantly or absent completely; networking of knowledge is poor; experience sharing and learning by doing is low.

In effect the study proposes an optimal knowledge transfer process for construction organisations in Tanzania using an IDEF0 business process model, and explores the cost-effectiveness for organisations in the industry pursuing knowledge management initiatives such as the knowledge transfer process. Lastly, recommendations for construction organisations at policy and functional level are made.

Keywords: Knowledge creation; knowledge transfer; construction organisations; process model
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Stockholm, October 2005
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**Acronyms**

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<tr>
<td>ACET</td>
<td>Association of Consulting Engineers</td>
</tr>
<tr>
<td>AQRB</td>
<td>Architects and Quantity Surveyors Registration Board</td>
</tr>
<tr>
<td>BPR</td>
<td>Business Process Re-engineering</td>
</tr>
<tr>
<td>CPD</td>
<td>Continuous Professional Development</td>
</tr>
<tr>
<td>DAWASA</td>
<td>Dar es Salaam Water and Sewerage Authority</td>
</tr>
<tr>
<td>ERB</td>
<td>Engineers Registration Board</td>
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<tr>
<td>FIDIC</td>
<td>Fe´de´ration Internationale des Inge´nieurs Conseil. (the acronym represents the French version of the International Federation of Consulting Engineers)</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GFCF</td>
<td>Gross Fixed Capital Formation</td>
</tr>
<tr>
<td>IDEF0</td>
<td>Integrated Definition Function 0 (zero)</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>KTH</td>
<td>Kungliga Tekniska Högskolan/ Royal Institute of Technology</td>
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<tr>
<td>NCC</td>
<td>National Construction Council</td>
</tr>
<tr>
<td>NEDCO</td>
<td>National Estate Designing Corporation</td>
</tr>
<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
</tr>
<tr>
<td>SEAP</td>
<td>Structured Engineers Apprentice Program</td>
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<tr>
<td>SIDA</td>
<td>Swedish International Development Agency</td>
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<tr>
<td>TCRB</td>
<td>Tanzania Contractors Registration Board</td>
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<tr>
<td>TQM</td>
<td>Total Quality Management</td>
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<tr>
<td>UCLAS</td>
<td>University College of Lands and Architectural Studies</td>
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<tr>
<td>UNCHS</td>
<td>United Nations Centre for Human Settlement</td>
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<td>UDSM</td>
<td>University of Dar es Salaam</td>
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<td>URT</td>
<td>United Republic of Tanzania</td>
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**Abbreviations**

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<td>Inter-Consult</td>
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<tr>
<td>Mechelec</td>
<td>Mechanical and electrical</td>
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1. Introduction

1.0 Background and research context

In developing countries construction industries are weak because of internal inadequacies and external difficulties and constraints. The industries are unable to perform the tasks required by them. As a result this imposes a severe constraint on economic development, as the required buildings and infrastructure are not made available (UNHCS, 1996). With globalisation and the associated opening up of country boundaries in terms of trade and investments, the challenge posed to the developing countries is intensified. This then calls for developing countries to strive for competitive strategies so as to survive in the globalised world. To achieve this, there is a need for organisations in construction to enhance their knowledge management strategy.

Organisations in construction are continuously exposed to opportunities for learning. This is so, since each new project in construction is a new experience. That is, no two projects can ever be exactly the same in that they may be composed of different working teams, physical features, contracts and periods in time. Such variations consequently bring in different working environments and calls for new skills, tactics and solutions for each new project. The implication is hence an organisation’s past dictates its present ability to deal with new experience; and that experiential knowledge has an important role to play in construction problem solving. Since a major portion of experiential knowledge is uncodified and tacit (Li and Love, 1998), investigating how organisations may effectively tap and transfer this knowledge for re-use is of interest.

Such an implication explains the pre-qualification prior to bidding of contracting firms (builders), that, among other attributes, enquires on the number of construction projects carried and those successfully completed. In doing this, the assumption is that, experience acquired in past projects by contracting firms will be transferred and effectively used in future projects. This then is a presumption that organisations in construction have in place mechanisms to capture
knowledge acquired in the course of carrying out a project and transfer the knowledge to future projects. But the concern is “How do they capture and transfer such knowledge?”

Furthermore, the fact that organisations in construction are able to deal with new circumstances on each specific project implies a mechanism exists for them to create knowledge. Since it is perceived that organisations by themselves cannot create knowledge but have to use individuals (Nonaka and Takeuchi, 1995), “How then do organisations create an environment for individuals to create knowledge?” These questions have henceforth prompted this study to investigate how knowledge is created and transferred in construction organisations in Tanzania and whether these organisations facilitate creation, and transfer of knowledge.

1.1 Significance of Study

Although effective knowledge transfer is generally viewed as central to a firm’s success, with a few exceptions, the strategic management literature neither specifies nor tests the processes or underlying mechanisms through which knowledge transfer occurs in organisations (Argote and Ingram, 2000). Empirical studies made in construction in relation to knowledge management have largely concentrated on the developed countries (Bröchner et al, 2004; Egbru et al, 2003) and mainly on the aspect of learning in construction organisations (Boyd and Robson, 1996; Bang and Clausen, 2001; Anheim and Widen, 2001). Similarly the few studies on knowledge creation and transfer in construction had focused in the developed world (Bröchner et al, 2004; Egbru et al, 2003; Niss, 2002; Sverlinger, 2000; Bjarni, 1994; Petursson, 1991). In addition limited empirical studies exist on knowledge management and its various facets like learning or knowledge transfer for the developing countries, and to be specific, for Tanzania. Other than Simkoko’s (1989) study on the factors impacting technology transfer in Tanzania, no studies in Tanzania have: investigated the knowledge creation and transfer process of construction organisations; nor explored how these organisations in the construction industry facilitate the creation and transfer of knowledge through a knowledge transfer model.

In addition, the Tanzania construction industry is typified by performance constraints that make it inefficient. Such constraints feature in: low capacity and capability of the local contractors and consultants; inadequate and erratic work opportunities, and inefficient and non-transparent procurement systems (URT, 2003).
This study is hence an attempt towards filling the existing academic gap and an address of some of the performance constraints. It thus explores how construction organisations in Tanzania could adopt a knowledge management initiative such as the knowledge transfer process to address and mitigate some of the performance constraints. The study hence analyses the mechanism of creating and transferring knowledge of construction organisations in Tanzania and comes up with a transfer process that reflects an optimal process for organisations in Tanzania, using a business process model.

1.2 Statement of the problem

The project-based nature of construction organisations creates a learning opportunity from most of the activities that are adopted by these organisations. Knowledge is being created in the course of carrying out core and non-core activities in the organisation. The knowledge thus created can be classified into three categories: an explicit, a combination of explicit and tacit and, a tacit form. In the explicit form it may occur in records, reports, charts and other structured forms. In the combination of explicit and tacit form, may be found in routines, norms, organisation structure, culture or individual memories and in the third category, in purely tacit form as in skills, "know how", mental modes, beliefs or perception (Nonaka and Takeuchi, 1995). The explicit form of knowledge is easily accessible for re-use and may be transferred within the organisation or when there is inter-action with other organisations (Jacob and Ebrahimpur, 2000). The tacit knowledge however is relatively difficult to access to, and organisations may not gain from it unless it is made explicit.

For organisations to get the most of knowledge acquired, created or existing in the organisation, a mechanism for tapping the various forms of knowledge has to exist. Such tapping can occur through the organisation’s various activities and organisations stand to benefit more, if these activities are done strategically not only to tap but also to create and transfer knowledge. That is strategically, organisations should thrive to ensure that: a knowledge gain created, or acquired in one unit or by an individual, is also gained by another and ultimately influences performance.

In recognition of the significant role of activities in the managing of knowledge in general, and specifically in knowledge transfer for an organisation, this study has taken construction
organisations’ *activities* as a media for which organisations can create and transfer knowledge in a construction organisation, using a knowledge transfer process model (See figure 1.1).

### 1.3 Objective

The study analyses the knowledge transfer process of construction organisations in the Tanzania construction industry and explores how these organisations facilitate creation and transfer of knowledge so as to develop an optimal knowledge creation and transfer process for the organisations using a business process model.

From the said objectives, two propositions are made:

**Propositions**

- The knowledge transfer process of construction organisations in Tanzania is incidental, unstructured and implicit.
- Facilitation of knowledge creation in construction organisations in Tanzania is insufficient.

**Research Questions**

- How do construction organisations in Tanzania transfer knowledge?
- How do they: a) acquire; b) distribute; c) interpret; d) organize to memory (store) and retrieve information and knowledge?
- How do construction organisations in Tanzania facilitate knowledge creation in their organisations?
- What is the optimal knowledge creation and transfer process for construction organisations in Tanzania and how can this be presented in a form that can be communicated effectively?
1.4 The theoretical frame

The significance of knowledge transfer has been underscored by various individuals (Argote and Ingram, 2000; Goh, 2002; Love et al, 2000; Cordey-Hayes and Gilbert, 1996; Senge, 1990) and knowledge transfer has been identified as a core factor of a firm’s performance as advancing in core competence is facilitated with what the firm knows. It is the leverage by which firms can acquire competitive advantage, the means by which they can continuously enhance their vision and achieve goals set through the firm’s strategies.

A holistic view has been adopted in explaining the theoretical framework for this study by considering the long-term and short-term effects for an organisation that has an effective knowledge transfer in place. The study hence conceptualises for effective knowledge transfer to occur in organisations, organisations need to have a vision, a knowledge management vision. This is of significance as organisations generally fall short of having such visions as most focus their vision and mission statement to market performance, finance, employment and, or management principles (Probst et al, 2000). Subsequently strategic knowledge goals are absent. Moreover, organisations do not specify what areas of knowledge should be developed but are rather concerned with markets and competition.

Hence organisations stand to gain by developing knowledge management strategies. Such strategies are to be set for long-term programs aimed at realising the knowledge management vision and for short to medium-term programs to achieve strategic goals for the organisation. These strategic goals are to be facilitated by the introduction of facilitating and enabling conditions through organisation structures, processes, technology and operational goals.

This study takes the realisation of the knowledge operational goals as to occur through a process, a knowledge transfer process that constitutes information and knowledge acquisition, information distribution, making meaning, storing (organisational memory), and information and knowledge retrieval. It is perceived, the long-term effects of an effective knowledge transfer will work towards visualising the knowledge management vision of the organisation, while the mid and short-term effect will work towards achieving strategic knowledge goals. Such a process is contemplated to create an enhancement of knowledge and may in short to medium-term call for a review of the knowledge management strategies and in the long-term the vision, so as to sustain the organisation’s competence. A model of effecting knowledge transfer and its subsequent outcome on an organisation as conceptualised in this study is illustrated in Fig.1.0 and Fig.1.1
Furthermore, the study considers in the process of knowledge transfer, knowledge is being created. The knowledge creation occurring through a conversion process whereby knowledge is converted from tacit to explicit form and vice versa (Nonaka and Takeuchi, 1995). Refer Figures 1.1 and 1.2.
Fig. 1.0: Sustaining knowledge through a knowledge transfer process

Knowledge Management Vision

Knowledge Management Strategy

Knowledge Transfer Process
- Acquisition
- Distribution
- Making Meaning
- Organisational Memory
- Retrieval

Long Term

Medium to Short Term

Knowledge Creation

Fig. 1.1: The knowledge transfer process
1.5 Key features in the theoretical model

Despite acknowledging the fact that various individuals have produced models on knowledge transfer, (Cordey-Hayes and Gilbert, 1996; Vito et al, 1999; Argote and Ingram, 2000; Roth et al, 2001; Goh, 2002) a knowledge transfer model borrowed from Dixon (1992), Sverlinger (2000) and Nonaka and Takeuchi’s (1995) knowledge creation model have been found relatively more appropriate for investigating the research problem and hence have been slightly modified and adopted. These models have been adopted due to a number of reasons.

Dixon's (1992) and Sverlinger’s (2000) knowledge transfer models have been adopted based on the fact that the models have observable and measurable attributes, making them effective tools for exploring and assessing the mechanism of the knowledge transfer process in organisations - a factor that forms the object of this study. Nonaka and Takeuchi’s (1995) knowledge creation model has been adopted since the study takes a view that for knowledge to be transferred, it has to exist, and that, the transfer process inherently creates knowledge. Henceforth, taking knowledge creation as embedded in the knowledge transfer process, a dissociation of the two is not practical. The mechanism of such a process is taken to occur through a conversion process of the two forms of knowledge, tacit and explicit knowledge, where knowledge is consequently created. Furthermore Nonaka and Takeuchi’s (1995) model, like Dixon's (1992) and Sverlinger’s (2000), all provide observable and measurable attributes that can address the research questions posed by the study. The explained mechanism of the knowledge creation process is illustrated in figure 1.2.
1.5.1 Knowledge defined
Various writers have described the term ‘knowledge’ differently with the various definitions seen as having one thing in common. That is, knowledge as being related to a process, which is often thought to involve human action.

In this study a definition of knowledge has been adopted which is as given in Probst et al, (2000, p.24) that “Knowledge is the whole body of cognition and skill which individuals use to solve problems. It includes both theories and practical everyday rules and instructions for action. Knowledge is based on data and information, but unlike these it is always bound to persons. It is constructed by individuals, and represents their beliefs about causal relationships.” Such a definition has been adopted based on the fact that it more or less embraces the definition of knowledge as given by various individuals such as Niss (2002), Bhatt (2001), Sverlinger (2000), Lundequist (1999), Vito et al. (1999) and Nonaka and Takeuchi (1995) implicating a widely accepted definition and also represents my understanding of the term in the field of knowledge management.

1.5.2 Explicit and tacit knowledge explained
Knowledge can occur both implicitly and explicitly (Argote and Ingram, 2000; Lundequist, 1999; Barrett and Sexton, 1999; Niss, 2002). With the latter where there is direct communication and
the former where the recipient cannot articulate the knowledge acquired. Further, tacit knowledge has been explained as involving intangible factors embedded in things like experience, values and personal beliefs (Barrett and Sexton, 1999), routines or norms imposed on members without them being able to articulate the knowledge embodied (Argote and Ingram, 2000). Niss (2002) referring to Baumard (1999) has further explained that there are two dimensions of tacit knowledge, a cognitive and technical dimension; divisions that she states are frequently used in knowledge management literature and that the technical dimensions described encompass the kind of informal personal skills or craft skills often referred to as know-how; while the cognitive dimensions has been defined as – beliefs, ideals, values, schemata and mental models, which are deeply ingrained in us and which are often taken for granted; and explicit knowledge as that which can be expressed in words and numbers and shared in the form of data, scientific formulae, specifications, manuals and the like (Niss, 2002). Others that have written on the subject have explained explicit knowledge in a similar manner (Barrett and Sexton, 1999; Probst et al, 2000).

In this study, both forms of knowledge will be explored in the transfer process as they form an integral aspect in the process.

1.5.3 Significance of making tacit knowledge communicable

A significant proportion of a company’s knowledge is said to be stored in the minds of its employees (Argote and Ingram, 2000; Probst et al, 2000). This thus exists as tacit knowledge. Firms have been encouraged to strive to make the tacit knowledge communicable by making it explicit (Jacob and Ebrahimpur, 2000). This is emphasized as they state explicit knowledge is easier to access and the knowledge which is often in short supply is that which is acquired through experience or learning by doing. They hence posit that organisations that are able to successfully tap the tacit knowledge will hence have a comparative advantage.

Furthermore, it is also considered that a key challenge of technology transfer under the knowledge perspective as the ability to convert tacit to/from explicit knowledge so as to be in a format that can easily be absorbed by construction firms (Barrett and Sexton, 1999). Since knowledge possessed by construction firms is significantly experiential (Love et al, 2000) and is stored in people’s heads, tapping of this tacit knowledge by converting it to explicit knowledge is essential.
1.5.4 Knowledge creation

It has been suggested that tacit knowledge could be tapped by conversion to explicit form and that such a process would create knowledge (Sverlinger, 2000; Lundequist, 1999; Nonaka and Takeuchi, 1995). The latter, have termed the process as a “socialization process” that constitutes four components: i) a socialization component where knowledge is transferred when there is social contact as through apprenticeship, or experience sharing; ii) an externalization component as when the experience is documented and hence made explicit thus chances of converting tacit to explicit knowledge exist; iii) a combination as when records, experiences are updated, reviewed, evaluated hence knowledge conversion is transferred mainly from explicit to explicit; iv) an internalization component where existing explicit and implicit knowledge enhances the tacit knowledge within an individual hence knowledge is converted from explicit to tacit knowledge. See Figure 2.3 and refer chapter two section 2.8.1. and 2.8.2. In this study, although the term “socialization” has been avoided to enhance unequivocal interpretation, the concept of knowledge creation has been adopted as constituting the four modes as explained and is the one taken as the optimal knowledge creation process.

1.6 Intra-organisational and Inter-organisational knowledge transfer

Opportunities for learning between firms exist as firms in the industry do not work in isolation and that firms differ in their capabilities. Inter-organisational knowledge transfer could hence be the solution for firms to share knowledge and thus enhance capacity. This is a factor empirically noted in various studies (Argote and Ingram, 2000; Niss, 2002). However, the capacity of a firm to absorb knowledge has a significant role to play for a firm to learn from the external environment (Vito et al, 1999). Others have emphasized for inter-firm knowledge transfer, knowledge acquisition and creation capabilities of the firms as essential (Cordey-Hayes and Gilbert, 1996; Sverlinger, 2000; Bhatt, 2001). These scholars purport the capacity of a firm to create and acquire knowledge as a pre-requisite in the knowledge transfer process whether inter or intra. These views enhance the significance of the study in that, for firms to gain from others through a knowledge transfer process, their intra-organisation transfer processes have to be efficient. Otherwise with poor absorptive capacities or acquisition of knowledge, inter-organisational knowledge transfer also becomes hampered.
1.7 Methodology

A multiple case study of construction organisations active in the Tanzania construction industry has been adopted. The justification of choice of this method originates from the object of study and its exploratory nature, that it is investigating the knowledge transfer process in organisations and hence making, collecting information in a real-life context important. The units of analysis included consulting firms in architectural, quantity surveying and engineering practices and construction firms (contractors) in civil and building works. These have been chosen, since these are among the key actors of the Tanzania construction industry and hence are considered a representative.

Construct validity- A multiple evidence approach was used in sourcing data whereby primary and secondary sources were sought with both qualitative and quantitative data being collected. Registered and active firms in the Tanzania construction industry were selected. A chain of evidence was established where a link was sought between the questions addressed and the theoretical propositions set by the study. A similar approach was used for the data analysis and conclusion.

Internal validity - facilitated by testing the propositions and investigating any causal relationships.


Reliability of findings - the following procedure was taken in the sample identification and collection of data:

i. Conduction of survey - a survey was carried out so as to map the sample through interviews and administering questionnaires. This formed a pilot study for the first year of my research study and was done in the year 2001 so as to map the sample for replication logic. It included both construction firms and consulting firms practising in the Tanzania construction industry. A total of 49 contracting firms and 19 consulting firms participated in the survey.

ii. Selection of cases – The outcome of the survey guided the selection of cases for data collection. Four cases were selected from the pilot population basing on the data that had been collected and the organisations’ background. Cases that were perceived to support the replication
logic that had been adopted were hence selected; two cases for the literal replication and two for the theoretical replication.

Furthermore, contracting firms registered under the same class category by the Contractor’s Registration Board in Tanzania (TCRB) were considered. This was done so as to ensure the construction firms were more or less of the same capability; a process ensured by the classification procedure under this board. For consulting firms, multi-disciplinary firms were considered. That is, those having more than one profession in the organisation. As the registration process does not reflect consulting capabilities hence all who were still under the registrar of the registration authorities were considered as having the same performance capabilities and the pilot study was taken as the basis for the pursuing stages of the study.

iii. Data collection approach – For the pilot study, data was collected through questionnaires and interviews while for the main study a triangulation method of data collection was used, hence data was collected from documents, archives, direct observation, interviews, questionnaires and part participant observation.

1.8 Delimitation of study
The study is limited to those consulting firms and contractors registered with the registration authorities since these are the only ones legally allowed to practice.

1.9 Data Analysis and presentation
The study relied on a ‘theoretical proposition approach’ (Yin, 1994) as the key analytical strategy among a cross case analysis. The data has been presented in various formats to aid understanding. This includes, descriptive and narrative modes, use of tables, diagrams and models.

1.10 Thesis structure
The thesis is structured into eight chapters.

Chapter one - This chapter gives an overview of the thesis. It gives the background of the research problem, the research objectives, propositions and the theoretical frame from which the study is based.

Chapter two – gives the parent fields of literature that the conceptual framework has borrowed from. It describes key concepts of knowledge, definition, types and forms, knowledge transfer mechanisms, models and how they fit into the broad knowledge management framework.
The knowledge creation concept is introduced and lastly the knowledge transfer model adopted by the study.

Chapter three – discusses what is viewed as constructing knowledge and the dilemma construction organisations face in the pursuit of a knowledge vision; areas of knowledge that construction organisations need to develop, information flows, experience in construction and what are the knowledge assets in a construction process. Towards the end of the chapter a brief account of the Tanzania construction industry is given focusing on its contribution to the economy.

Chapter four - This chapter discusses the research methodology of the study. The case study strategy of inquiry is given together with the research design and the outcome of a pilot study appearing as a component in the subsequent chapter. The analytical generalisation mode of analysis is also explained in the chapter.

Chapter five – covers the pilot study that was undertaken in the course of the research. It constitutes its objective and the methodology that was opted to achieve the objective; the implications of findings from the data analysis; and last the outcome of the pilot study.

Chapter six – This is part one of the data collection and analysis phase. This chapter focuses on the first research question. The four case studies are explored to what extent they give answers to the research question.

Chapter seven – This is part two of the data collection and analysis phase. It explores the second research question by looking at how practices and knowledge in construction organisations in Tanzania create knowledge.

Chapter eight – Gives the conclusion of the study that constitutes a recognition of the study’s contribution to knowledge, the testing of the study’s propositions, answers to the research questions and implications of outcome of the study for theory, practice, policy, methodology and for further research.

1.11 Summary

This chapter gives a brief overview of what had been done in this study. It commences by a background of the research problem and giving of the study’s objective, propositions and research questions that are followed by a theoretical framework. A briefing of the key concepts,
the methodology and the way data was collected, analysed and presented is given. Last, the structure of the thesis is given with chapter eight giving a context of the conclusion.
2. Literature review

2.0 Introduction

This chapter looks into key definitions and concepts relevant to this study and related areas such as knowledge management and knowledge creation. It commences by distinguishing between data, information and knowledge as given by various writers. The concept of knowledge transfer, which is core to this investigation, is introduced covering mechanisms and models of knowledge transfer process. Knowledge creation, knowledge management, organisational learning and learning organisation as variously conceptualised are discussed as inseparable complements to the discussion of knowledge transfer. The knowledge transfer model and its constituent sub-processes adopted by the study hence conclude the chapter. The parent fields of literature that form the major part of this chapter are illustratively shown in Fig.2.1.

Fig.2.1: The classification model of the parent field of literature
2.1 Definition of key concepts

Key concepts related to the study are being discussed in this section. This is in acknowledgement of Layder’s (1998) and Bless and Higson-Smith’s (1995) views that, concepts are the basic building blocks of any theory since they provide general abstract definitions which group objects or social phenomena together in terms of a combination of aspects.

2.1.1 Data, information and knowledge

According to Merriam-Webster Collegiate Dictionary (2003), data has been explained as factual information used as a basis for reasoning, discussion or calculation. In attempts to clear the confusion between data, information and knowledge, writers on knowledge and knowledge management issues have taken the caution of explaining how these terms relate or differ (Probst et al, 2000; Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995; Bhatt, 2001). Probst et al. (2000) had considered a conceptual hierarchical model in an attempt to define these terminologies giving an enrichment process as occurring through the levels of the hierarchy. Symbols are identified at the lowest level of the hierarchy in knowledge formation and when syntaxes are applied to symbols, they become data. Describing the characteristic features of data, they state data as capable of interpretation within a particular context, thus providing the receiver with information. When the information is networked and used, that is when it is referred to - it becomes knowledge. They further acknowledge additional levels going beyond knowledge, featuring as wisdom, intelligence or ability to reflect. The relation between symbol, data, information and knowledge levels in the conceptualised hierarchy is illustrated in Table 2.1

<table>
<thead>
<tr>
<th>Networking (all paired items are even in number)</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content (even numbers)</td>
<td>Information</td>
</tr>
<tr>
<td>Syntax e.g. (2, 4, 6)</td>
<td>Data</td>
</tr>
<tr>
<td>Symbol set e.g. (&quot;2&quot;, &quot;6&quot;, &quot;4&quot;)</td>
<td>Symbols</td>
</tr>
</tbody>
</table>

Furthermore, it is considered more helpful to visualise data, information and knowledge along a continuum with data at one end and knowledge at the other. Such a view is justified by the fact that one seldom sees a problem in clearly defined stages, of skills and knowledge rather the stages are acquired slowly, developed over time through a process in which quantities of
information are assembled or interpreted. A progression process along a continuum that progresses from data via information to knowledge hence occurs. Table 2.2 below shows the data knowledge continuum adopted from Probst et al. (2000).

<table>
<thead>
<tr>
<th>Data</th>
<th>Information</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured</td>
<td></td>
<td>Structured</td>
</tr>
<tr>
<td>Isolated</td>
<td></td>
<td>Embedded</td>
</tr>
<tr>
<td>Context-independent</td>
<td></td>
<td>Context-dependent</td>
</tr>
<tr>
<td>Low behavioural control</td>
<td></td>
<td>High behavioural control</td>
</tr>
<tr>
<td>Symbols</td>
<td></td>
<td>Cognitive patterns for action</td>
</tr>
<tr>
<td>Distinction</td>
<td></td>
<td>Mastery capability</td>
</tr>
</tbody>
</table>

Data has been defined as a set of discrete, objective facts about events (Davenport and Prusak, 1998). In organisations’ context they describe it as constituting structured records of transaction. Citing an example of a customer going to a gas station and fills the tank of his car - that transaction, can partly be described by data as such: when he made the purchase; how many gallons he bought or how much he paid. However, they highlight the inherent limitation of data in that for the example cited, the data does not indicate why he went to that service station and not another one; or predict the likeliness of him coming back, hence indicating there is no inherent meaning in data.

Data describes only a part of what happened, it provides no judgement or interpretation, no sustainable basis of action and says nothing about its own importance or irrelevance. However Davenport and Prusak (1998) caution that one should not take data for granted, data is important for organisations largely because it is an essential raw material for the creation of information. Data becomes information when it is given meaning - when value is added or when converted into information by contextualising; categorising; calculating; correcting and condensing.

2.1.2 Information

Information is a message usually in the form of a document or an audible or visible communication and as with any message, it has a sender and a receiver. It is data endowed with relevance and purpose (Davenport and Prusak, 1998). On further explaining key features of information they take a view that if a message does not inform the receiver it is no information. It
hence follows that, it is the receiver, not the sender who decides whether the message he gets is really information - that is, if it truly informs. A memo full of unconnected ramblings may be considered "information" by the writer but judged to be noise by the recipient. The only message it may communicate successfully, they state, is an unintended one, about the quality of the sender's intelligence or judgement.

Similarly Nonaka and Takeuchi (1995) in explaining the term "information" acknowledge its interpretation features. They consider information as providing a new point of view for interpreting events or objects, which make visible previously invisible meanings or shed light on unexpected connections. Likewise, the role of information as a necessary medium or material for eliciting and constructing knowledge is emphasised. Davenport and Prusak (1998) and Nonaka and Takeuchi (1995) further acknowledge the two forms by which information can be perceived; this is the quantitative form that focuses on the volume aspect and the qualitative form that Nonaka and Takeuchi (1995) had referred to as the semantic form - one that gives meaning, measures the informativeness and usefulness of the information.

The relationship between data, information and knowledge is seen to be recursive depending on the degree of the interpretation (Bhatt, 2001). Illustrating the relations he cites an example of a patient's visit to a doctor's office. The doctor he says elicits a lot of "information" from the patient. Some of the information becomes relevant as the doctor considers it important for the medical diagnosis of the patient. Some of the information given by the patient however is irrelevant for the doctor and becomes "data". The doctor quickly assimilates the acquired information in his/her "knowledge base" and after finding a useful pattern in the information, prescribes medication to the patient. If the doctor is unable to find a relative pattern in the information, the doctor may recommend further lab-test or refer the patient to a specialist, who may be in a better position to find a useful pattern in the information.

The example continues citing two possibilities. The first is that the doctor may recommend the patient for some lab-test whereby more information may be elicited or the lab technician may find some other pieces of information through the lab-test. The information acquired from the lab-tests may confirm or un-confirm the doctor's initial hypotheses about the diagnosis. It may also happen that the preliminary analysis of the data (which was insufficient and incomplete without lab-test) could be quite relevant to the doctor for medical diagnosis of the
patient. What is purported here also emphasised by Bhatt (2001) is the recursive nature of data, information and knowledge.

Bhatt (2001) further goes on and presupposes on the second option that the doctor recommends the patient to a specialist, whereby the specialist might elicit quite a different sort of information. It could also be possible that the specialist may find some pieces of information quite relevant, which were earlier, discarded by the doctor in making his preliminary diagnosis of the patient. He conclusively suggests that a message or a fact may vary from data, information or knowledge depending on the sender's and the receiver’s knowledge base. He posits the idea that it is actually the "knowledge base " that often dictates the distinction between data, information and knowledge ". Conclusively he defines knowledge as an organised combination of data assimilated with a set of rules, procedures and operations learnt through experience and practice.

2.1.3 Knowledge

The concept of knowledge is taken as to have developed chronologically over time (Kakabadse et al, 2001; Nonaka and Takeuchi, 1995). They cite Plato's (1953) concept of knowledge as the earliest attempt in conceptualising knowledge as "justified true belief". A concept they cite debated by his student Aristotle (1928) and latter on throughout the era referred to as “continental rationalism” (Descartes, 1911), “British empiricism” (Locke, 1987), and by the German philosophers (Kant, 1965; Marc, 1976; Hegel, 1977) to those they referred to as the twentieth-century philosophers (Dewey, 1929). Furthermore, they likewise identified attempts by prominent individuals to understand the knowledge phenomenon in organisations. Tracing it back to Taylor in 1911 in his scientific management, through Barnard in 1938 that shed light on the importance of behavioural knowledge in the management process, to Drucker, 1993 in his concept of the "knowledge worker". Argyris and Schö"n (1978) and Senge’s (1990) work are also prominent examples of attempts in understanding knowledge at organisational level.

Various writers, (Bhatt, 2001; Probst et al, 2000; Vito et al, 1999; Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995) have described the term knowledge differently with the various definitions seen as having one thing in common that, knowledge as being related to a process, which is often thought to involve human action. Refer table 2.3. Knowledge is defined as a dynamic human process of justifying personal beliefs towards the truth; being created by the flow of information anchored in the beliefs and commitments of its holder (Nonaka and Takeuchi, 1995) - thus emphasizing that knowledge is essentially related to human action.
Knowledge has also been described as an organised combination of data assimilated with a set of rules, procedures and operations learnt through experience and practice (Bhatt, 2001). Vito et al. (1999) like Bhatt (2001) emphasize the interpretation of a set of information to convert to knowledge. On the other hand Lundequist (1999) has described knowledge as something that a certain person has when he says or does something with good reason, which has to be demonstrable in practical actions or by a proposition. He further goes on to say “knowledge must thus be justified by arguments, reasons that show why a certain proposition is true or a certain action sensible, and in which context it is valid” (p.17).

Knowledge is considered meaning made by the mind and that without meaning knowledge is information or data (Bhatt, 2001). Nonaka and Takeuchi (1995) comparing the traditional epistemology and the western epistemology in defining knowledge noted a variation in focus. They describe while the traditional epistemology defined knowledge as " justified true belief" focusing on truthfulness as an essential attribute of knowledge, the western epistemology emphasised absolute, static and non-human nature of knowledge as typically expressed in forms of propositions and logic; a shortcoming, that they consider fails to acknowledge knowledge as a dynamic human process of justifying personal beliefs towards the truth. Like Probst et al. (2000), these writers (Bhatt, 2001; Nonaka and Takeuchi, 1995) emphasise knowledge as essentially related to human action and that both information and knowledge are context-specific and relational; in that, they depend on the situation and are dynamically created in social interaction among people.

Davenport and Prusak (1998) have indicated the difficulty of defining knowledge in a neat and simple way. They thus define knowledge as a " fluid mix of framed experience, values, contextual information and expert insights that provides a framework for evaluating and incorporating new experiences and information” (p.5) and that it originates and is applied in the minds of knowers. In organisations, they state, it is not only embedded in documents and repositories but also in organisational routines, processes, practices and norms.

In this study a lexical definition of knowledge has been adopted which is as given in Probst et al. (2000, p. 24) that, “Knowledge is the whole body of cognition and skill which individuals use to solve problems. It includes both theories and practical everyday rules and instructions for action. Knowledge is based on data and information, but unlike these it is always bound to persons. It is constructed by individuals, representing their beliefs about causal
relationships.” Such a definition has been adopted based on the fact that it more or less embraces the definition of knowledge as given by various scholars (Nonaka and Takeuchi, 1995; Sverlinger, 2000; Vito et al, 1999; Lundequist, 1999; Bhatt, 2001; Niss, 2002). Hence taken in this study as representing a commonly accepted term in the field of knowledge.

Table 2.3: Knowledge definition as given by various writers

<table>
<thead>
<tr>
<th>Definition</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge is the whole body of cognition and skill which individuals use to solve problems. It includes both theories and practical, everyday rules and instruction for action. Based on data and information but unlike these, it is always bound to persons. Constructed by individuals and represents their beliefs about causal relationships.</td>
<td>Probst et al. (2000 p .24)</td>
</tr>
<tr>
<td>Knowledge is a 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 minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms.</td>
<td>Davenport and Prusk, (1998, p. 5)</td>
</tr>
<tr>
<td>Knowledge is a &quot;justified true belief&quot;. It is a dynamic human process of justifying personal belief towards the &quot;truth&quot;</td>
<td>Nonaka and Takeuchi, (1995, p. 58)</td>
</tr>
<tr>
<td>Knowledge is meaningful information. It is an organised combination of data, assimilated with a set of rules, procedures, and operations learnt through experience and practice. In a sense, knowledge is a &quot;meaning&quot; made by the mind therefore without meaning knowledge is information or data.</td>
<td>Bhatt, (2001, p.70)</td>
</tr>
<tr>
<td>Knowledge is an abstract concept that is consciously or unconsciously built by the interpretation of a set of information acquired through experience and meditation on experience itself, which is able to give its owner a mental or physical ability in an art.</td>
<td>Vito et al. (1999, p.54)</td>
</tr>
<tr>
<td>Knowledge is information in action.</td>
<td>Svelby (1997) as cited in Sverlinger (2000, p. 41)</td>
</tr>
<tr>
<td>The whole set of insights, experiences and procedures that are considered correct and true and that therefore guide the thoughts, behaviours and communication of people.</td>
<td>Van der Speek, Spilkeet (1997) as cited in Sverlinger (2000 p. 41)</td>
</tr>
</tbody>
</table>
2.2 Types and Forms of Knowledge

Despite the various classifications of types of knowledge such as the: articulated or non-articulated, tacit and explicit, transferable knowledge and thematized or non-thematized knowledge, a majority of writers on this field have largely concentrated on the two forms of knowledge, tacit and explicit knowledge. These include: Nonaka and Takeuchi (1995) in their theory of knowledge creation, Davenport and Prusak (1998) their concept of working knowledge, Probst et al. (2000) in their work on knowledge management, Goh (2002) on his article on knowledge transfer, Argote and Ingram (2000) in their knowledge reservoirs concept, Jacob and Ebrahimpur (2000) in their analysis of the role of implicit understanding of knowledge in determining the nature of knowledge transfer and Kakabadse et al. (2001) in their research article that emphasised a recognition of the potential of the tacit knowledge.

Furthermore, Argyris and Schön (1978) in their theory of action, acknowledge the tacit and explicit forms of knowledge, stating that organisational theories of action need not be explicit. Meaning, what organisations say they do and what they actually do, may not necessarily be open. What they refer to as the “espoused theory” may however be explicitly indicated such as in organisational documents, charts, policy statements, while the “theory in use” - may remain largely tacit. Probst et al. (2000), identify this behaviour as a paradox of dealing with knowledge; that when interpreted basing on Argyris and Schön’s concept imply that what organisations actually do is their “theory in-use” and represents their organisation’s beliefs and values that are tacitly held. That what a company desires, or states to do - the “espoused theory”, is actually different. They cite a company through its glossy brochures, which may portray itself as a learning organisation, but in actual fact it may not. Table 2.4 illustrates what they termed as the paradox of dealing with knowledge that demonstrates the irony of how organisations manage knowledge – like why would organisations train employees but not give them an opportunity of using that knowledge. Argyris and Schön (1978) further considered the theory in-use that is largely tacit, as accounting for an organisation’s identity and continuity.
Table 2.4: The paradox of knowledge (Probst et al, 2000)

<table>
<thead>
<tr>
<th>Desired /ideal situation</th>
<th>Actual situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>We train our employees thoroughly</td>
<td>But we do not let them use their knowledge</td>
</tr>
<tr>
<td>We learn mostly in projects</td>
<td>But we do not pass on our experiences</td>
</tr>
<tr>
<td>We have an expert for every question</td>
<td>But very few people know how to find him</td>
</tr>
<tr>
<td>We document everything thoroughly</td>
<td>But we cannot access our knowledge stores</td>
</tr>
<tr>
<td>We recruit only the brightest</td>
<td>But after three years we lose them to our competitors</td>
</tr>
<tr>
<td>We know everything about our competitors</td>
<td>But not much about ourselves</td>
</tr>
<tr>
<td>We ask everyone to share knowledge</td>
<td>But we keep our own secrets</td>
</tr>
<tr>
<td>We co-operate in order to learn from others</td>
<td>But we do not know what our learning goals are</td>
</tr>
</tbody>
</table>

2.3 Significance of knowledge transfer

Knowledge transfer is becoming increasingly important in organisations as firms today are more often organised on a global basis so as to take advantage of differences in expertise, labour costs and access to markets around the world (Argote and Ingram, 2000). Business trends that point to the importance of knowledge transfer as including the increased use of joint ventures, strategic alliances, acquisitions and increased frequency of mergers are among the examples cited. They however caution although organisations can realise remarkable benefits by transferring knowledge from one unit to another, successful knowledge transfer can be difficult to achieve. This is so they state, as individuals who do not understand why particular practices are effective may not be adept at communicating their knowledge to others. That, organisations may not share information they possess with other members and also, strong social identities and in-group favouritism may impede knowledge sharing across groups and division in organisations.

Knowledge transfer is even more important in construction organisations due to their project-based orientation. Such orientation creates significant discontinuities in flows of personnel, materials and information (Bresnen et al, 2003) and hence knowledge. There is hence
a need to explore how such discontinuities could be mitigated. Knowledge transfer is one option that could be considered.

Furthermore, the study of knowledge is interesting to any field but the study’s focus has been on the organisational context of a construction organisation in a developing country, as knowledge is perceived as a means by which organisations can enhance their performance. Tanzania has been taken as a typical case of a developing country whose construction industry is characterized by poor performance in terms of productivity, cost overruns and delays in completion (Mlinga and Mbuya, 2004; URT, 2003)

2.4 Knowledge transfer defined

Argote and Ingram (2000) had defined knowledge transfer in organisations as the process through which one unit (e.g. group, department, or division) is affected by the experience of another. They consider knowledge transfer in organisation manifests itself through changes in the knowledge or performance of the recipient units, and that such changes can be used as a measure of knowledge transfer in an organisation; a view also supported in Bröchner et al. (2004). The latter also emphasize the transmission process inherent in knowledge transfer – that, one sends or presents knowledge to a potential recipient and the recipient absorbs.

Cordey-Hayes and Gilbert (1996) have described knowledge transfer as a means, by which organisations can implement and appropriate new technology. They view it as the capacity of the firm to recognise the value of internal and external information and to use it for commercial ends. Vito et al. (1999) has considered knowledge transfer as a strategy for enabling firms to have a competitive advantage, knowledge transfer as a critical factor for a firm to rapidly respond to changes, innovation and achieve competitive success. This study, acknowledging the advantages and inherent features that could be brought about by knowledge transfer application as explained by these authors, (Argote and Ingram, 2000; Vito et al, 1999; Cordey-Hayes and Gilbert, 1996), has taken a functional definition of knowledge transfer; knowledge transfer as a process made possible by the carrying out of particular activities and constituting the following sub-processes: information and knowledge acquisition, information distribution, making meaning, organisational memory and retrieval of information and knowledge. The process is illustrated in Fig. 2.4 - 2.8.
2.5 Mechanism of knowledge transfer

Various writers have viewed the mechanism of knowledge transfer differently. The following discussion has categorised such schools of thought into four themes. Those who have envisaged the mechanism as occurring through: knowledge reservoirs (Argote and Ingram, 2000; Roth et al, 2001), organisational characteristics and managerial practices (Goh, 2002; Vito et al, 1999; Davenport and Prusak, 1998), a knowledge conversion process (Nonaka and Takeuchi, 1995) and knowledge transfer process (Sverlinger, 2000; Vito et al, 1999; Cordey-Hayes and Gilbert, 1996).

i) The knowledge reservoir concept

Argote and Ingram (2000) conceptualise knowledge transfer in organisation occurs through personnel movement, training, communication, observation, technology transfer, reverse engineering, products, replicating routines, patents, scientific publication, presentation, interaction with suppliers and customers, alliances and other forms of inter-organisational relationship. In their model an approach of knowledge transfer that looks into reservoirs of knowledge in organisations has been conceptualised. That, knowledge is embedded in three basic elements of organisations; that include members, tools and tasks, and that these elements combine to form sub-networks.

They posit the idea that the three basic reservoirs in varying circumstances form various networks. These may be member-member networks as in the social interaction of the members in organisation; task-task network as in sequence of tasks and routines, or tool-tool networks where there is combination of technologies in use. Other possible combinations include: member-task networks where members are assigned tasks, member-tool network when members work with tools; task-tool network, which specify which members perform which tasks and with what tools. Based on such an approach, they view that an organisation’s performance improves with increase in both internal compatibility of the networks and their external compatibility with other networks. For instance, an organisation's performance is enhanced when the member-task network allocates tasks to the members most qualified to perform them, similarly when members have the appropriate tools to perform the tasks allocated to them. For knowledge transfer to effectively occur these reservoirs and networks are suggested with a condition that they are made compatible within themselves and to a new environment.

Compatibility as a key factor in the transfer of knowledge has also been emphasised by Vito et al. (1999), Goh (2002) and Davenport and Prusak (1998). These authors considered the
absorptive capacity of subjects as an essential component in the transfer. Roth et al. (2001) comes with a similar approach that knowledge in organisations exists in four different carriers: the individual, the small group, the organisation and the inter- organisational domain such as important customers, suppliers, and competitors; with each carrier possessing different forms or aspects of knowledge such as cognitive knowledge in the form of mental constructs and precepts, skills and knowledge embodied in products or well-defined services or artefacts.

**ii) Organisational characteristics and managerial practices concept**

Organisational characteristics identified as facilitating knowledge transfer include: leadership style; problem seeking/solving behaviour; presence of support structures such as technology, training, skill development, rewards and organisational design; absorptive and retentive capacity and types of knowledge (Goh, 2002). Under managerial practices he emphasised a high level of trust between individuals and work groups, an aspect also emphasised by Davenport and Prusak (1998) who similarly advocated for a strong and pervasive culture of co-operation developed through work practises that encourage and allow individuals and groups to work together.

Davenport and Prusak (1998) furthermore encouraged a strong culture of continuous improvement and learning linked to problem seeking and problem solving that is focused on specific values such as product quality and customer service - a feature they state, that could be facilitated through: incentives; an organisation structure that encourages horizontal communication and few hierarchical barriers; consistency of skill levels and competencies among employees; a structured approach to encouraging sharing and transfer of knowledge through structured processes such as sharing best practices and lastly, a reward system that does not only focus on finance.

The practice of organisations transferring people from one department to another; informal conversations at water coolers or in the cafeteria; after-work hours meetings by individuals or one firm to another, talk-rooms set-up by many Japanese firms that are considered to encourage spontaneous meetings of the mind that have the potential of generating new ideas or solve old problems in unexpected ways - are all considered possible mechanisms for knowledge transfer (Davenport and Prusak, 1998).

Furthermore, Davenport and Prusak stress the notion that there are situations whereby knowledge transfer can work only if the various parties are brought together physically. In emphasising this point they cite the case of the Boston Harbour tunnel project. Refer Box 1.
Drawn from this case the implications are that particular skills in a process do not lend themselves to codification and that physical presence is important.

Box 1: The Boston Harbour case (Davenport and Prusak, 1998)

In this project a key contractor was to link two islands through a tunnel, had overseen a similar project in New Zealand - whereby a tunnel linking two islands and with similar characteristics was constructed. The tunnellers in New Zealand had developed innovative improvements on a particular drilling process that some executives wanted the Boston workers to emulate. They tried to transfer that knowledge in various ways by sending memos, descriptions, creating diagrams, manuals and even hiring consultants to give talks to the Boston crew. The firm strenuously resisted bringing the groups together as it was expensive but the core reason was the belief that a technological mediation must be the right way to transfer knowledge. Eventually however the contractor had to fly two groups of workers to spend time together because nothing else worked. The New Zealand groups discussed and demonstrated their innovations with the Boston workers and were thus able to transfer their knowledge in bulk. Over time the Bostonians came to internalize these innovations and employed them on the tunnel.

iii) Knowledge conversion concept

There are those who consider in transferring knowledge the interplay between tacit and explicit knowledge as essential and that the transfer as occurring through what they term as a “socialization process” where knowledge is created through a conversion process of tacit to/from explicit (Nonaka and Takeuchi, 1995; Sverlinger, 2000). Through such a socialization process, they purport knowledge in organisations is transferred whether or not we manage the process; Davenport and Prusak (1998) cite when an employee for instance asks a colleague in the next cubicle how to put together a budget request, he's requesting a transfer of knowledge. When an engineer asks another engineer if he has ever dealt with a particular problem, the second engineer if willing and able, will transfer his knowledge. The significance of physical interaction as cited in the Boston Harbour example also confirms the occurrence of knowledge transfer through a socialization mode as given by Nonaka and Takeuchi (1995).
iv) The process concept of knowledge transfer

Cordey-Hayes and Gilbert (1996), Vito et al. (1999) and Sverlinger (2000) had considered a process approach in the transfer of knowledge and identified key processes under which transfer occurs. Both Cordey-Hayes and Gilbert (1996) and Vito et al. (1999) had taken knowledge acquisition, communication, application, acceptance and assimilation as the key processes in the transfer. Sverlinger (2000) adopting and modifying Dixon's (1992) model on organisational learning has more or less similar processes that he identifies as: knowledge acquisition, distribution, making meaning, organisational memory and retrieval. Probst et al.'s (2000) knowledge management building block is also a process-oriented approach and has more or less identified the processes mentioned in these other models.

2.6 Models of organisational learning, knowledge management and the knowledge transfer process.

While Egbu et al. (2003) acknowledge knowledge management definition as varying based on the individual’s or organisation’s perception and awareness of their knowledge-base and their approaches to exploiting and enhancing it, they cite a comprehensive definition that knowledge management as constituting the creation of a thriving work and learning environment that fosters continuous creation, use and re-use of both organisational and personal knowledge in the pursuit of enhancing organisational value; a definition similar to Robinson et al.’s (2004) that views knowledge management constituting any process of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organisations. Knowledge management has also been defined as a formalised knowledge transfer (Sverlinger, 2000; Davenport and Prusak, 1998). Such definitions explain the similarities noted between knowledge management and knowledge transfer models of writers such as Kasvi et al. (2003), Probst et al. (2000), Apostolou and Mentzas (1999) and McAdam and McCready (1999). Close similarities are also noted between some knowledge transfer models (Vito et al, 1999; Cordey-Hayes and Gilbert, 1996; Sverlinger, 2000) and those who had come up with learning organisations and organisational learning concepts (Dixon, 1992, 1999b and 2000; Garvin, 2000; Senge, 1990).
Furthermore, early approaches to the subject of knowledge transfer are also found in the literature on organisational memory and organisational learning (Sverlinger, 2000). Such a predicament has obliged this section to review efforts made by various authors in these concepts.

### 2.6.1 Organisational Learning

It is perceived that learning when undertaken by individuals or organisation agents is the process of improving actions through better knowledge and understanding. Organisations learn when they encode inferences from history into routines that guide behaviour (Argyris, 1999). Likewise, Probst et al. (2000) and Dixon (1999b) emphasised the improvement feature that has to occur in a learning situation. Dixon (1999b) defines organisational learning as the intentional use of learning processes at the individual, group and systems level, to continuously transform the organisation in a direction that is increasingly satisfying to its stakeholders while Probst et al. (2000) on the other hand, considers organisational learning as constituting changes in the organisation's knowledge base, the creation of collective frames of reference, and growth in the organisation's competence to act and solve problems. Hence as stated in Rowley (2000), organisational learning is perceived to be intimately associated with survival and future success linked with continuous improvement.

Örtenblad (2001) differentiating between organisational learning and learning organisation has identified two key features. That a learning organisation is a form of organisation while organisational learning is an activity or processes of learning in organisations and that to become learning organisation needs effort while organisational learning exists without any efforts. The latter feature is noted contrasting with what Dixon (1999b) and Argyris (1999) had emphasised; whereas the former in her definition had used the word “intentional” and the latter describing "organisations learn when they encode inferences from history" - both emphasize effort as a prerequisite for organisational learning.

Furthermore, Argyris (1999) had divided the literature that pays serious attention to organisational learning into two main categories. The practice-oriented, promulgated mainly by consultants and practitioners of the learning organisation, and the sceptical scholarly literature of organisational learning produced by academics. However he considers the two literatures though having different thrusts, appealing to different audiences and employing different forms of language, have common intersection key points; their conception of what makes organisational learning desirable or productive, their view of the nature of the threats to productive
organisational learning and their attitude towards whether and if so how such threats may be overcome.

While the characteristic features of a learning organisation have been given, it is also acknowledged that learning is not devoid of obstacles (Senge, 1990; Martzdorf et al., 2000; Love et al., 2000). On the other hand, Davenport and Prusak (1998) despite acknowledging organisational learning as an important component of knowledge management success, however consider by itself, as not sufficient. They are of the view that it is rare for organisational learning initiatives to lead to knowledge management because many learning-oriented organisations ignore the possibilities for structuring and leveraging knowledge. Counter arguing on Senge's (1990) notion, that perceived organisations seeking to manage knowledge as placing too much emphasis on information technology and information management, Davenport and Prusak in response argue that the world of organisational learning places too little emphasis on structured knowledge and the use of technology to capture and leverage it. They hence are of the view that without an approach to managing structured knowledge, organisational learning is too conceptual and abstract to make a long-term difference to organisations.

### 2.6.2 Categorization of knowledge management frameworks

Knowledge management frameworks are seen as fitting into four categories (Apostolou and Mentzas, 1999). Such categorisation identifies those who had built knowledge management frameworks under the focus of knowledge creation, processes, technology and those that had opted for a holistic approach. Under the knowledge creation framework Apostolou and Mentzas (1999) cite Nonaka and Takeuchi (1995) as leading in this framework. A vast majority of knowledge management writers are acknowledged by these authors to abide to the process orientation category and the American Productivity Quality Control (APQC) framework that considers internal benchmarking and transfer of best practices as the most tangible manifestation of knowledge management framework. It hence follows that Goh's (2002), Sverlinger's (2000), Vito et al.’s (1999), and Cordey-Hayes and Gilbert’s (1996) knowledge transfer models, Dixon's (1999b) learning cycle and Dixon's (1992) organisational learning model, belong to this category of knowledge management.

The third category includes those focusing on technology. A lot of emphasis has been made in creating an understanding of the role of technology in the management of knowledge. Some have viewed technology as an infrastructure necessary for successful knowledge transfer.
(Davenport and Prusak, 1998) while others have viewed technology as an enabler among others in the knowledge transfer process (Sverlinger, 2000). The last category refers to those that had adopted for a holistic view that has a framework of an interdisciplinary nature that explicitly and with equal weight includes technology, processes, organisational structures and cultural issues.

2.6.3 Knowledge management framework adopted by the study

Adopting Robinson’s et al.’s (2004) and Sverlinger's (2000) working definition of knowledge management, that it consists of all initiatives an organisation undertakes to create and transfer knowledge - this study in exploring the knowledge transfer process of construction organisations, falls under the knowledge management framework. Henceforth, based on Apostolou and Mentza's (1999) categorisation of knowledge management frameworks explained in the previous section, it fits under the process orientation.

2.6.4 Knowledge transfer models

With the many interpretations of the knowledge transfer process in effect, various knowledge transfer models have been introduced. Some have simply viewed it as the knowledge of one actor being transferred to another (Goh, 2002; Vito et al, 1999) while knowledge management consultants are reported to view it as a process performed in an organisation as a part of the business process and usually supported by information technology based tools (Sverlinger, 2000). The following section hence looks at these knowledge transfer models with the aim of acknowledging the contribution made by various individuals in understanding the knowledge transfer process.

Vito et al. (1999) and Cordey-Hayes and Gilbert (1996) knowledge transfer models

Vito et al. (1999) adopting Cordey-Hayes and Gilbert’s model (1996) conceptualised the knowledge transfer process as encompassing two distinct dimensions, an information system and an interpretative system. Information being the single component in the information dimension and five components existing in the interpretative dimension, namely: acquisition, communication, application, acceptance and assimilation. Cordey-Hayes and Gilbert (1996) had stressed that knowledge is transferred when it features in the core routines of the organisation and is reflected in the behaviour and practices of members, a stage identified as assimilation.

It is noted that, the processes identified in these models relate closely to the knowledge transfer models given by large management consultants interviewed in Sverlinger (2000) in his study on how professional service organisations in Sweden manage knowledge. The models
given by the firms mentioned in the study similarly identified the first and foremost stage of knowledge transfer as the creation of knowledge. An aspect similarly emphasised by Vito et al. (1999) and Cordey-Hayes and Gilbert (1996) who had referred to it as knowledge acquisition. This first stage was followed by a distribution and sharing process and lastly adaptation and use, which also relates to the assimilation process given in Vito et al. (1999) and Cordey-Hayes and Gilbert (1996).

While Sverlinger (2000) had identified routines as a platform where organisation knowledge is stored and he related them to what Huber (1991) whom he cites had referred to as, organisational memory, Cordey-Hayes and Gilbert (1996) had identified routines as indicators that, knowledge has been transferred in the organisation. Making an analogy of these interpretations together with Vito et al.'s (1999) and Cordey-Hayes and Gilbert's (1996) models, the implication drawn is that, when knowledge is stored in active repositories of the organisations such as routines and made use of, transfer occurs.

**Sverlinger's (2000) model**

Early approaches to the creation and transfer of knowledge are considered found in the literature on organisational memory and organisational learning (Sverlinger, 2000). The focus he states, being on memory and particular sub-processes in the processes of organisational memory and organisational learning. The sub-processes given by Sverlinger are reproduced in Table 2.5 together with one constructed in the course of carrying out the literature review for this study (Table 2.6). The purpose of illustrating both approaches is to highlight the existing relation between knowledge transfer, organisational learning and organisational memory - thus emphasising the presumption taken that, one cannot discuss one and leave out the others.
Table 2.5: Sub-processes of cognition, organisational learning, organisational memory and knowledge transfer (Sverlinger, 2000, p. 59)

<table>
<thead>
<tr>
<th>Author</th>
<th>Sub-processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argote (1999)</td>
<td>Sharing &amp; generating new knowledge</td>
</tr>
<tr>
<td>Bartezzani et al., (1997)</td>
<td>Abstraction and generalisation</td>
</tr>
<tr>
<td>Dixon (1992)</td>
<td>Information acquisition</td>
</tr>
<tr>
<td>Huber (1991)</td>
<td>Knowledge acquisition</td>
</tr>
<tr>
<td>Walsh, Ungson (1991)</td>
<td>Information acquisition</td>
</tr>
<tr>
<td>Wiig (1997b)</td>
<td>Knowledge creation</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Concept</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Cordey-Hayes and Gilbert (1996); Vito et al. (1999)</td>
<td>KT</td>
</tr>
<tr>
<td>Sverlinger (2000)</td>
<td>KT</td>
</tr>
<tr>
<td>Probst et al. (2000)</td>
<td>KM</td>
</tr>
<tr>
<td>Apostolou and Mentzas (1999)</td>
<td>KM</td>
</tr>
<tr>
<td>Dixon (1999b)</td>
<td>OL</td>
</tr>
<tr>
<td>Senge (1990)</td>
<td>LO</td>
</tr>
</tbody>
</table>
2.7 Factors influencing knowledge transfer

Cultural factors have been identified as among the factors inhibiting effective knowledge transfer (Davenport and Prusak, 1998; Jacob and Ebrahimpur, 2000). Davenport and Prusak identifying what they referred to as the most common cultural factors inhibiting effective knowledge transfer as: lack of trust; different cultural backgrounds, vocabularies, frames of reference; lack of time and meeting places; narrow idea of productive work; inappropriate incentive schemes that do not motivate sharing but rather focus on individuals; lack of absorptive capacity in recipients; and intolerance for mistakes and need for help. Some of these factors have also been mentioned by Jacob and Ebrahimpur (2000) and Goh (2002) and they include: lack of trust that inhibits sharing of knowledge, frames of reference that do not facilitate job rotation, and absence of visible rewards for sharing knowledge. These authors also cite other factors as noted by various individuals: characteristics of the individual members such as their ability and motivation; characteristics of the social network; and the extent of codification of knowledge.

Argote and Ingram (2000) while regarding that when knowledge is not codified, strong ties that allow repeated interaction promote knowledge acquisition and shorten project times and hence healthy for knowledge transfer, others have considered this as a barrier to transfer and thus emphasise the codification of knowledge (Zack, 1999). Characteristics of the technology or tools being transferred and the appropriateness of the knowledge being transferred to the recipient environment are also considered vital components that influence transfer (Argote and Ingram, 2000).

2.8 The knowledge creation concept

Organisations are not simply information and knowledge processing units that solve existing problems and adapt to changing environments. Rather in the course of re-defining problems and solutions and recreating their environment, they create knowledge. Creating new knowledge is
also not a matter of simply learning or acquiring knowledge from the outside; knowledge has to build on its own, frequently requiring intensive and laborious interaction among members of the organisation (Nonaka and Takeuchi, 1995).

Nonaka and Takeuchi's (1995) theory of knowledge creation postulates that the process has two interrelated dimensions, an ontological and epistemological. The former referring to the fact that an organisation cannot by itself create knowledge but rather this has to occur through individuals. A fact also mentioned by Argyris and Schön (1978) and Argyris (1999). Nonaka and Takeuchi (1995) further state that knowledge created within the organisation moves spirally through the levels of the organisation, whereby the knowledge created by individuals is amplified and crystallises as a part of the knowledge network of the organisation. This process, they consider, crosses intra and inter-organisational levels and boundaries. As for the epistemology view, knowledge is considered created through a conversion process of tacit and explicit forms of knowledge through what they termed as “a socialization process”.

Davenport and Prusak (1998) taking knowledge generation to be similar to knowledge creation, acknowledge the contribution of Nonaka and Takeuchi (1995) on this aspect and come up with their own mode of knowledge generation constituting five features: acquisition, dedication of resources, fusion, adaptation and knowledge networking. While Nonaka and Takeuchi (1995) in their socialization mode of knowledge creation looked into the interplay of the tacit and explicit form of knowledge in the creation process, Davenport and Prusak (1998) only concentrated on what the organisations can do to facilitate the generation/creation of knowledge without explaining the underlying mechanism. A study of construction organisations in UK (Egbu et al, 2003) on the other hand, established knowledge creation triggers for organisations (authors taking knowledge production as synonymous with knowledge creation), as instigated by the need to address and solve problems, manage change and innovation.

2.8.1 The knowledge creation concept adopted by the study
This study takes knowledge creation as occurring through a conversion process of two forms of knowledge, the tacit and explicit form; and that such a process occurs as conceptualised in Nonaka and Takeuchi (1995), in what they referred to as a “socialization process”, which constitutes four modes; a socialization, an externalization, a combination and an internalization mode. The concept is indicated in Fig 2.2 and Fig 2.3. Fong (2003) cites Tuomi (1999) who had criticized the model as not featuring much social activity. Henceforth to facilitate better focusing
in this study, the term “socialization” has been replaced by use of the term “knowledge creation”. Furthermore, in addition to the four modes acknowledged as essential for knowledge creation, the study also takes the presence of enabling conditions in organisations as an important condition for knowledge to be created. Likewise since it is taken that the mechanism of knowledge creation occurs through a conversion of two forms of knowledge, it is logical that organisations should create an environment that will trigger such a conversion. The study has hence in consequence taken enabling conditions and triggers of knowledge conversion as essential components in the process. The conceptualised process is hence indicated in Figure 2.2.

![Fig. 2.2: Knowledge creation concept adopted by study](image)

2.8.2 The mechanism of knowledge creation

Referring to Nonaka and Takeuchi's (1995) concept that knowledge is created through a socialization process where knowledge conversion occurs between the two forms of knowledge, tacit and explicit knowledge, it follows that understanding of the underlying mechanism of the conversion process is crucial. Nonaka and Takeuchi (1995) had given four modes of conversion of tacit and explicit forms of knowledge through a cyclic and recursive process. The first mode is the socialization mode where it is posited, conversion is from tacit to tacit; the second mode an externalization mode where conversion is from tacit to explicit; the third mode a combination mode where conversion is from explicit to explicit and lastly an internalization mode where conversion is from explicit to tacit. Refer Fig 2.3
The socialization mode: a tacit to tacit knowledge conversion

Socialization has been defined as a process of sharing experiences and thereby creating tacit knowledge such as shared mental models and technical skills (Nonaka and Takeuchi, 1995). Socialization in organisations is facilitated in various areas and scenarios. This include situations such as in: apprentices, where individuals acquire knowledge through observation; imitation and practices; on the job training; working side by side as in peer assist method as those cited in Dixon (1999a) of the British Petroleum or the brainstorming camps of Honda where informal meetings are held to discuss and solve difficult problems (Nonaka and Takeuchi, 1995).

Externalization mode: a tacit to explicit knowledge conversion

Among the four modes of knowledge conversion, the externalization mode is considered key to knowledge creation (Nonaka and Takeuchi, 1995). This taken as key presumably based on the fact that it makes the tacit knowledge that is difficult to access, more accessible. In this mode tacit knowledge is converted to explicit knowledge and may occur through metaphors, analogies, concepts, hypotheses, models, dialogue, collective reflection and articulation of tacit knowledge through codification or verbal means.

Combination: an explicit to explicit knowledge conversion

This mode presupposes that re-configuration of existing information as in sorting, adding, combining and categorising of explicit knowledge may create new knowledge. Such mode of knowledge creation is seen for example in formal education through training. In organisations,
Nonaka and Takeuchi (1995) consider the creation occurs when for instance middle management breaks down and operationalise a corporate vision, business or product concept. They consider for instance when a team forms a concept, this constitutes a combination of existing data as well as knowledge that resides outside the team to create more shareable knowledge. The combination mode makes use of documents, meetings, discussions, telephone conversations, face to face, and other forms of communication in knowledge creation. The combination mode is also found in patents, written rules, charts and similar documents of the organisation (Sverlinger, 2000).

**Internalization: an explicit to tacit knowledge conversion**

This is a process that has been identified as closely related to "learning by doing", a process whereby explicit knowledge is embodied into tacit knowledge. It occurs when experiences through socialization, externalization and combination are internalised into individuals' tacit knowledge bases in the form of shared mental models or technical know-how (Nonaka and Takeuchi, 1995). Such a conversion may be facilitated through verbalisation, use of diagrams, documents, manual or sharing experiences such as the telling of success stories.

The above discussion has narrated the mechanism of knowledge creation so as to set grounds for exploring how construction organisations in Tanzania facilitate such a process, and to test the proposition set forth in the study. The following section discusses what has been adopted by the study as triggers of the four modes of knowledge creation.

**2.8.3 Triggers of knowledge conversion**

In emphasising the significance and the interdependence of the two forms of knowledge Nonaka and Takeuchi (1995) consider the tacit and explicit form of knowledge are limited when acting on their own. For instance, cite the compilation of a financial report, which essentially is an explicit knowledge, does not add on to an organisation's knowledge base unless a conversion process occurs. Rather they emphasise the dynamic interaction between tacit and explicit knowledge through the four modes of knowledge conversion as essential to knowledge creation and identify mechanisms that trigger such conversion through the various modes. Table 2.7 gives a summary of triggers that facilitate a conversion of the two forms of knowledge.
Table 2.7: Knowledge conversion triggers

<table>
<thead>
<tr>
<th>Knowledge conversion mode</th>
<th>Triggers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socialization mode</td>
<td>Interaction, sharing of experiences</td>
</tr>
<tr>
<td>Externalization mode</td>
<td>Meaningful dialogue, collective reflection</td>
</tr>
<tr>
<td>Combination mode</td>
<td>Networking of knowledge</td>
</tr>
<tr>
<td>Internalization mode</td>
<td>Learning by doing</td>
</tr>
</tbody>
</table>

As can be noted from table 2.7, Nonaka and Takeuchi (1995) considered the socialization mode being triggered by building a field of interaction that facilitates the sharing of members' experiences and mental models. The externalization mode being triggered by meaningful dialogue or collective reflection in which using appropriate metaphor or analogy helps team members to articulate hidden tacit knowledge that is otherwise hard to communicate. The combination mode triggered by networking newly created knowledge and existing knowledge from other sections of the organisation thereby crystallising them into a new product, service, or managerial system and finally, learning by doing as triggering the internalization mode. As mentioned in a previous section, Egbu et al. (2003) had on their part identified: the obligation or need to solve problems, managing of change and innovation as triggers of knowledge creation in construction organisations in the UK.

2.8.4 Enabling conditions for knowledge creation

Nonaka and Takeuchi (1995) have furthermore identified five enabling conditions for knowledge creation and they include: intention, autonomy, fluctuation and creative chaos, redundancy and requisite variety. Intention as an enabler described as featuring in the form of strategy within the business setting. In stressing the significance of the “intent enabler” to be known to employees since it instigates commitment - they quote Polanyi’s (1958) notes that had emphasised this notion by stating, "Commitment underlies the human knowledge, creating activity".

Autonomy is explained as a potential for bringing in creativity or introducing unexpected opportunities in the process, creating knowledge whereby it may feature from the individual level to organisational level. Box 2 illustrates how Nonaka and Takeuchi (1995) viewed the significance of this enabler to an organisation.
Box 2: Autonomy as an enabler for knowledge creation

Nonaka and Takeuchi (1995) gave an analogy of a knowledge-creating organisation that secures autonomy, to a living organic system composed of various organs that are made up of numerous cells. They considered since relationships between systems and organs and between organ and cells are neither dominate-subordinate nor whole-part, each unit in an organisation, like an autonomous cell, should control all changes occurring continuously within it.

Fluctuation and creative chaos as an enabling feature is seen through the breaking of monotony - as stated, "order without recursiveness" (Nonaka and Takeuchi, 1995, p.78), whereby the authors view that evoking a sense of "crisis" by proposing challenging goals may also result in the same. The authors consider allowing "interpretative equivocality" to emerge from lower levels of the organisation may trigger a change in fundamental ways of thinking and also help externalise tacit knowledge. Davenport and Prusak (1998) had viewed the justification for crisis introduction into an organisation as a means of one to safeguard or anticipate what is to come in the future. Hence consider, British Petroleum’s decision to restructure itself into a large number of fairly autonomous business units as less an adaptation to current problems than an anticipation of future challenges.

Redundancy being the fourth condition for knowledge creation refers to existence of information that goes beyond the immediate operational requirements of organisational members (Nonaka and Takeuchi, 1995). Suggesting ways of building redundancy into organisations as including: introduction of overlapping approaches such as when different departments work together, having strategic rotation and frequent meetings both on regular and irregular bases, or facilitating formal and informal networks - such as after office drinking sessions.

Requisite variety as a condition for knowledge creation refers to an organisational internal diversity that enables it to deal with the variety and complexity posed by the environment. Egbu et al’s (2003) study further identified the existence of a close resemblance for promoters of knowledge creation in the cases it studied, and some of the enablers of knowledge creation given by Nonaka and Takeuchi (1995).
2.9 The knowledge transfer model adopted by the study

The knowledge transfer model used in this study is based on Sverlinger's (2000) knowledge transfer model, Dixon's (1992) organisational learning model and Nonaka and Takeuchi's (1995) knowledge creation concept. The former models (Sverlinger, 2000; Dixon, 1992) have been adopted as they provide attributes that enable the investigation of the study's research problem. Both have identified activities as medias of conveying knowledge, a factor that the study considers as practical and realistic in respect of the recognition of activities’ essential role in the existence, survival, and achievement of goals in an organisation. In addition to this essential role, the inherent feature of activities of being observable and measurable, make the models appropriate as analytical tools for this study. The concept of knowledge creation has been adopted since it is taken as an integral part of the whole process of knowledge transfer. Sverlinger's five sub-processes of knowledge transfer that had featured as six sub-processes of organisational learning in Dixon (1992) and Nonaka and Takeuchi's (1995) four modes of knowledge creation have formed the bases of data collection and later, analysis. The sub-processes used in the study are: knowledge and information acquisition; information distribution; making meaning; organisational memory and retrieval of information and knowledge. It is considered significant to further point out that, although the sub-processes are sequentially discussed, in essence they are continuous and interactive (Dixon, 1992).

Terminologies in the sub-processes - One notes from the model (Refer Fig. 2.4 - 2.8), that the sub-processes “acquisition” and “retrieval” appear with information and knowledge while for the “distribution” sub-process there is only information, “making meaning” and “organizational memory” appear without indicating whether it is information or/and knowledge being referred to. Despite acknowledging that the two modellers (Sverlinger, 2000; Dixon, 1992) did not explain in their models why the sub-process terminologies differed in respect of having information and knowledge together or having one term only, this study has taken the view as explained earlier in chapter one that acknowledges: the dynamic nature of data, information and knowledge; the knowledge base of the relayer vis-à-vis recipient, as determining factors whether a message is data, information or knowledge; and the inherent feature of knowledge, unlike information or data, is bound to a person.

From such a premise, the sub-processes as given (Sverlinger, 2000; Dixon, 1992) are adopted and slightly modified with an interpretation that: one can acquire both information and
knowledge – for instance the latter acquired tacitly as through experience, working side by side or observation and imitation; one distributes information explicitly or implicitly; one makes meaning to information received and it hence becomes knowledge and this process occurs through an interpretative process where one is less formal and other more structured as in the use of tools support to aid interpretation; organisational memory constitutes both information and knowledge; retrieval can be of information and/or knowledge.

2.9.1 Knowledge and information acquisition

Dixon (1992) had identified two modes of acquiring information, an internal and an external mode. Externally, she stated information could be acquired through what she referred to as borrowing, searching, grafting or collaborative arrangements; with borrowing occurring for instance in attending conferences, or through reading printed material. Acquisition of knowledge through searching, as in reading reports, interaction with customers or competitors; grafting, as in the recruitment of new members, acquisitions or mergers; collaborative mode, as in joint venture schemes or consortiums. Internally she stated knowledge could be acquired through: congenital means as through understanding the history of the organisation and the thoughts of the founders; learning from experience as through successes and mistakes; experimenting such as in developing original innovations; inventing new processes; implementing continuous process improvement and getting feedback on incremental change and through critical reflection such as in dialogue, questioning assumptions and norms. The “borrowing” and “searching” terminologies as defined in Dixon (1992) have been modified in the adoption of the model so as to be closer to their literal meaning. Hence borrowing refers to attendance of conferences and interaction with customers, suppliers, competitors and consultants while searching refers to reading of reports and other printed material. The knowledge and information acquisition sub-process adopted is as appearing in Fig. 2.4.
2.9.2 Information distribution

One of the most difficult tasks in knowledge management is to distribute knowledge to the right people or make organisational knowledge available at the point where it is needed (Probst et al, 2000). Others have considered for knowledge to be transferred, availability of knowledge is not enough, but mechanisms ensuring its absorption are essential (Bröchner et al, 2004).

Information distribution has been viewed as referring to the process by which an organisation shares information among its units and members (Sverlinger, 2000). Dixon (1992) had considered distribution of information occurring in what she termed “intentionally” and “unintentionally”. Intentionally the distribution may occur as through individual written communication such as the use of memos, reports, letters (currently one would talk of the Internet) or training as through formal courses, on the job training, internal conferences, seminars, briefing or internal publications. Unintentionally she cites distribution of information may occur through job rotation, task forces, informal networks, stories and myths. For the terms “intentional and unintentional” the study has used the terms explicit and implicit to aid
understanding since these terms indicate when activities are adopted for the primary reason of distributing information and when the distribution occurs as a secondary aspect. Refer Fig.2.5. Probst et al. (2000) considered the right conditions for knowledge sharing and distributions as: a trend towards group-work where an individual is judged according to his contribution in the team; preservation of cultural knowledge such as avoidance of abrupt changes in company structure; use of information and communication technology and space management.

Vito et al. (1999) identified four components that influence the knowledge interaction between two or more individuals: the actors involved in the knowledge transfer process, the context where the interaction takes place, the content transferred between the actors and the media that the transfer is carried out. Other writers who had written on the subject of knowledge management, organisational learning, knowledge transfer and working knowledge have similarly mentioned these features. (Bröchner et al, 2004; Goh, 2002; Probst et al, 2000; Dixon, 1992 and1999b; Davenport and Prusak, 1998).

The common water cooler talks, the Japanese talk rooms (Davenport and Prusak, 1998), the Swedish coffee rooms (Sverlinger, 2000) have also been cited as examples of channels through which information could be shared implicitly. Davenport and Prusak (1998) cite an example from a high tech microelectronic and computer corporation in illustrating the significance in some situations of the physical presence of members and face-to-face communications. Refer Box 3. The significance of individuals to ensure efficient task integration was also noted in Bröchner et al.’s (2004) empirical study on cross-border post acquisition knowledge transfer among construction consultants.
Box 3: The Sematech’s case

Sematech, a high tech microelectronic and computer corporation has the practice of transferring people from one department to another as an example where knowledge is transferred through the transfer of people. In the consortia with Microelectronics and Computer Corporation it has the practice where "assignees" come to Sematech to participate in research and take their ideas with them. The firm considers the face-to-face meetings and the assignees physical presence in the organisation as important channels for transferring knowledge.

Nonaka and Takeuchi (1995) defining redundant information as the existence of information that goes beyond the immediate operational requirements of organisational members consider the sharing of redundant information as promoting the sharing of tacit knowledge. Such a motive, they cite may be created through different functional departments working together, strategic rotation of personnel and the use of brainstorming camps as those adopted by Honda.

Vito et al. (1999) had mentioned the significance of media capacity and richness in distribution of knowledge as vital in knowledge transfer. Defining media capacity as the ability to process information from the qualitative and quantitative point of view, and media richness as the capability to reduce equivocality. Explaining media with high capacity as that able to process information at a high quantitative and qualitative level such as those relying on rules, forms, procedures, and data bases whereby impersonal media sources are the dominant tools used. These include written and numeric documents, e-mail, telephone and fax. Media characterised by a high level of richness as one where there is personal face-to-face involvement between actors.

Bröchner et al. (2004) and Davenport and Prusak (1998) similarly acknowledged the significance of media in the transfer of knowledge. The latter had considered how much of what we try to communicate is absorbed and used - this they referred to as viscosity; and how quickly and widely is the knowledge disseminated - which they referred to as the velocity of the knowledge. Dixon (1992) considered if the message transferred is subject to interpretation, she recommended a rich medium such as face to face to be opted which she viewed as having an ability to construct joint cognitive maps between the subjects and able to resolve equivocality through discussions and rapid feedback; while Bröchner et al. (2004) considered non-routine
information as suitable for such a medium. Figure 2.5 illustrates the information distribution sub-process model used by the study.

2.9.3 Making meaning

Receiving information and making meaning from it are very different processes and that widely distributed information does not mean that organisation members know (Dixon, 1999b). There are two perspectives given by which organisation can give meaning to information acquired (Dixon, 1992). Refer Fig. 2.6. The first is, interpreting information such as in dialogue, critical reflection, and process checks, taking action, or, unlearning, whereby it is taken that such interpretation represents a more commonly understood meaning by the organisation acquired through a reflective action and less from seeking additional data (Sverlinger, 2000). The second, is a structural system perspective of making meaning whereby the focus is on amount, frequency and distribution of information that Dixon (1992) had referred to as an “analysing information” process that occurs through methods such as rational analysis, problem-solving processes, extrapolating from past events, formulation of strategies and use of decision support tools. Although both authors did not explain how the formulation of strategies featured as a method of making meaning, the study has taken that the ground work that need to be done prior to strategy formulation as enhancing analysis and hence meaning is made of situations.

![Fig.2.6: Making meaning](image)
Garvin (2000) considered that an organisation would interpret information based on its "interpretative framework" that is constituted by a set of shared assumptions about markets, customers, competitors, technology and the organisation's mission and competencies. He further emphasises the need for such interpretative frameworks to be tested and updated continuously - an emphasis similar to the "creation of chaos" discussed by Nonaka and Takeuchi (1995).

It is further perceived that certain conditions have to exist for collective interpretation to occur in an organisation (Dixon, 1999b). The first condition requires that the information be widely distributed among the individuals engaged in the collective interpretation rather than residing in only one or two individuals. The second is that egalitarian values should exist. That, there is freedom to speak openly and individual's ideas are not considered worthy or not by virtue of position or status, and there is respect for an individual's views. The third is the organisation size and physical arrangement and lastly processes and skills that facilitate organisational dialogue.

2.9.4 Organisational memory

Organisational memory refers to the repository in an organisation where knowledge is stored for future use (Kasvi et al, 2003; Sverlinger, 2000). It is also viewed as the point of reference for new experiences, as without memory no learning is possible (Probst et al, 2000). Various writers had identified and indicated differently where organisational memory could occur (Egbe et al, 2003; Argote and Ingram, 2000; Davenport and Prusak, 1998).

Argote and Ingram (2000) had identified three reservoirs of knowledge: organisational members, tools and tasks. Davenport and Prusak (1998) although not identifying as many storage bins as Dixon (1992), have more or less identified similar repositories. They mention the external knowledge such as: competitive intelligence; structured internal knowledge such as research reports, product-oriented marketing materials and methods; and informal internal knowledge what are sometimes referred to as lessons learned such as discussions and databases full of know-how.

Dixon (1992) referring to Walsh and Ungson’s (1991) work had given five storage bins where organisational memory resides: individuals, culture, transformations, structures and ecologies. She identifies culture as a learned way of perceiving, thinking and feeling about problems that is transmitted to members of the organisation both purposefully and unintentionally. Transformation being the various processes of the organisation ranging from the
design of work itself to the budgeting process - describing transformations as "the login that guides the transformation of an input… to an output" (Dixon, 1992, p.44). For the structures bin, she refers to organisational roles that differentiate tasks and control, the design of the organisation itself, and ecology - for the latter meaning, the actual physical structure of the work environment.

Dixon's (1992) model of organisational repositories also referred in Sverlinger (2000), looks into organisational memory as having, an internal and external storage. Under the former, a further classification exists acknowledging that knowledge can be stored both intentionally and unintentionally and again the terms have been replaced with explicit and implicit form of storage as these terms provide a clearer message. Refer Fig.2.7. Explicitly occurring such as in lessons learned, databases, records and reports, policies, core competencies, transformations and processes. Implicitly, occurring through culture, structure, organisation ecology and theories of action, with the theories of action considered tacitly held within organisations and constitute the espoused and theory in-use. Where the former, espoused theory of action refers to one that an individual gives allegiance and which upon request communicates to others and the theory in-use governs one’s actions - that may or may not be compatible with the individual’s espoused theory and that the individual may or may not be aware of the incompatibility of the two theories (Argyris and Schön, 1978).

Knowledge can be stored externally through external storage reservoirs and may not be part of the organisational memory *per se*. Such external sources may include: competitors, government records, financial reports, former employees, suppliers, customers and business partners (Sverlinger, 2000).

Organisational memory has been perceived as possible to influence organisations both positively and negatively (Dixon, 1992). The organisational memory positively attributing when it provides history of what has and has not worked and thus carries the potential for preventing the organisation from making the same mistakes again and for providing tested solutions. In this sense, organisational memory works as a sorting device for identifying successful practice. She refers to the negative impact of organisational memory as occurring when it predisposes how a situation will be viewed, automatically eliminating alternative explanations that might be more useful.
It is being alleged that there is usually a conflict between unlearning and preserving knowledge hence organisations are cautioned when re-organising their companies to be careful lest they lose on some of their organisational memory (Probst et al, 2000). Quoting Hedberg's (1981) definition of unlearning as the process in which learners clear out their old knowledge - they urge organisations to introduce a process of unlearning when as a result of changes in the environment, previous patterns of interpretation and reaction (the organisation's theory of action) no longer meet current challenges. They state, "Unlearning means being ready to question one's own routines and to let go of the familiar" (Probst et al, 2000). They however acknowledge the problem as being in the decision of what knowledge assets are no longer needed, or whether they might be needed in the future.

Argyris and Schön (1978) have also underscored the significance of individuals in organisational memory in their discussion on organisation learning. The two had considered in order for organisational learning to occur; learning agent’s (the individuals) discoveries, inventions and evaluations must be embedded in organisational memory. They must be encoded in the individual images and the shared maps of organisational theory in-use from which individual members will subsequently act. They allege on the absence of such encoding, individuals will have learned but the organisation will have not. Figure 2.7 represents the sub-process “organisational memory” used in the study, taken to adequately reflect where organisations store knowledge.
2.9.5 Retrieval of information and knowledge

The retrieval of information may either be controlled or automatic (Dixon, 1992) and like in the other sub-processes the terms have respectively been replaced with explicit and implicit as explained previously, they better describe the mode of retrieval. Dixon (1992) perceived the automatic (implicit) retrieved information as one signifying that what is learned, has been so well learned that it enhances the cognitive capacity of the organisation for new learning. She however mentions the limitations inherent in the automatic retrieved information, that it is tacit and therefore unavailable for reflection or challenge and cautions as possible to lead to errors of which the organisation is unaware. Sverlinger (2000) further adds on how individuals and groups may retrieve information purposefully and consciously by making an analogy to past decisions. Figure 2.8 illustrates the adopted retrieval of information and knowledge sub-process.
Fig. 2.8: Retrieval of information and knowledge

Dixon (1992) in referring to Walsh and Ungson (1991), further describes how the mode of retrieval differs for each of her five reservoirs. Refer Table 2.8

Table 2.8: Retrieval modes of organisational reservoirs

<table>
<thead>
<tr>
<th>Storage bin/reservoir</th>
<th>Retrieval mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>controlled</td>
</tr>
<tr>
<td>Culture</td>
<td>automatic</td>
</tr>
<tr>
<td>Structure</td>
<td>automatic</td>
</tr>
<tr>
<td>Ecology</td>
<td>automatic</td>
</tr>
<tr>
<td>Transformation</td>
<td>automatic</td>
</tr>
</tbody>
</table>

2.10 Summary

This chapter has looked into key definitions and concepts relating to knowledge and knowledge transfer. Data, information and knowledge has been viewed along a progressive continuum
whereby through an enriching and value adding process, data progresses to information and eventually becomes knowledge. The two forms of knowledge, tacit and explicit knowledge were subsequently introduced reflecting on the renowned works of Probst et al. (2000), Argote and Ingram (2000), Nonaka and Takeuchi (1995) and Argyris and Schön (1978). Knowledge transfer as defined and conceptualised by various authors in the extant literature has also been covered; with reviews indicating that mechanisms for knowledge transfer as occurring through: knowledge reservoirs (Argote and Ingram, 2000); organisational characteristics and managerial practices (Goh, 2002; Vito et al, 1999; Davenport and Prusak, 1998); knowledge conversion (Nonaka and Takeuchi, 1995) or through a process (Sverlinger, 2000; Vito et al, 1999; Cordey-Hayes and Gilbert, 1996).

The study taking a proposition that organisational learning, knowledge management and knowledge transfer are inseparable phenomena - concepts and models relating to organisational learning, knowledge management have been discussed. The knowledge transfer model as conceptualised by Sverlinger (2000), Vito et al. (1999), Cordey-Hayes and Gilbert (1996) together with factors influencing knowledge transfer then followed. Taking Nonaka and Takeuchi's (1995) notion that organisations are not simply information and knowledge processing units, but also create knowledge, the knowledge creation process as given by these two authors were subsequently explored.

The knowledge transfer model adopted by the study is given towards the end of the chapter detailing the five sub-processes in the model, namely: knowledge and information acquisition; information distribution; making meaning; organisational memory; and retrieval of information and knowledge.
3. Constructing knowledge in construction organisations

3.0 Introduction
After discussing key definitions and concepts related to knowledge and knowledge transfer in the preceding chapter, this chapter explores how these concepts apply to construction organisations. The dilemma construction organisations encumber in pursuing knowledge goals and the characteristic of such goals is discussed. Information flows and construction experience together with knowledge assets in a typical construction process then follows. A background of the Tanzania construction industry is then covered towards the end of the chapter.

3.1 The knowledge vision and mission statement and construction organisations’ dilemma
Traditionally, a vision and mission statement contains statements about the ideals to which a company believes itself to be committed. Hence a vision and mission statement for knowledge will contain an analogous statement about the significance of knowledge and how it should be treated in general. Furthermore the effectiveness is based on the extent to which it is feasible to put into practice the vision and mission statement, not simply presented as a document for press, and shareholders, but rather as a guide for employees (Probst et al, 2000). They henceforth consider a knowledge vision and mission statement as functionally facilitating a reference to knowledge aspects whenever strategic or operational decisions are made.

Goals in organisations are seen to exist at three levels, normative, strategic and operational. Normative knowledge goals pertain to the general vision of company policy and all aspects of company culture. Strategic knowledge goals are then set for long-term programmes aimed at realising the vision. Probst et al. (2000), also consider operational goals as helping to
ensure that strategic programmes are implemented in daily company activity. From such a
classification, it hence follows that for knowledge to be effectively transferred in construction
organisations, the goal has to feature in all three levels: the normative, strategic and operational
level that are inherently complementary. Vision and mission statements should make this
aspiration clear, strategic goals should set verifiable goals that pursue the vision and mission
statements, while the operational goals should set the means or the mechanism for achieving the
set goals.

In such pursuance, a dilemma for construction organisations lies in the nature of their
undertaking that of dealing with one-off projects, typified by temporal teams, working conditions
and contractual arrangements. Subsequently the concern should be how diverse should the vision
and mission statement be so as to accommodate such a dynamic situation? In addition, Probst et
al. (2000) refer to the company charter such as legal structures, company policies and culture as
structures that facilitate normative goals - to what extent then can these structures accommodate
the dynamic and project-based nature of construction organisations?

**Organisation structures versus project organisation structures**

At the strategic management level, Probst et al. (2000) identify organisational structures as a
means of facilitating strategic goals while organisation’s programmes serve as activities for these
goals. How then does the project organisational structure feature in this scenario? To what extent
should the project organisation structure be compatible with the organisation's structure, yet save
the specific nature and demands of the project at hand? A similar dilemma is noted in Schindler
and Eppler (2003) and Walker (2002). Schindler and Eppler, identify potential conflicts between
project aims and organisations’ surroundings since the latter has long-term goals while the former
does not. Walker on the other hand, emphasizes organisation structure as a particularly important
aspect in the functioning of an organisation and that if inappropriately designed, it would not
perform adequately, as people have the ability to construct informal organisation structures that
circumvent the formal structure to the benefit of performance. He also cautions that a strong
informal structure can work against an organisation’s co-ordination and control.

Reflecting on operational management goals of construction organisations, these are
straightforward, as they are made explicit in terms of engagements and agreements. The difficulty
lies in having operational management goals that have a knowledge focus; a focus that has
knowledge management attributes as an integral part.
Having highlighted the challenge construction organisations face in the course of introducing knowledge vision and mission statements, strategic and operational knowledge goals, various issues of interest come to the fore. These include probing of:

- the characteristics of goals in these organisations,
- areas of knowledge that construction organisations need to develop,
- the nature of construction experience, form of knowledge and information flows in construction organisations and
- lastly mapping knowledge assets in construction organisations.

Such issues are discussed in the subsequent section.

### 3.2 What are the characteristics of goals in a construction organisation?

Despite the many difficulties in formulating goals, goals are still considered the best way of describing a desired state of affairs. Probst et al. (2000) gives the characteristics of an organisation's goal as typified by its components. He identifies the typical components as: the goal object, goal characteristics, goal measures, contribution to achieving goal, time frame and target person responsible for achieving the goal. Such characterisation when used in a construction organisation, apart from depicting the temporal nature of goals in construction organisations, also show the inherent learning opportunities that could enhance the process of goal formulation in such organisations. See Table 3.1.

*Table 3.1: Characteristics of goals in construction organisations*

<table>
<thead>
<tr>
<th>Goal component</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal object</td>
<td>Deliver project; meet contractual obligations</td>
</tr>
<tr>
<td>Goal characteristics</td>
<td>Time; design and functional aspects</td>
</tr>
<tr>
<td>Goal measures</td>
<td>Time; cost; quality</td>
</tr>
<tr>
<td>Contributions to achieving goal</td>
<td>Knowledge; resources</td>
</tr>
<tr>
<td>Time frame</td>
<td>Time frame for goal achievement</td>
</tr>
<tr>
<td>Target person(s) responsible for achieving goal</td>
<td>Project team</td>
</tr>
</tbody>
</table>
3.3 What areas of knowledge construction organisations need to develop?

Probst et al. (2000) alleged organisations rarely formulate knowledge goals. That, organisation knowledge is disregarded when goals are formulated at normative, strategic or operational levels; vision and mission statements are filled with information about market, finance, organisation performance, and strategic direction of business activities. They note further, that corporate strategies do not specify what areas of knowledge should be developed. This poses an interesting question to the focus of this chapter and subsequently to the section that follows as it probes into areas of knowledge that construction organisations need to develop. More specifically the question asked is: "What areas of knowledge should be developed in a professional consultant firm or a contracting firm?"

Taking a simplistic view, construction firms' long-term objectives can be viewed as concerned with enhancing efficiency. This can be through increasing productivity, improving services, and maintaining existing clients and attracting new business. Construction organisation can thus thrive to develop areas of knowledge within the said parameters, so as to enhance their efficiency hence performance. Of essence then is how can the efficiency or enhanced performance be facilitated? What are the specific knowledge areas these construction organisations need to develop? What knowledge do they need to enhance production, services, facilitate customer satisfaction or have an optimal supplier relationship?

Abundant suggestions exist in the modalities that organisations can adopt as solutions to the questions posed. These have featured in concepts such as Total Quality Management (TQM), Business Process Re-engineering (BPR), value chain management, supply chain management, and lean production or benchmarking. As the study does not intend to evaluate to what extent the various solutions given fulfil the aspired goals, the following section discusses some of these concepts though briefly. The justification for their inclusion being, all in varying levels when implemented have been taken as having the potential of improving performance in organisations. This is in respect of identifying them as addressing four key issues that are significant for enhancing performance; customer, process, management and supplier. Basing on such a presumption, the following section looks at the extant literature conceptualisation as to how firms could enhance performance. Concepts of Total Quality Management (TQM), business process-
reengineering (BPR), process innovation, value chain management, supply chain management and lean enterprises are discussed.

**Total Quality Management (TQM)**
The aim of TQM is viewed as to continuously improve process performance in order to satisfy customer requirements. It is described as a process that ensures maximum effectiveness and efficiency within a business and secures commercial leadership putting in place processes and systems which will promote excellence, prevent errors and ensure that every aspect of business is aligned to customer need and advancement of business goals without duplication or waste of effort (Lindfors, 2003a and 2003b). Love et al. (2000a) had advocated a re-thinking towards approaches to TQM by practitioners, academic and professional institutions, so as to take learning as a norm. They considered TQM as an enabler for creating a learning organisation and criticise construction organisations as to have eschewed implementing TQM practices because short-term benefits are relatively minimal. However the authors caution although re-engineering has been opted for, as an alternative to facilitate radical performance improvement, the path to its implementation is incremental. They have thus suggested that first, organisational change should be viewed by organisations as a continuous process and that before construction organisations consider implementing re-engineering initiatives, they should address their existing approaches to quality, so that an adaptive learning of TQM culture is cultivated.

**Business Process Re-engineering (BPR) and process innovation**
Business process re-engineering (BPR) has been described by Lindfors (2003b) as a fundamental re-thinking and radical design of business processes so as enable the achievement of improvements in critical contemporary measures of performance such as cost, quality, services and speed. The aim of BPR is to re-engineer processes from a customer perspective for the purpose of improving organisational performance not through incremental improvement but through quantum leaps. However, again Love et al. (2000a) in taking re-engineering as concentrating on radically changing the way an organisation conducts its business, seeking to re-invent the organisation by changing processes, organisational structure, management styles, behaviour, culture and reward system, consider the path to its implementation as inhibitive as mentioned in the preceding section.
However, Davenport and Prusak (1998) consider re-engineering as one of the approaches to getting started with knowledge management. They identify a common objective of such process change programme as the compilation and leverage of "best practices" or effective ways to perform a process that have been identified inside or outside the company. The successful application of BPR in the UK construction industry with a saving of over 20% of project cost and a compressed construction programme has also been reported in Brown and Riley (2000).

Value chain management and supply chain management
Supply chain management has been viewed as a collection of interdependent activities that facilitate achievement of a firm's strategy and its way to achieve overall results. Within the value chain, the activities are interrelated by linkages and reconfiguring that often lead to opportunities of achieving dramatic levels of differentiation, assuming that differentiation is good from a competitive standpoint. The supply chain is also taken as a synonymous concept to the value chain and has been defined as an integrated philosophy to manage the total flow in a supply chain from supplier to end customer (Lindfors, 2003b).

The concept's advocacy hence lies in an organisation's ability to optimise and co-ordinate linkages so as to reduce cost and enhance differentiation within the chain; and for the value chain not to be taken as a series of independent activities, but, as a system of interdependent ones.

The lean production concept
Cost effectiveness has been seen as focussing on the lean production concept, a concept whose approach facilitates: elimination of unnecessary steps, alignment of all steps in an activity in a continuous flow, recombination of labour into cross-functional teams dedicated to an activity, and a continuous strive for improvement (Womack and Jones, 1994). The authors acknowledge the strive for improvement as also strongly advocated in the TQM concept and encourage firms not to stop at the lean production only - but to go a step beyond and create "lean enterprises". The lean enterprise approach is also considered built on the principles of TQM, BPR, supply chain management and the learning organisation concepts - concepts that focus on four key issues: customer, process, management and supplier (Lindfors and Leiringer, 2002). Furthermore, the trend towards leaner organisation is seen to have contributed to the heightened interest in
knowledge based on the principle that you really understand the value of something once it is gone (Davenport and Prusak, 1998).

**Innovation in construction**

Construction firms are perceived to have always displayed a peculiar capability for innovation. The site-based nature of production, increasing numbers of different specialisms, relative uniqueness and the changing use of final products and the variety of production processes, constantly throw up problems which firms have to solve in a variety of ways. But in spite of an innate ability to deal with change, construction is not generally viewed as an innovative sector (Gann, 2000). Gann characterises innovation in construction as prompted by the need to solve problems often needlessly created elsewhere in the production process. Such innovation he states, generally lacks direction and can result in further problems, which others have to rectify. He refers to this characterisation as the paradox of change that construction firms possess. Positing that construction firms as having internal dynamics that generate innovation, but not necessarily of the type that leads to lasting improvement in performance.

Leiringer (2003) despite acknowledging the problem-solving feature inherent in construction as possibly acting as a key source of innovation considers problem solving on a construction site not as a true innovation unless the knowledge is retained and the result used in future projects. Gann (2000) suggests for construction firms aspiring to reap the benefits of innovation to have a systematic effective innovation that will enhance cost optimisation, time and quality. This strategy he states may be realised by: developing a commitment to learning from previous experience, gaining feedback from users and developing new techniques for measuring improvements and enabling assessment of performance over time to be made.

**Benchmarking**

Benchmarking is viewed as providing the means to identify why best practice organisations are high achievers and how others can learn from best practices to improve their own approach. It is a continuous process of establishing critical areas for improvement within an organisation, of investigating the extent to which others carry out the same or similar tasks more efficiently, identifying the techniques that give rise to better performance, implementing them and measuring
the outcome (Garnet and Pickrell, 2000). The significance of benchmarking also noted in a
doctorate study that investigated strategies for construction performance improvement in
Tanzania that established TQM provided a feasible long-term performance strategy for
performance improvement and that, benchmarking is the key tool for initiating and sustaining the
TQM approach (Lema, 1996).

3.4 Forms of knowledge, information flows and construction
experience
Knowledge in construction organisations as in other organisations exists in both tacit and explicit
form. The tacit form existing in the form of skills, know-how of individuals, norms, rules of the
organisation, and the organisation culture. The explicit form existing in organisation policy
statements, objectives, organisation charts, working manuals, and organisation reports. Such
forms of knowledge are considered not static in nature, and through a socialization process,
conversion of tacit to explicit form and vice versa occur recursively and new knowledge is
created (Nonaka and Takeuchi, 1995).

Furthermore, quantitatively, continuous information flow has been viewed to exist in
construction processes and that cumulatively it builds on the knowledge an organisation
possesses. Petursson (1991) had indicated how organisations in construction could enrich their
knowledge base by making use of what he referred as the forward and backward flow of
information. That is, if taken that - information goes through an interpretative and meaningful
process (Bhatt, 2001; Davenport and Prusak, 1998; Vito et al, 1999). The backward flow of
information in the construction process is a significant aspect for organisations to build upon their
knowledge base in both forms of knowledge. This is so since feedback on constructability, cost
matters and the time factor have a chance of being incorporated in future designs; and when such
an action is taken, the organisation is considered to have undergone a learning process and to
have learned (Argyris, 1999).

Construction organisations could hence possibly take advantage of such information flows
(refer Figures 3.1 and 3.2) in the various stages of a construction project. Such a
conceptualisation as shown in the figures creates issues of interest as to: how effective is this
information flow, is it relayed in a manner that is unequivocal, is the message explicit, is it well
articulated? As stated, such information flows are significant since they build on the knowledge resource of organisations.

Bjarni (1994) had looked into construction experience as knowledge that is based on information about methods used to perform construction tasks, field operations and results of prior projects. He considers such an experience as knowledge that provides technical, operational, contractual or administrative guidance for subsequent projects. He conceptualises relationships between construction experience, construction knowledge and expertise in construction; that, past and current projects generate experience that is put into context with the help of an evaluation process and becomes construction knowledge.

Since this study has taken construction organisation as constituting contracting firms and consultant firms, taking Bjarni's (1994) conceptualisation, it is of interest to explore what construction experience each entity entails.

3.4.1 Construction experience and information flows - a contracting firm's perspective

Taking Bjarni's (1994) concept, that past and current projects generate experience, it is hence crucial to probe further and consider what particular knowledge is drawn from these projects by contracting firms? Taking the conventional/traditional mode of procuring construction contracts, as this is the dominant method used in Tanzania, the following stages are being discussed as to how construction experience is acquired. Information and potential knowledge conversion pertaining to each stage of a traditional construction project are noted.

I. Information and knowledge in the pre-contract stage of a construction project

Bid preparation - in the processes of building up rates for tender purpose, what did the organisation learn? For instance, from the contract conditions, are there any special conditions?

Bidding strategy - what to the organisation's understanding and belief that made the organisation win a bid?

Award process – What was learnt in the tender opening stage? Was the contractor able to get the feel of the market situation?
II. Information and knowledge in the post-contract stage

*Mobilisation phase* - prior to commencement of work on site the organisation could acquire a lot of information through the various activities such as information and knowledge on handling of statutory authorities, preparation of the site plan or programme of works.

*Physical execution phase* - this includes:

i) Constructability issues such as nature of site and physical conditions; how to deal with various actors in a construction project e.g. how to deal with suppliers, nominated sub-contractors or statutory authorities.

ii) The operationalisation of the contract documents such as the particular conditions of contract, the bills of quantities, specifications and drawings.

*Commissioning phase* - this is an information and knowledge rich phase as it marks the end of contractual obligation of the contractor. It is a stage where the organisation can recapitulate information and knowledge commencing from the invitation to tender, decision to tender, bidding, award, and execution to the commissioning stage. It is a phase that can conclusively indicate the actual from what was envisaged or planned.

As noted from a contracting organisation perspective, the construction process commencing from the bid preparation to the commissioning phase is rich in information. Such information is what Bjarni (1994) had considered as construction experience which when *evaluated* will create construction knowledge that aid decision-making and build expertise.

3.4.2 Construction experience and information flows – a consultant’s perspective

Professional consultant services in the Tanzanian construction industry are largely procured through the architect, engineer and the quantity surveyor as key professionals. This has formed the bases of selecting these professionals in the discussion of opportunities of acquiring construction experience by professional consultants in Tanzania. The sequential stages of a building project under the traditional mode of contract have been adopted in the ensuing discussion.

1. Inception and design brief preparation

a) *Clients brief* - this is a stage where the client's ideas are conceptualised by the professionals involved in the project. The practice in Tanzania will be for the client to approach the architect who is the principal consultant. This is an opportunity for the architect to consider the client's
requirements and preferences as information and knowledge that can be used in future. Again, it follows that the architect after obtaining the client's requirement will call upon other professionals as appropriate. These consultants together will establish the viability of the client's concepts, from which varying information could be drawn. Depending on the nature of the project, the information may range from market, economic, technical to social aspects.

![Information flow diagram](image)

**Fig.3.1: Information flow in the inception and design brief stage**

**b) Design brief stage** - The interaction of the consultants during the design brief creates an information rich environment as alternatives, arguments and concepts are being presented to pave the way for the development of the design. See Fig 3.2.

**II. Design development and Bills of quantities preparation**

During the development of the design, the architect or engineer will more often use past projects or past information and link to the current requirements and come up with the sketch design initially and later on the detailed design. The quantity surveyor on the other hand would have produced cost targets based on the sketch design, and conduct cost checking as the design is developed. Such exchange of design and cost information enriches both the architect and the quantity surveyor through the process. Interaction with specialists, and suppliers is also important at this stage since it is at this stage where quotations and specialist participation is sought more precisely.
III. Physical execution of the project
Information and knowledge that is drawn by a consultant architect, quantity surveyor or engineer during this phase includes: a) Compatibility of the contract documents to the physical environment of the project at hand. Examples may include, issues on constructability, compliance to certain conditions of contract and implications to stakeholders, the nature of variations and claims that have emerged in the process, or shortcomings in contract documents; b) The interaction of the project team; c) Unforeseen events.

IV. Commissioning phase
As in contracting firms, this likewise is a rich source of information and knowledge for the professional consultants. Information could be obtained as to whether what had been planned for was actualised. Table 3.2 cites a few of the potential situations that provide information and knowledge.

Table 3.2: Information flows in the commissioning phase

<table>
<thead>
<tr>
<th>Sources</th>
<th>Information, knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects liability period</td>
<td>Suitability of: specifications, detailing</td>
</tr>
<tr>
<td>Final project cost and duration</td>
<td>Sources of: cost overrun, delay</td>
</tr>
<tr>
<td>Variations</td>
<td>Sources: Client, Consultants, Statutes</td>
</tr>
</tbody>
</table>

Fig.3.2: Information flow in the design development stage
From table 3.2, establishing the source of variation for instance, is an experience that can be carried to future projects. If a major portion of variations originated from the architect or engineer - then it is in order to consider to what extent were the working drawings detailed so as to cover client's requirements exhaustively? However, conclusively, Bjarni (1994), like Garvin (2000) acknowledge, experiencing alone is not enough. Bjarni advocates an evaluation process that Garvin had referred to as critical reflection as a necessary activity for the experience to be knowledge acquired or for learning to have occurred.

The above discussion having explored the potential for individuals and organisations to draw information and knowledge in the process of undertaking a construction project has shown that, information inherent in the various construction activities can be interpreted into construction knowledge. It also portrays through a construction process how information is transformed into an object. The transformation agents being: processes, resources and goals as shown in figure 3.3.

![Fig.3.3: Information to object transformation](image)

**3.5 Knowledge assets in construction organisations**

Prior to a discussion of transfer of knowledge it is logical to consider what knowledge exists in a construction process so as to be transferred. Construction organisations as participants in the process become the focus of this discussion. Thus the question being addressed in particular is - what knowledge resources do construction organisations possess so as to be able to transfer? Knowledge possessed by participants in a construction process is identified as the knowledge assets for organisations. A presumption that takes an organisation’s assets as constituting internal assets e.g. like the resources it owns and external assets as all the stakeholders in the construction process. Table 3.3 gives an illustration of the participants in a construction process and the knowledge they possess.
### Table 3.3: Knowledge assets in a construction process

<table>
<thead>
<tr>
<th>Participant</th>
<th>Knowledge assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Suitability of the final product on functional, comfort and durability</td>
</tr>
<tr>
<td>Client</td>
<td>Functional, comfort, durability, marketability of final product</td>
</tr>
<tr>
<td>Architect/ Design team/ Quantity Surveyor/ Engineer</td>
<td>Design and cost matters; Time, programmes; Constructability</td>
</tr>
<tr>
<td>Contractor:</td>
<td></td>
</tr>
<tr>
<td>- Main</td>
<td>Constructability, cost, time matters</td>
</tr>
<tr>
<td>- Specialists</td>
<td>Constructability, cost, time, maintenance</td>
</tr>
<tr>
<td>Suppliers</td>
<td>Functional, comfort, maintenance, cost aspects</td>
</tr>
<tr>
<td>Plant, equipment lending firms</td>
<td>Functional, cost matters, life cycle costing</td>
</tr>
<tr>
<td>Authorities in:</td>
<td></td>
</tr>
<tr>
<td>- Specialist services e.g. water, electricity, telecommunications</td>
<td>Functional, cost, time, regulatory matters</td>
</tr>
<tr>
<td>- Statutory bodies - municipals</td>
<td></td>
</tr>
<tr>
<td>Financial institutions</td>
<td>Financial, insurance matters</td>
</tr>
</tbody>
</table>

Having so far discussed knowledge areas of construction organisations, information flows, the generation of knowledge through experience and knowledge assets in a construction process of a project, the subsequent section gives a brief background information of the Tanzania construction industry whose organisations formed the bases of the cases studied.

### 3.6 The Tanzania construction sector and industry

The Tanzania construction sector constitutes: all civil and building works related to design, construction, maintenance and rehabilitation of roads, aerodromes, bridges, irrigation systems, dams, commercial and residential buildings. The sector is responsible for the procurement and subsequent utilisation of construction equipment and plants, development and registration of contractors and professionals related to the industry. At industrial level, the construction industry comprises all those organisations and persons concerned with the process, by which building and civil engineering works are procured, produced, altered, repaired, maintained and demolished. This includes: companies or firms and individuals working as consultants, main contractors and
sub-contractors, material and component producers, equipment suppliers and building merchants (URT, 2003).

The Tanzania contracting sector is categorized based on specialization whereby building contractors constitute about 50% while civil works contractors are about 37% of all contractors; electrical, mechanical, specialist and temporary contractors constitute the rest. The consulting sector of the construction industry constitutes architects, engineers and quantity surveyors. Both the consulting and contracting firms although operating countrywide, about 50% (and above for the consultant) have their basis in the capital city of Tanzania, Dar es Salaam. The contracting sector is typified by having many, local and small firms, with the lower class contractors constituting about 62.6% of the total number of contractors which is currently at 2,911. Foreign contractors although forming a meagre 3% of this total number hold an upper hand in terms of the monetary value of projects done. For instance a survey by the National Construction Council of Tanzania (NCC), in the years 1990 – 1996 revealed although local contractors got 79% of projects carried within this period, this was equivalent to 3.4% in value of the total while 96.6% went to foreign firms. In 1997 for both consultants and contractors it was perceived the share of local contractors was estimated at less than 10%. A similar pattern was observed in 1999 of a study carried by the TCRB that similarly showed foreign contractors’ market share in terms of monetary value for building and civil works at 71.6% (Mlinga and Mbuya, 2004).

The industry is an essential contributor to social-economic development and also a major consumer of the development budget, as approximately 50% of the annual development budget is consumed by this sector (Mlinga and Mbuya, 2004). Its contribution to the economy can be highlighted in three economic indicators, the Gross Domestic Product (GDP), The Gross, Fixed Capital Formation (GFCF) and the amount of manpower employed by the industry. The contribution of the industry to the GFCF at constant 1992 prices in the years 1992 - 2001 has more or less been constant as indicated in Fig.3.4; with a contribution to the GFCF showing on average a 44.2 % which is less than the expected 50% common to developing countries. However the average growth rate for the construction sector increased from 1.3% in 1994 to 12% in 1998 and between 1999 and 2000 it averaged to 8.5% (URT, 2003).
3.6.1 Performance of the Tanzania construction industry

The Tanzania construction industry policy in giving the background of the industry identified poor performance as one of its setbacks (URT, 2003). Likewise a study of the macro-economic performance of the Tanzania construction industry over a twenty-five-year period by Lema (1996) revealed that the performance of the industry had been unfavourable. Of recent the situation has been viewed to be the same particularly for local construction firms (Mlinga and Mbuya, 2004; URT, 2003). Baradyana (2000) taking time, cost and quality as parameters for performance identified major factors behind the poor performance of the Tanzania construction industry as rooted in organisational and managerial problems. Although Baradyana (2000) like Lema (1996) had indicated the key factor behind the poor performance as related to the poor state of the Tanzania economy, both acknowledge some of the performance problems could be addressed at organisational and managerial levels. Lema (1996) had advocated an adoption at firm level of the TQM philosophy and the use of benchmarking for initiating and sustaining the same, while Baradyana (2000) advocated motivation strategies. Datta (2000) focusing on production levels on the other hand suggested rationalisation of waste in construction sites as one of the means towards improvement of the industry performance. He cites data from four countries south of the equator, Tanzania, Zambia, Zimbabwe and Botswana and estimated 40% of construction is re-work, only 30 to 40% of labour potential is used, 8% of total project costs
account for accidents and 20 to 25% of construction materials are wasted. The studies cited typify the industry performance as hampered by a variety of factors.

As the Tanzania construction industry constitutes a formal and an informal construction sector that both contribute significantly to the industry, the following section gives a background of the two sectors to acknowledge their role in the industry.

3.6.2 The Tanzania formal and informal construction sector: a chronological perspective

The construction market in Tanzania is divided into two, the regulated and the non-regulated. A SIDA evaluation report series of 1992 reported the industry as characterised by a lack of documented facts and records such as of: size, value or volume of construction, the supply of building materials and size of the labour force. The institutional set up for the industry was also reported of low capacity (Björklöf et al, 1992).

An overview of the formal and informal construction sector in the past three decades however, recorded an emerging regulated construction sector from the 1970's that was boosted by the country's policy of socialism. The major and dominant client at the time was the public client through its agencies and parastatal organisations. However during the late 1970's to 1980's the deteriorating economy in Tanzania coupled with inefficiencies in the government agencies and parastatal organisations, created hindrances to the sector. Subsequently the sector experienced setbacks in the form of scarcity of building materials, fuel shortages and an absence of foreign exchange facilities that restricted importation. From the early 1980's onwards, structural adjustment programmes aimed at improving and stabilising the economy were introduced. With such programmes a re-emerging construction industry largely boosted by infrastructure development projects such as the Integrated Road Project (IRP) are seen. From thereon, an increase of the private sector participation is also noted.

Regarding the informal construction sector, this comprises unregistered and unprotected individuals and small enterprises that supply labour and contribute in various ways to the output of the construction sector (Mlinga and Lema, 2000). The participation of the informal sector is significant to the country as it provides housing and other infrastructure facilities to the 80% of the population that lives in the rural area (URT, 2003). Based on the National Informal Sector Survey (NISS) for Dar es Salaam, (the capital city) and the Dar es Salaam Informal Sector
Survey (DISS) of 1991 - 1995 both surveys show the informal sector in the Tanzania industry as growing. Indicators in the years 1991- 1995 such as of the total gross output, total value added and total capital formation were noted to have increased by 188%, 244% and 173% respectively (Mlinga and Lema, 2000).

3.6.3 Structural adjustments in the national economy and the construction sector
Tanzania had taken a number of structural changes from the early 1980's that had an influence on the construction sector. Such structural adjustment programmes included:

i) The National Economic Survival Programme (NESP) 1980/81 and the Structural Adjustment Programme (SAP) of 1982-1984 - The NESP targeted export promotion while the SAP emphasised more economic structural changes. One of the implications to the construction industry was the rationalisation of supply of materials through the removal of import restrictions

ii) The Economic recovery programme (ERP) 1986-1989 - which outlined the revival of the almost collapsing economy. The programme introduced a number of measures such as: the adjustment of the exchange rate and interest rate so as to achieve a positive real interest rate, reduced price controls, increased producer prices for export of goods, trade liberalisation policy that included among others, the removal of restrictions on import and distribution of construction materials and a reduced ministerial control over parastatal organisations.

With such measures the economy moved out of stagnation and in 1988/89 the Tanzania economy grew at a 4% rate (Björklöf et al, 1992). On average from 1990 to 2003 the percentage growth rate of the GDP for Tanzania has been at 3.9% (URT, 2004), see figure 3.5; with a 5.6% growth record for the year 2003 noted as attributed by three key industries: the manufacturing, mining and construction (Tanzania economic overview, 2005)
Laws and regulations initiatives in the Tanzania construction industry

The industry has continuously indulged in reviewing, modifying and introduction of laws and regulations so as to create a conducive environment for the performance of the industry. Recent developments towards this end include the following:

- The Tanzania Building Regulation (TBR) which is in final draft form
- The Building Act - which is in preparation
- The Public Procurement Act No. 3 - enacted 2001 aimed at facilitating transparency in the procurement of goods, works and services for government and its institutions
- The Construction Industry Policy – introduced in 2003

3.7 Summary:

This chapter had commenced by discussing the dilemma of construction organisations pursuing knowledge visions and missions. It has explored the nature of knowledge goals in construction organisations, areas of knowledge that construction organisations need to develop, information and knowledge flows in a construction process and what the study has considered as knowledge
assets in a construction process. Towards the end, the chapter has given a background of the Tanzania construction industry, in terms of its performance through macro-economic indicators.
4. Research methodology

4.0 Introduction

This chapter discusses the research methodology adopted by the study. It commences by discussing three research approaches namely, quantitative, qualitative and mixed method research together with strategies of inquiry relevant to each approach. The appropriateness and limitations of these strategies of inquiry in addressing the study's research question is further discussed. Justification of choice of strategy of inquiry by the study - that is, the case study strategy then follows. Subsequently, the chapter discusses aspects that had been considered in the case study design. These include: the unit of analysis, the rationale for single versus multiple-case approach, the research design and criteria for judging the quality of research. Methodological issues are further discussed in the chapter giving justification for the units of analysis and the choice for a replication against a sampling logic. The research design is illustrated followed by a discussion of validity and reliability issues as related to case studies and how they were taken care of. The case study protocol that served as a guide for the research design is given in the appendix (See appendix “A”).

4.1 Approaches to research

Creswell (2003) had identified three key approaches to research - a quantitative, a qualitative and a mixed method approach. The following section gives some of the key features in these approaches.

Quantitative research
This research approach has been characterised as having a cause and effect thinking, reductionism to specific variables, hypotheses and questions, use of measurement, observation
and a test of theories. It employs strategies of inquiry such as experiments and surveys and collects data on predetermined instruments that yield statistical data.

**Experiments**
Moser and Kalton (1971) had considered the notion of an experiment as involving some degree of planning and control from the side of the experimenter- were the predictor variable is manipulated. Experiments, like case study strategies, likewise focus on the "how" and "why" questions (Yin, 1994); however unlike case study, experiments require control over behavioural events. Such controls hence implicate influencing certain behaviours and hence for one doing an exploratory study such as this one this method is quite inappropriate.

**Surveys**
The purpose of surveys has been stated as explaining the relationship between numbers of variables (Moser and Kalton, 1971). Unlike a case study approach, the survey does not emphasise the diverse aspect of a single case but rather the frequency or number of answers to the same question to different people. The different cases loose their individuality and become anonymous (Bless and Higson-Smith, 1995) and the method in contrast to for example ethnography, focuses on the population in which the phenomenon under investigation occurs rather than on the social setting in which it is embedded. It is an inquiry that focuses on "how many" or "how much" (Yin, 1994). As this study's research questions are on the line of inquiry of "how", being exploratory, the survey method focusing on the frequency of an incidence became unsuitable for adoption.

**Qualitative research**
Qualitative research approach is viewed to have emerged primarily during the last three or four decades and unlike in years back, what constitutes a qualitative inquiry, is presently relatively understood (Creswell, 2003). He further characterises qualitative research as being emergent rather than tightly pre-figured, fundamentally interpretative, views social phenomena holistically, is introspective, and acknowledges biases, values and interests.

Sverlinger (2000) quoting Bryman et al. (1988) considered the positive aspects of a qualitative approach as one that gives the interpretation of action, events and perspective through the eyes of those being studied subsequently bringing the researcher closer to the reality being studied. While Creswell (2003) considers qualitative procedures as standing in stark contrast to
the methods of quantitative research, Sverling (2000) on the other hand views the use of a qualitative approach as always constituting some underlying patterns of a quantitative approach like the use of interviews as part of the data collection process. Creswell further considers qualitative inquiry as employing different knowledge claims, strategies of inquiry and methods of data collection and analysis. Among the strategies associated with the qualitative approach include ethnographies, grounded theory, case studies, phenomenology and narrative research. This study has opted for the case study approach in the qualitative strategy of inquiry as against ethnographic, phenomenology, ground theory or narrative strategies of inquiry based on the justification that is subsequently explained.

**Case study strategy**

Yin (1994) has given two technical definitions of a case study inquiry. The first, case study inquiry as an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident. The second, as an inquiry that copes with the technically distinctive situation in which there will be many more variables of interest than data points and where: one result relies on multiple sources of evidence with data needing to converge in a triangulating fashion; benefits from the prior development of theoretical propositions guide data collection and analysis. In this sense Yin (1994) sees the case study strategy as not merely a data collection tactic or simply a design feature, but a comprehensive research strategy. Case studies are also perceived as valuable in developing concepts and making them more precise (Lundequist, 1999).

However, criticism on the other hand exists on the use of the case study inquiry as a research strategy. That, a case study inquiry lacks rigour, hence allowing equivocal evidence or biased views; lacks or has little ability of generalising findings (Yin 1994; Leiringer, 2003) and that they take a long time (Yin, 1994). The two authors however have factually counter argued such criticism. As for the lack of rigour and tendency to bias - this is considered equally possible in experiments, and it is obligatory no matter what strategy of inquiry adopted that the investigator must work hard to report all evidence fairly. However, Yin (1994) acknowledges the possible cause of such critique as to have originated from the fact that such weakness may have been more predominantly noted in case study research.

Regarding the critique on generalisation, case studies like experiments are generalisable to theoretical proposition and not to populations or universes. In this sense Yin explains both case
studies and experiments as not representing a "representative sample" and that the investigator's role is to make an analytical generalisation and not make a statistical generalisation e.g. enumerate frequencies. Regarding the critique on the time case studies take - this need not be the case or the norm, and such critiques are taken to have confused case study strategy as a data collection method (Yin, 1994).

**Ethnographies**

Like case study strategy, ethnography, studies a subject within a natural setting but considered more appropriate in an intact cultural group and where the study is over a prolonged period of time. It is also primarily based on observational data. Construction organisations not being cultural groups and the fact that this study was planned for a fixed period of time, and the need to have the "lived in experience" made ethnographies inappropriate for addressing the research questions posed by this investigation.

**Ground theory**

Characterised by the insistence that theoretical concepts and hypotheses must emerge from the data as it is uncovered or gathered in the research process itself (Layder, 1998). As this study is inclined to the testing of theoretical propositions set out early in the thesis as against construction of new theory, the ground theory inquiry was equally opted out as a suitable research strategy.

**Narrative strategy**

This is a form of inquiry where the researcher studies the lives of individuals and asks one or more individuals to provide stories about their lives. This information is then retold or restoried by the researcher into a narrative chronology. For reasons similar to those mentioned in the grounded theory, the narrative research strategy of inquiry was not considered.

**Mixed methods research approaches**

These are approaches in which the research tends to base knowledge claims on pragmatic grounds (Creswell, 2003). It involves collecting both numeric and text information either simultaneously or sequentially so as to best understand research problems with the final database representing both quantitative and qualitative information. To an extent, this study had used the mixed approach in that the pilot study undertaken in the year 2001 had used a quantitative approach, while the main data collection has adopted a qualitative approach. The quantitative approach had been used intentionally to develop the research questions and refine the research.
design. Consequently, the fact that the quantitative approach had been purposely used for the forementioned reasons, this study cannot be taken to be under the mixed method approach. In addition, the distinct advantages of a case study in addressing questions of exploratory nature (Yin, 1994) outweigh the benefits inherent in the mixed methods approach.

4.2 Justification of choice of case study

This study has opted for the case study approach as the strategy of inquiry against other qualitative strategies such as ethnographic, phenomenology, ground theory or narrative strategies of inquiry based on three major attributes:

i) The nature of investigation

ii) Previous empirical studies in the field of knowledge and construction and

iii) The multiple source of evidence that the case study approach facilitates.

i) The nature of investigation

The nature of this thesis is exploratory, as it investigates how construction organisations in Tanzania:

- Transfer knowledge - how they a) acquire; b) distribute; c) interpret; d) store and retrieve information and knowledge
- Facilitate knowledge creation

The dominant mode of such an exploratory inquiry is the "how" and "why" questions, a situation likely to lead to the use of qualitative research (Walker, 1997) and case studies in particular (Yin, 1994). Furthermore the inherent characteristics, of a qualitative strategy of inquiry that provides for the opportunity to study in a natural setting, studying an emergent as opposed to a tightly pre-figured situation and its holistic approach to the social phenomenon, made the case study approach an appropriate choice for the pursuance of the study's research questions. Further, the choice of this methodology was reinforced by the fact that the nature of investigation did not attempt to have control over behavioural events and that the study's focus was on a contemporary issue, meriting the use of case study (Yin, 1994).
ii) Previous empirical studies in the field

Researchers have empirically studied knowledge management initiatives such as learning, knowledge transfer, and technology transfer projects in the construction industry using case studies as a strategy of inquiry. (Bröchner et al, 2004; Egbu et al, 2003; Saad, 2002; Anheim and Widen, 2001; Bang and Clausen, 2001; Matzdorf et al, 2000; Femenias, 2001; Bjarni, 1994; Sverlinger, 2000; Nkado, 2000; Boyd and Robson, 1996; Petursson, 1991; Simkoko, 1989).

Bröchner et al. (2004) studied how knowledge transfer is influenced by technical and heterogeneity factors in a post-acquisition case; while Egbu et al. (2003) in exploring knowledge production sources and capabilities in UK construction firms studied 14 cases; Boyd and Robson (1996) investigating how learning could be enhanced in construction projects had taken two case studies for which they had used personal project diaries and de-briefing as techniques for data collection.

The use of case study as a research methodology strategy is also noted in Sverlinger (2000) who had used four Swedish construction companies in the investigation of how technical consultancy firms serving the construction industry manage knowledge. Sverlinger (2000) like Matzdorf et al. (2000) used questionnaires complemented with interviews as data collection tools. Femenias (2001) looking at how demonstration projects work as a source of information had taken two case studies - one from the Netherlands and another from Sweden. Bang and Clausen (2001) exploring the learning mechanism employed by building firms to capture and transfer knowledge and innovative ideas from one project to another had similarly used three contracting firms as cases. Anheim (personal communication, 27th June 2002) investigating how contracting organisations learn, undertook a single case study using the giant NCC contractor of Sweden and made the investigation in two sequential projects, monitoring how the lessons learned from one project were carried on to another. Simkoko (1989) analysing factors impacting technology transfer in construction projects investigated 12 case studies in developing countries of which six were from Tanzania. Although the list is exhaustive, the cited examples show that empirically the case study approach has proven to work.

iii) Multiple source of evidence

The use of a multiple source of evidence in case study strategy addresses the problem of limitation inherent in various methods of data collection in that, it makes up for the shortcomings that exist within each method (Creswell, 2003). He related such limitations in the various
methods as the course of emergence of "mixed methods" and noted from the original concept of triangulation, additional reasons for mixing different types of data emerged - resulting to one method helping develop or inform the other method. The use of multiple source of evidence by the case study strategy has a further beneficial influence to the research in that it also enhances the construct validity of the research (Yin, 1994).

As can be noted in the discussion above the nature of the research questions has an influential effect on the choice of research strategy. A further concern was, "to what extent has the case study strategy been successfully applied?" The empirical evidence cited, partly serves as an answer to its viability. Finally the versatility of the case study in the sourcing of evidence has also been a positive attribute in its choice. Having discussed the justification for the choice of case study strategy, it henceforth becomes logical in providing an understanding of how the case study was designed.

4.3 The case study design

Yin (1994) had identified five aspects that need to be considered in a case study design: defining the boundaries of a case study, the unit of analysis, the research design, establishing the rationale for single or multiple-case studies and lastly defining the criteria for judging the quality of research design. As the case study boundary has been discussed in the introductory chapter that covered the study's objective, research questions and scope of study, the following section discusses the remaining aspects of the design - the unit of analysis, the rationale for single or multiple-case studies, replication versus sampling logic and the research design.

Unit of analysis

Guided by the main objective and the research questions addressed by the study, that explored: the knowledge transfer process in construction organisations in Tanzania and how these construction organisations facilitate creation and knowledge transfer - the unit of analysis considered appropriate for such cause, were construction organisations. In Tanzania this refers to contractors or contracting firms and professional consulting firms. With the definition of a contractor being - a person(s) who for reward or other valuable consideration undertake the construction, installation or erection for any other person, of any structure situated below, on or above the ground or to other work connected therewith or the execution for any other person of
any alteration work (TCRB, 2004); and for the consultant, a person or firm engaged to give professional advice or service for a fee, but is not an employee of the engaging party.

**Rationale for single or multiple case approach**

A multiple case approach had been adopted by the study generally basing on the distinct advantages and disadvantages that multiple case studies bear against single case studies. Yin (1994) considers the evidence from multiple case studies as more compelling and hence makes the overall case study more robust. Furthermore the nature of the investigation pursued did not have features that justified the use of a single case study - such as the unusual or rare case, the critical case or revelatory case.

**Replication versus sampling logic**

The choice of the units of analysis was based on what Yin (1994) had referred to as the replication logic - an approach he explained as analogous to the logic used in multiple experiments. The replication approach as applied in multiple case studies is illustrated in Fig.4.1. As can be seen from the figure, the initial step involved developing a theory; followed by case selection and the designing of protocol for data collection, and lastly, conducting individual case studies. As stressed by Yin (1994), each individual case study is considered as a "whole" study in which convergent evidence is sought regarding the facts and conclusions for the case. Each case's conclusions are then considered as information needing replication by other individual cases. The individual and multiple-case results hence formed the summary report.

Multiple cases that supported the study's theoretical proposition that Yin referred to as "literal replications" and those that did not support the theoretical proposition that he referred to as "theoretical replication" were selected. For the former the selected cases were construction organisations that were presumed to have:

- A weakness in codifying knowledge
- A working environment and practices that do not facilitate knowledge creation
- Ad hoc and implicit mechanisms of knowledge transfer

Regarding the theoretical replication - selected cases were construction organisations that had indicated the following:

- A strong culture of codifying knowledge
- A working environment and practices that facilitate knowledge creation
• Existence of orderly and explicit mechanisms of knowledge transfer

4.3.1 The Research Design

A research design has been defined as "an action plan for getting from here to there", where here, may be defined as the initial set of question to be answered, and there, is some set of conclusions about the questions (Yin, 1994). Lundequist (1999) considered it as a programme of how to carry out a research project. Acknowledging the key components of research designs for case studies as given by Yin (1994), that they constitute: the study's questions; propositions, and; the criteria for interpreting the findings - this study's research design constituted stages as shown in figure 4.2
Stage I: Literature review

This stage covered key definitions and concepts relevant to the study and related areas such as knowledge management and knowledge creation. The mechanisms of knowledge transfer and various models of the knowledge transfer process were explored and discussed as given in the extant literature (See chapter two). Knowledge creation, knowledge management, organisational learning and learning organisation as variously conceptualised were discussed as inseparable complements to the discussion of knowledge transfer. The knowledge transfer model and its constituent sub-processes adopted by the study were henceforth introduced towards the end of this stage.

Furthermore, the review of the literature incorporated the relating of various concepts as given in the relevant extant literature to construction organisations. This included: the dilemma facing construction organisations pursuing knowledge visions and missions, the exploration of knowledge goals in construction, areas of knowledge that construction organisations need to develop, information and knowledge flows in a construction process and what the study has considered as knowledge assets in construction organisations.

Lastly a profile of the Tanzania construction industry, its performance in terms of macro-economic indicators was discussed. The accomplishment of the literature review for the study was facilitated through examining academic and technical journals, technical reports, textbooks, conference proceedings, and official and government reports.

Outcome of stage I:
The literature review facilitated clarity in the identification of the research questions and propositions; which is acknowledged as a crucial process in the selection of an appropriate unit of analysis (Yin, 1994).
**Stage II: The pilot study**

The pilot study was conducted so as to refine and focus the study’s questions, propositions and develop relevant approaches for data collection. It was conducted in the months of November, December 2001 and January 2002. Two independent studies were carried out covering consulting firms and contracting firms (contractors) in Tanzania.

**Outcome of stage II: pilot study**

The outcome of the pilot study facilitated the choice of cases for the main study through the adoption of a purposeful sampling technique (Lupala, 2002; Layder, 1998; Bless and Higson-Smith, 1995; Patton, 1987). Cases that showed an inclination towards the support for either of the replication logic i.e. the literal and theoretical replication (Yin, 1994) were henceforth chosen. The data from pilot study was also used for objectivity testing, and academic papers were prepared. This stage is identified here as a component of the research design but is further explained in detail on a separate chapter (chapter five).

**Stage III: Objectivity of the investigation**

This stage constituted the presentation through papers of results from the pilot study in international conferences. The aim for this exercise was to test the validity of: the theoretical frame of reference adopted by the study, the research questions and propositions being pursued and the appropriateness of methodology for data collection – specifically, to what extent it facilitated the linking of data to propositions. A total of three papers were written two of which have been published in conference proceedings and one was accepted for presentation in a regional conference in Lund, Sweden but due to logistical problems the paper was not submitted for presentation. The first article was on "Knowledge transfer: sustaining knowledge in construction" which was published in the XXX IAHS World Congress on Housing, Housing Construction - An interdisciplinary Task, which took place in Sept 9 - 13, 2002, Coimbra, Portugal. The second was on "Professional consulting firms as learning organisations in the Tanzania construction industry: a case of a developing country” This paper was presented in the CIB W99 International Conference on Construction Project Management Systems: The Challenge of integration- Sao Paulo - Brazil, March 25 - 28, 2003.
Outcome of stage III: Objectivity of investigation
In the process of carrying out the literature review, the pilot study and the writing of the papers that ensued, a greater understanding of the problem being studied was acquired.

Stage IV: Data collection and analysis
Data collection - A multiple source of evidence was used in which the following data collection methods were used: documentation, archival records, interviews and direct observation. A case study protocol was prepared to ensure the smooth carrying out of this stage. Refer Appendix “A”. The data collection in this stage formed the basis of analysis of the problem being studied.

Data analysis - As indicated in the case study protocol this involved the studying of the individual cases and making a cross-case analysis (refer Fig. 4. 1).

Outcome of stage IV:
Individual case reports were written.

Stage V: Conclusion and recommendations
Cross case conclusions drawn and recommendations were made.

Conclusively, having discussed in detail the research design as a component of the case study design, the subsequent section discusses its final component - the criteria for judging the quality of research design.

4.3.2 Criteria for judging the quality of research design
Reliability and validity - Although validity in qualitative research is not seen as carrying the same connotation as it does in quantitative research, Creswell (2003) acknowledges reliability though in a limited way can be used to check for consistent patterns of theme development among several investigators in a team and generalise some facets of multiple case analysis. According to Yin (1994) the tests for measuring the quality of research designs, include: construct validity, external validity and reliability. Since he also identified relevant stages in the research process where such tests could be carried, the following section explains how the quality of the research design for this investigation was tested.
Construct validity - This involves establishing correct operational measures for the testing of the theoretical concepts. Critiques of the case study approach have always considered this aspect as lacking in such an approach and as a result allege there is a tendency to subjective judgement creeping in during the data collection (Yin, 1994). In this study, the construct validity was made possible by: the use of multiple sources of evidence; the establishment of a chain of evidence by linking the research questions and propositions to the data that was collected; and the conclusion made thereof. The sources of evidence included direct observation, interviews, documentation, archival records and physical artefacts. The triangulation of data source is seen as addressing the potential problems of construct validity as the multiple sources of evidence essentially provide multiple measures of the same phenomena (Yin, 1994). Such an approach apart from acknowledging the comparative strength and weakness of each source of evidence also provided a complementary function for each source.

External validity - This test deals with the problem of knowing whether the study's findings are generalizable beyond the immediate case study. An analytical generalisation has been adopted as against statistical generalisation. In the former, the approach strives to generalise a particular set of results to some broader theory and not like in a survey research where a sample readily generalises to a larger universe (Yin, 1994). The study's theoretical propositions were hence tested through replication logic.

Reliability- Prior to the data collection process the case study protocol was prepared so as to guide the process and also increase the reliability of the investigation (Yin, 1994). Details of the protocol are as in appendix ‘A’ – constituting case study questions and the data to be collected. This ranged from questions, observations to be made, documentary and archival records to be collected. Furthermore, the case study questions in the protocol had two characteristic features that made them distinct from those in a survey interview. The first, being that they where purposely made to guide the investigator in the data collection and second, the fact that they were accompanied by a list of probable sources of evidence. These sources included the identification of individuals to be interviewed, documents to be sought and what is to be observed.

4.4 Choice of cases

The choice of cases for the study constituted two stages. The first stage involved a pilot study done through a survey that participated 68 construction firms. Results of the survey facilitated
purposive sampling in the second stage. Four cases that were believed to have features that will either show literal or theoretical replications were chosen. The composition of the sample for the pilot study is shown in Table 4.1.

Table 4.1: Sample of pilot study

<table>
<thead>
<tr>
<th></th>
<th>Large (Class I- III)</th>
<th>Medium (Class III – IV)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractors</td>
<td>20</td>
<td>29</td>
<td>49</td>
</tr>
<tr>
<td>Consultants</td>
<td>N/a</td>
<td>N/a</td>
<td>19</td>
</tr>
<tr>
<td>Total sample</td>
<td></td>
<td></td>
<td>68</td>
</tr>
</tbody>
</table>

*Numbers of cases* – The number of cases was discretionary chosen based on the analogy made by Yin (1994) of statistical studies in choosing the level of significance. He had considered much as the choice of "p <0.05 or "p<0.01" is not derived from any formula but is a matter of discretionary, judgmental choice, the selection of the number of replications depends upon the certainty the researcher wants to have. The four cases selected were considered adequate for the problem studied - as it was noted, adding more cases would not have an influence on the outcome. Two organisations, Masasi and NEDCO were chosen perceived to have features that would support the proposition. In a similar fashion the number of cases for the theoretical replication were guided by Yin's (1994) contention that it would be dictated by the researcher’s sense of the complexity of the realms of external validity. That is, if it is anticipated that other organisations having similar characteristics were chosen would not give the same results as the ones used in the study, then a higher number of cases is to be sought. Since this was not anticipated, two organisations, Konoike and Inter-Consult were identified as ones that would not support the propositions and hence portray the theoretical replication. The former organisation is a Japanese based international company with a very high reputation in Tanzania, and Inter-Consult is among the prominent consultant firms in the industry. The background of these organisations coupled with their responses to the questionnaires and interviews made in the pilot study, hence formed a key feature in their choice.

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1 Classes as categorized by the Tanzania Contractors Registration Board
4.5 Sources of evidence

The study had used in various magnitudes sources of evidence that Yin (1994) had considered complementary and beneficial to case study approach. These sources are: documentation, archival records, interviews, direct observation, participant observation and physical artefacts. Sources of evidence used in the study are explained in the section that follows.

i) Documentation and archives

These were opted for, for their inherent strength that they can be reviewed repeatedly, are unobtrusive (not created as a result of the case study), are exact and have a tendency to broad coverage in terms of time span and events (Yin, 1994). He considered the most important use of documents is to corroborate and augment evidence from other sources. For the study, the targeted documents and archival information included the following: organisational files, minutes of meetings, written reports, organisational brochures, manuals, references, procedural documents, announcements, notices, photographs and other visual presentations such as charts and diagrams.

ii) Interviews

This is considered as one of the most important sources of evidence in a case study strategy inquiry. Moser and Kalton (1971) acknowledge, the fact that although many situations merit the description "interview", they confine their definition to a situation where one is simply seeking information from an interviewee. The interview can either be formal or informal but they emphasise that in practice, the choice is not between the completely formal and the completely informal approach, but between many possible degrees of informality.

Regarding this study, the fact that a partly participant observation approach was used, I had an opportunity of mingling together with the individuals in an organisation henceforth various forms of interviewing were adopted. This included formal and less formal interviews, structured and open-ended interviews. Interviews of open-ended nature were used in matters of opinion or verification of information given from a structured or a focused interview done within the same organisation. Focused and structured interviews sought mostly factual information, and were conducted, targeting the senior cadres in the organisation.

Questionnaires -The questionnaire was administered focusing on information sought and the responsibility the individual carries in the organisation. (Refer to the case study protocol
appendix “A”). For instance, a question in a structured interview to a technical director in one department was informally and in an ad hoc manner asked to another technical director in the organisation.

Regarding the administration of the questionnaires for the focused and structured interviews, a copy of the questionnaire was issued to the respondent on the commencement of the session to facilitate greater understanding of the question being probed. Recording of responses was whenever possible, done on the spot to avoid problems of re-calling facts. However, interviews of the open-ended nature were not that easy to record on the spot and there was also the fear of loosing on some crucial contextual aspects while the respondent was talking and myself writing. These were hence recorded immediately after. Tactically such open-ended questions were also left for opportunities were individuals were relaxed, as during lunch-hour, approaching an individual who has not gone out for lunch or has returned early.

**iii) Direct Observation**

An observation protocol that featured in the case study protocol aided data collection. Less formal, direct observation was also made through the field attachment in the organisations. Regarding this method of observation the following was intentionally done.

*Walking around and talking* - This involved walking around the office and talking to individuals at various levels. During the conversation, observations were made based on the observation protocol that I had prepared. This included among others, observing the tasks individuals were working with, how they interacted with each other and also observed the general atmosphere of the office as whether conducive to sharing of information and knowledge. Similarly the observation protocol served as a guide for making observations at site level. It included observing the team constituents, the dialogue that ensued between members, it’s frequency and content, and the general site conditions as pertaining to the transfer of knowledge.

*Studying the office environment* – this included studying the offices and facilities that was available. Computers, Internet connection, availability of software packages were observed in relation to the identification of technological enablers. Other facilities observed if available were recreational facilities such as tea-rooms.

*Studying the seating arrangement* – An observation was made in all the case studied regarding the sitting arrangement. Hand drawn sketches were made and later analysed as to how the sitting arrangements facilitated information and knowledge sharing within the organisations.
Studying of documents – an observation was made of the documentation that was available in the organisation. Organisations that had a documentation room, the content of stock, specialisation of document, time of publication and ease of accessing to documents by individuals were observed.

iv) Participant observation

Yin (1994) takes participant observation as a special mode of observation in that one is not merely a passive observer, but assumes a variety of roles within a case study situation or actually participates in the events. He considers this method provides an invaluable opportunity for data collection in that it provides an opportunity for one to gain access to events and processes that would have otherwise not been accessible through other data collection methods such as interviews, or even direct observation. The approach also enables acquisition of information from the "inside view" of the cases studied as against external to it. He further emphasizes the distinct advantage of such an "in-view" perspective as invaluable in producing an "accurate" portrayal of a case study phenomenon.

This study had used amongst other methods, a "partial participant observation" for data collection. This is so, since it was not possible for roles to be assigned to me during the field attachment. It was only on very few occasions at site level that I could participate fully in an activity that was being carried out such as in the "morning parade" and the daily briefing meetings at Konoike site in Arusha and some re-measurement tasks assigned at the Masasi site. Such a limitation however, had a positive side in that, potential biases, were taken care of by not participating fully in the events that were carried. Nevertheless, being in the midst of the workers in the organisations - I felt more like a participant observer as against a direct observer.

4.6 Process modelling approach

A process model has been developed in the course of the study to illustrate an optimal knowledge transfer model that is considered appropriate for construction organisation in Tanzania. The inherent communicating advantages that are offered by a model have been used to facilitate the understanding of the problem being studied. Karhu (2001) in identifying at least seven process-modelling methods common in construction had together with Aguilar-Saven (2004) given the strength and weakness of the various process models and it is from such analysis that the IDEF0
was selected as the most suitable method in communicating the questions that are being explored in this study. This factor is also supported by the fact that the IDEF0 method covers four important aspects of a process: input, control, output and mechanism or resources (ICOM). Refer Fig. 4.3.

4.6.1 IDEFO model
IDEFO originally was called the structured analysis and design technique (SADT) and was developed in the 1960’s as an engineering discipline for the development of complex systems. In the 1990’s it became quite popular in construction process modelling efforts (Lundgren, 2002). IDEF0 is a modelling technique based on combined graphics and text that are presented in an organized and systematic way to gain understanding, support analysis, provide logic for potential changes, specify requirements, or support systems level design and integration activities (NIST, 1993). Simply described as a method that analyzes a subject or system on how it operates and models it to identify the potentials for improvement (Feldman, 1998).

The language's syntax of the IDEF0 includes boxes, arrows, rules, and diagrams. Boxes represent functions, defined as activities, processes or transformations. Arrows represent data or objects related to functions. Rules define how the components are used, and the diagrams provide a format for depicting models both verbally and graphically. The format also provides the basis for model configuration management. Figure 4.3 shows the basic concept of the IDEF0 syntax.

Fig. 4.3: IDEFO graphical language
The IDEF0 is composed of a hierarchical series of diagrams that gradually display increasing levels of detail describing functions and their interfaces within the context of a system. Such detailing is achieved through what is known as a “decomposition” mechanism. The method communicating tools include: diagrams, graphic, text, and glossary. The graphic diagrams define functions and functional relationships via box and arrow syntax. The text and glossary provide additional information in support of graphic diagrams. Based on the strength of the IDEFO (Lundgren, 2002; Karhu, 2001; Feldman, 1998) the study selected the method as a communication tool to better portray the optimal knowledge transfer process for construction organisations in Tanzania.

Production of the knowledge transfer model using IDEF0 method
An optimal knowledge transfer model essentially aiming at bringing in improvements was developed based on the outcome of the case studies analyses. The process hence constituted an identification in the organisations: of shortcomings in the modality of the knowledge transfer process; of knowledge visions and goals if any; of activities that would best facilitate knowledge transfer and the planning of improvements in the observed knowledge transfer process.

4.7 Summary:
The chapter has discussed three approaches to research, namely, the quantitative, qualitative and the mixed method. The case study method as an approach to achieving the study's objective, validating the research propositions and answering research questions has been discussed. Factors identified as attributing to this choice of strategy include: the nature of investigation, the use of empirical evidence and the diverse nature of case study strategy in the sourcing of evidence. Components of the case study and the research design adopted are also explained. Five significant stages formed the research design: an extensive literature review, the conduction of a pilot study, objectivity testing, data collection and analysis and last but not least, the conclusion.

Reliability and validity issues for enhancing the quality of the research have been taken care of by ensuring that the study has an in-built construct validity and external validity. The construct validity facilitated by the use of multiple sources of evidence, while the external validity by an analytical generalisation. The reliability of the data collection process has been
facilitated by the use of a case study protocol. Purposive sampling in the choice of the cases used was made possible by pursuing information rich cases while the number of case studies has been dictated by the need to have an analytical generalisation through a replication as against a sampling logic. The general analytical strategy for the study is hence one that relies on theoretical propositions made at the outset of this study. A pattern-matching logic is subsequently used to facilitate this general analytical strategy.

The basics of a process modelling approach, the IDEF0 have been introduced since the method is used in the modelling of the optimal knowledge transfer process for organisations in Tanzania. Having discussed how the research was carried through, the chapter that follows constitutes the pilot study, which is succeeded by a chapter on data collection and analysis.
5. The pilot study

5.0 Introduction
The pilot study covered construction organisations in Tanzania towards the end of year 2001 and effectively took about three calendar months. The aim was to test the researchability of the research problem and identify an appropriate methodology. This chapter commences by explaining how the pilot study was undertaken by going through the methodology. It discusses the data collection and analysis tool and gives findings there-from. Implications drawn and outcome of the pilot study form the closing sections of the chapter.

5.1 Methodology
An identification of what construction organisations in Tanzania represent had to be made, of which professional consulting firms and contracting firms (builders) were selected. Since the study aimed at investigating how construction organisations in Tanzania create and transfer knowledge, it was considered logical to establish the prevalence of knowledge transfer in construction organisations, prior to the investigation. A survey as a data collection method was chosen based on its characterisation of having the ability to establish a frequency or existence of a phenomenon.

Population and sample
At the time of the pilot study the total population of contractors in the construction industry was 2,047 while for professional consulting firms was, 188 for architects and quantity surveyors, and 414 for engineers (URT, 2002). However for the study, this population was reduced in size in two folds: first, it targeted organisations that were active in the past five years, and those that had on-going projects or just completed projects; this was done so as to obtain data that would reflect the current situation; second, it targeted organisations whose physical address were accessible. It is hence from this population that the sample was drawn. Based on the TCRB classification of contractors, they are classified into classes that reflect the value of work the organisation can bid
for; and contractors in the large and medium category were identified for inclusion in the sample. This covered contractors in classes one to three identified in the large contractors category, and four to seven identified in the medium contractors category. Based on these factors, a purposive and random selection was chosen in selecting the sample for contractors. Figure 5.1 illustrates how the sample was chosen.

For professional consulting firms, the sample was purposively and randomly picked from a list provided by the relevant registration authorities, targeting multi-disciplinary consulting firms and the availability of physical address. The former was done so as to ensure key professionals in the industry that is, architects, engineers, and quantity surveyors are represented in the sample.
Sample size:
The sample size constituted a total of 49 contractors (builders) of which class I – III were 20 in number, and class IV – VII category, were 29. For professional consultant firms, 19 organisations formed part of the sample. Refer Table 4.1 for the sample.

Data collection and analysis:
Data was collected by interviews and questionnaires administered to the organisations. The questionnaires constituted both closed and open-ended questions while the interview was mostly unstructured. To ensure consistency, the data collection started with one group, the contractors and latter followed by the consultants.

The tools for analysis – as mentioned, the pilot study aimed at validating the research problem and identify an appropriate methodology; it hence follows, the research objectives should be the bases of choice for the tool of analysis. Since the research aims at analysing the knowledge transfer process of construction organisations in Tanzania and exploring how these organisations facilitate creation of knowledge, it is imperative to establish what is a knowledge transfer process, that it could be observed and analysed. A model of a knowledge transfer process developed from the literature coverage was hence adopted. This model has five sub-processes constituted of: knowledge acquisition, information distribution, making meaning, organisational memory and retrieval of information. The model features in Figures 2.4 – 2.8 and is discussed in the literature chapter section 2.9.

5.2 Findings: consultant firms

Internal knowledge acquisition
Information was sought as to what extent firms acquire knowledge from internal sources as in: congenital means such as organisation founders, or prevailing technology; critical reflection as in dialogue and questioning assumptions; experiential as through successes and mistakes; experimental as in innovation and research activities, and employees’ awareness of firm's objectives.

The majorities perceive experience as the key source for internal knowledge acquisition. Acquiring knowledge through experimenting as in R & D activity is non-existent. Slightly above a third of the firms report to have innovated strategies to improve performance such as: the
introduction of work on a contractual basis; flexible working hours; development of own cost
data bank; enhancement of the working environment and the introduction of IT. Strategic
recruitment of new members to enhance knowledge acquisition in the organisations is not
common (15.8%), and when practiced, done on a part-time basis. One senior architect in an
interview acknowledged the small innovative changes introduced in the architectural details used
in the office as not found in books or manuals, but most have evolved over time. He stated, “
This is a transfer process through a product!!”

A significant proportion of consultant firms (68.4%) take time for critical reflection; two
executives in separate firms through interview admitted that although critical reflection occurred,
it was not documented or shared with others in the organisation; and only three firms admitted to
some extent to codify discussions and reflections made on performance. A third of the
respondents use the firm’s financial cash flow as the indicator for performance when doing
critical reflection. Only two firms used a deviation of the actual from the planned work; and only
one firm had the clients they maintain as an indicator. With the current downsizing of firms and
the subsequent skeletal structure due to less work in the building construction sector in Tanzania,
firms reported to have less and less formal meetings for reviewing performance and have thus
opted for ad hoc interaction. One director of a firm stated

“… With only two directors (architects) and one draughtsman – interaction is now
spontaneous. We do not have formal meetings any more”

**External knowledge acquisition: consultants**

Information sought from respondents as to the means of external knowledge acquisition included
the following: number of conferences attended in the last five years; links with other
consulting/contracting firms; relations with clients; recruitment of new members as a means of
acquiring knowledge; collaboration arrangements; subscription to construction journals, and
access to technical, economic and social reports.

At least 47% of the firms had on average attended one conference per year. At least 78%
of the firms have inter-firm linkages that facilitate sharing of information mostly through regular
project meetings. However one architectural firm commented that although it has linkages with
other architectural firms, such links are not on sharing construction information. Respondent
stated, lack of trust obstructs such sharing, and if there is any sharing of useful architectural information this is done on individual and not firm basis. He cited for instance, the firm shares information with a UK based firm since they are working in different markets but will not share the same information with a local architectural firm. External sourcing of information from documented material is high. At least 16 out of the 19 firms subscribe to journals both local and international. Incidentally the same number of firms reported links with competitors and perceive clients and customers as a source of knowledge acquisition. The same however, cannot be stated on collaboration as a means of acquiring knowledge. Only two firms had mergers and 12 firms had jobs through joint ventures. Part of the findings is shown in Figures 5.3 and 5.4.

**Fig. 5.3: Internal knowledge acquisition: consultants**

**Fig. 5.4: External knowledge acquisition: consultants**
Information distribution: consulting firms

The enquiry included the mode of transferring information as through memos, reports, or verbal means; number of formal courses attended by employees since joining the firm and the existence of training programmes, on-the-job training; job rotation; the practice of task forces in solving problems; internal publications such as brochures, journals, newsletters, internal seminars, workshops or courses, and informal networks.

![Bar chart showing distribution and sharing of information in consulting firms]

Fig. 5.5: Distribution and sharing of information: consultants

Although training programmes reported by executives to exist in at least 50% of professional consultant firms, employees are not aware of the programmes. However about 68.4% of the firms report to have their employees attend formal courses. The practice of on-the-job training is noted to be high (84.2%), while internal seminars and workshops are non-existent. Job rotation for professional consulting firms is at a very low level (10%); however, firms perceive an individual going through the whole process of a project, as equivalent to job rotation, a term that they refer to as “full cycle exposure”. Also reported, the use of task forces in solving problems is not common; the same applies of informal networks, which is reported by around 21.1% of the firms. The pattern for information distribution for the consultant firms studied is hence illustrated in figure 5.5.

Making meaning: consulting firms

The modality used by respondents and their firms in making meaning of the distributed information was sought. It was queried whether the interpretations were through dialogue,
Information was further sought as to what extent respondents' firms facilitated such modes of interpreting information.

Respondents perceive dialogue and critical reflection, as the dominant modes of making meaning. A significant proportion (63.2%) cited facilitation of dialogue by firms as average while a lesser proportion (31.5%) perceived the effort as high. Critical reflections and process checks reported to be common between consultants, clients and suppliers during the design phase where cost plans are matched against cost targets. Extrapolation from past events is high (75%) and seen more as a natural phenomenon than a conscious effort in interpreting information.

Organisational memory: consulting firms

The perception of respondents as to how the organisation stores information and knowledge acquired was obtained from respondents. A scale of high, medium and low was used to gauge the perceptions. Organisational memory bases or repositories covered included reports and records, firms' policies, routines, culture, structure, recalling the past, and tools. For external repositories, the perception of respondents on existence of such storage in competitors, customers and former members of the organisation were explored.

A majority (78.9%) of the respondents indicated key repositories of their organisations as records and reports. Stating the former to be in specific project files. Individuals as repositories were ranked next, by 63% of the firms. Only a fair majority of professional consultant firms (52.6%) consider organisational memory to be in the structure of the firm, and a lesser proportion in the policy (42.1%) and culture (36.8%). External organisational memory is seen to lie mostly in clients, followed by consultants whom the organisations had worked with.
Retrieval of information

Mode of retrieval of information was explored from the data. It was probed as whether retrieval is controlled as when individuals or a group of individuals purposefully retrieve information or is automatically done such as when it is embedded in the culture, the physical environment of the organisation, the structure or in the individual’s tacit knowledge.

It was noted that controlled and purposeful retrieval of information is the dominant mode in the consultant groups studied; for instance, certain details from drawings used in a previous project would be purposefully sought for use in a proposed project. Respondents however admitted inadequate documentation makes retrieval of information difficult. A director of a firm revealed that a problem may arise in the course of a project and one would know such a problem as to have been previously encountered; but the solution used might not be retrievable, as it was not documented.

Consultants further commented how the volume of work in the construction industry influences the knowledge transfer process from their understanding. They viewed the low volume of work in the construction industry:

- Limits chances of learning through repetition.
- Turns obsolete historical records – as the lapse of time between jobs is magnified.
- Increases consultants’ fear and mistrust as they compete for fewer jobs and sharing of information and knowledge is inhibited.
• Makes formal means of communication less relevant as daily, weekly meetings are replaced by ad hoc and spontaneous communications.

5.3 Findings: contracting firms

Information and knowledge acquisition: contracting firms
Data collected from contractors showed they also acquire information both internally and externally through various activities. These activities were identified and are as presented here.

Internal knowledge acquisition
The responses revealed that at least 75% of the contracting firms, both large and medium have innovative activities. However, noted codification of such innovation is completely absent. All contractors affirmed the existence of developing their own strategy to enhance work. Individuals in 40% of the large contracting firms are knowledgeable of the firm’s objectives and strategic goals, while for the medium contractors it is only 6.8%. Writing down strategic goals is almost non-existent in both the large and medium contractors. It is only one firm in the large contractor’s category that reported the practice, and no firm at all for the medium contractors. Codification of critical reflection of the firm’s performance is at a very low level; only an insignificant number for both the medium contractors (2 out of 29) and the large contractors (1 out of 20) have the practice of codifying reviews made on performance. On the other hand, a high proportion of contracting firms (90%) have informal discussions of problems and successes in their work, and this is done mostly during the break. R & D activity is absent.

Figure 5.7 illustrates part of the data collected for the internal knowledge acquisition.
External knowledge acquisition: contractors

Inter-firm linkages observed as low for contracting firms. Being much lower for the large contractors with only 5% of firms reporting such links and 17.2% for medium contractors. Only about 30% contracting firms recruit individuals to bring in knowledge to the firm and respondents retorted: “One recruits when there is a need, ... a job”. Collaboration arrangements such as joint ventures, mergers, and consortium are at a low level. However one of the interesting aspects of such collaboration is that formal records do not exist for such ventures. This was noted when an interview was made to the officials in TCRB when asked about such ventures, that there are no official records for such ventures known to the board. Respondents subscribe to at least one local construction journal, mostly the journal of the TCRB, which is automatically, subscribed in their annual registration fees.

Information distribution

The practice of on-the-job training noted to differ markedly between the large and medium contractors. With 68.9% of large contractors reporting the practice and only 40% for the medium contractors. One firm acknowledged the benefit of on-the-job training in stating
“Overtime, a carpenter is able to acquire painting skills and hence is engaged in the project over a longer period – otherwise we would have to let him go”.

Firms reported not to generally send individuals to formal courses. However between the two groups, it was noted, medium contractors relatively have more individuals (55.2%) attending formal courses than large contractors (30%). Internal seminars and workshops are non-existent. Job rotation is predominant in large contracting firms (75%), while insignificantly reported in medium firms. The use of task forces in solving problems is practised, being reported by about 44.8% of the firms. Informal networks within firms are also reported to be a predominant feature in the contracting firms surveyed with 90% affirming to its existence.

Part of the data analysis is portrayed in figure 5.8 that shows an information distribution pattern of contractors. Table 5.2 further illustrates the response disparities between the large and medium contractors in responding to the same phenomenon.

![Informal networks as a means of information distribution predominant](image)

**Fig.5.8: Distribution and sharing of information: contractors**

**Making meaning: contractors**

Respondents acknowledged making meaning occurring through dialogue, were the ensuing discussion improvises interpretation for issues. Respondents also identified process checks as opportunities for interpretation.
**Organisational memory: contractors**

50% of contracting firms considered organisational memory to be mostly in reports and records and gave it a high score (Refer figure 5.9). Contracting firms’ perception of organisational repositories as being in the structure, policy and culture of the firms was reported to be insignificant and most respondents did not respond to this question in the questionnaire. However one firm cited an example that reflected the use of individuals as repositories, that, the organisation has a team of carpenters, painters whom they employ permanently whether there is a project or not. It was acknowledged as costly when the organisation does not have projects, but the organisation sees it as the only way to maintain their standards for such tasks. By doing this, the organisation is acknowledging these employees as reservoirs of the standards the organisation has established over time.

![Fig. 5.9: Organisational memory: contractors](image)

**Retrieval of information: contractors**

Respondents through interviews acknowledged how retrieval becomes a difficult task as the record keeping is poor. However reported whenever done, retrieval of information is done by individuals searching through organisational records.
5.4 Implications drawn from the pilot study data set

- One of the key implications is that the organisations studied have portrayed through various activities that a knowledge transfer process exists in construction organisations in Tanzania. Such an outcome is crucial and provides a base for the pursuance of the main study’s research problem of – “how these organisations create and transfer knowledge”

- The second implication from the data is that – the knowledge transfer process is noted to vary between the contracting and professional consultant firms. An implication that makes a comparison between the two of interest and is presented in table 5.1.

<table>
<thead>
<tr>
<th>Firms/ Knowledge transfer processes</th>
<th>Contracting firms</th>
<th>Consultant firms</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I.1 Internal knowledge acquisition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative activities</td>
<td>More</td>
<td>Less</td>
<td>Contracting firms more inclined to acquire knowledge through innovations</td>
</tr>
<tr>
<td>Awareness of firm's objectives</td>
<td>Less</td>
<td>More</td>
<td>Individuals in consultant firms responsible not only for the means but also for the end</td>
</tr>
<tr>
<td>Documenting strategic goals</td>
<td>Non-existent</td>
<td>Low</td>
<td>Collective responsibility and transfer of explicit knowledge hampered in both entities</td>
</tr>
<tr>
<td>Codification of critical reflection</td>
<td>Non-existent</td>
<td>Low</td>
<td>Knowledge remains largely tacit for both due to lack of codification</td>
</tr>
<tr>
<td>Informal discussions</td>
<td>More</td>
<td>Less</td>
<td>A suitable environment for facilitating knowledge creation through informal discussion more prevalent in contracting firms</td>
</tr>
<tr>
<td><strong>I.2 External knowledge acquisition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-firm linkage</td>
<td>Less</td>
<td>More</td>
<td>Limited sharing of information from others by contracting firms</td>
</tr>
<tr>
<td>Recruitment of new members</td>
<td>More</td>
<td>Less</td>
<td>A positive attribute exists for contracting firms by bringing in new knowledge through recruitment</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Non-existent</td>
<td>Low</td>
<td>Opportunities for knowledge transfer through others</td>
</tr>
</tbody>
</table>

Table 5.1: The knowledge transfer process - professional consultant firms vs. contracting firms
<table>
<thead>
<tr>
<th></th>
<th>existent</th>
<th>Less</th>
<th></th>
<th>exist for consultant firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference, seminar attendance</td>
<td>More</td>
<td>Less</td>
<td>Contracting firms more inclined to learn by the interaction in such events</td>
<td></td>
</tr>
<tr>
<td><strong>II. Information sharing and distribution</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training programmes</td>
<td>Non-existent</td>
<td>Non-existent</td>
<td>Knowledge transfer through training not highly favoured by both; ad hoc training that is done may not be compatible with need of firm</td>
<td></td>
</tr>
<tr>
<td>On-the-job training</td>
<td>Less</td>
<td>More</td>
<td>More opportunity in consultant firms to convey tacit knowledge</td>
<td></td>
</tr>
<tr>
<td>Internal workshops, seminars etc.</td>
<td>Non-existent</td>
<td>Non-existent</td>
<td>Opportunities for sharing experiences and learning from others within the firm inhibited in both entities</td>
<td></td>
</tr>
<tr>
<td>Job rotation</td>
<td>More</td>
<td>Less</td>
<td>More opportunities of learning by doing in contracting firms</td>
<td></td>
</tr>
<tr>
<td>Task forces</td>
<td>More</td>
<td>Less</td>
<td>Opportunities for sharing experiences and transfer knowledge within the team inhibited in consulting firms</td>
<td></td>
</tr>
<tr>
<td>Informal networks</td>
<td>More</td>
<td>Less</td>
<td>Opportunities for sharing uncoded, tacit and explicit knowledge enhanced for contracting firms</td>
<td></td>
</tr>
<tr>
<td><strong>III. Make meaning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dialogue, process checks, critical reflection, past events</td>
<td>Exist</td>
<td>Exist</td>
<td>Dialogue, predominant; however, use of tools for rational analysis absent - a shortcoming that may bar learning from previous situations</td>
<td></td>
</tr>
<tr>
<td><strong>IV. Organisational memory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reports, records</td>
<td>Less</td>
<td>More</td>
<td>Uncodified knowledge may be lost for consultants; both uncoded and codified knowledge for contracting firms may be lost</td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>Less</td>
<td>More</td>
<td>Knowledge assimilation higher in consultants as relatively existing in firm’s structure such as in routines, norms, procedures, etc</td>
<td></td>
</tr>
<tr>
<td>Policies</td>
<td>Less</td>
<td>More</td>
<td>Ditto</td>
<td></td>
</tr>
<tr>
<td>Individuals</td>
<td>More</td>
<td>Less</td>
<td>Individuals as repositories pose danger of losing firm's knowledge when moving to other firms</td>
<td></td>
</tr>
</tbody>
</table>
• The third implication drawn is on methodology; that the survey methodology used in the study has been adequate and has served its purpose of identifying the prevalence of a knowledge transfer process in the sample studied.

5.5 Summary:
The chapter has covered the pilot study done in the course of the research. It commenced by giving the objective and methodology undertaken to achieve the stated objective. Findings based on the tool of analysis, that is, the knowledge transfer process model was subsequently given followed by implications drawn from the study. Three implications have been identified: the prevalence of a knowledge transfer process in construction organisations in Tanzania; the existence of differing knowledge transfer patterns between professional consultant firms and contracting firms; and the appropriateness of the survey method for achieving the pilot study’s objective. The outcome from the study henceforth validates pursuance of the research problem and guides on choice of an appropriate research method. That: a knowledge transfer process exists in construction organisations in Tanzania and hence an investigation of how such a process occurs is a valid course.
6. Data collection and analysis of case studies

6.0 Introduction
The chapter gives an exposition of data collected from four construction organisations in the Tanzania construction industry. Sub-processes in the knowledge transfer model adopted by the study formed the basis for the data collection process. These sub-processes are: knowledge and information acquisition, information distribution, making meaning, organisational memory and retrieval of information and knowledge. The sub-processes together with their respective activities are explained and illustrated in the literature chapter. (Refer figs. 2.4, 2.5, 2.6, 2.7 and 2.8). A triangulation method of data collection was used for each case, constituting structured and unstructured interviews, documentation, archival information, and direct observation. (Refer case study protocol Appendix “A”).

Research question 1
“How do construction organisations in Tanzania transfer knowledge” How do they

- Acquire
- Distribute
- Make meaning
- Organise to memory (store) and
- Retrieve - information and knowledge

6.1 The case studies
Four construction organisations from the industry were studied; two multi-disciplinary consultant firms, and two contracting firms. These were i) Inter-Consult limited company; ii) Konoike construction company; iii) Masasi construction co and iv) NEDCO.
6.1.1 Inter-Consult Company Ltd.

Data collection – data was collected from Inter-Consult through formal and informal interviews, documentation, archives, questionnaire administration and direct observation. Formal and structured interviews using a questionnaire were done to three directors, and six employees of whom three are of middle management level. The aim was to obtain information that crosscuts the entire organisation. Informal interviews were conducted in a random manner and these covered the managing director and about 75% of all the professionals. In essence, an informal inquiry for the majority of employees was done guided by the study’s case study protocol. (Refer Appendix “A”)

Background – Inter-Consult limited is a multi-disciplinary consulting firm registered in Tanzania from 1978 and wholly owned and managed by Tanzania nationals. The firm is organized into five functional departments that provide services in the following fields: i) Architecture and Town Planning; ii) Structural and Bridge Engineering; iii) Quantity Surveying iv) Civil Engineering and Project Management and v) Electrical and Mechanical Engineering. Services provided through the various departments range from pre-feasibility/ economic studies, detailed engineering design, to construction supervision. Inter-Consult is currently one of the leading local consultants in Tanzania with 27 years of proven experience. The company operates countrywide on locally and externally financed projects. The company is also an active member of the Association of consulting Engineers in Tanzania - ACET, which is affiliated to the International Federation of Consulting Engineers (FIDIC), with two of Inter-Consult’s directors being on the ACET council. Inter-consult has also one of its employees on the Engineers Registration Board of Tanzania (ERB).

The organisation since its inception has done over 400 projects. These range in value from a few millions, to billions of Tanzanian shillings. In undertaking some of the consultancy projects the firm has worked jointly with a number of international consultant firms.

Resources and facilities

Staff - The permanent staff component was reported to stand at 43, of which 27 are professionals of various engineering and related disciplines. The professional staff constituting the following specialists: architects, planners, structural, bridge, road, civil, electrical, mechanical and geotechnical engineers; quantity and land surveyors; hydrologists and the administration staff. In
addition to this core professional staff, the company has a team of qualified technicians and draughts men.

Computer technology - the company makes use of the latest computer aided design facilities on all its projects. This includes a variety of computer software packages such as for: electrical load analysis, interior and exterior lighting levels analysis; and drafting packages such as: AutoCAD, R14 & R2000, R 2002, ArchCAD 7.0, TurboCAD and Caddie; contract management packages, latest spreadsheet software, word-processing, and desktop publishing packages.

Documentation room - the office has a modestly stocked documentation room accessible to all employees. This room is stocked with various manuals, to name a few, they include: Clerk of works manual as published by the JCT, (UK); Pavement and material design manual - published by the Ministry of works in Tanzania (1999); Draft road manual (1989) - published by the Ministry of Works in Tanzania; Operational manuals for various software programs, Laboratory testing manuals (2000); Code of practice for scale of provision, selection and installation of sanitary appliances - British Standards, textbooks on engineering, technical reports, practice manuals and general reference books for the engineering profession.

In-training programs - the company on an annual basis provides industrial training for students from the University of Dar es Salaam, Dar es Salaam Institute of Technology and University College of Lands and Architectural Studies (UCLAS). The company also provides for its graduate engineers a structured engineers apprentice program (SEAP).

Knowledge acquisition in organisations - the theoretical model perception
Activities in the knowledge and information acquisition model as given in figure 2.4 formed the basis of data collection. The model illustrates ways by which organisations could acquire information and knowledge. Basically two main modes are given: an external and internal. External acquisition as through conferences, consultants, printed material, reports, customers, competitors, new members, acquisition, mergers, joint ventures and consortium; internal acquisition as through founder members, prevailing technology, dialogue, questioning assumptions, successes, mistakes, and R & D projects. Based on these parameters, the section that follows reports on the data collected for Inter-Consult knowledge acquisition process.
Acquisition of knowledge in Inter-Consult Co Ltd.
Inter-Consult company acquires information and knowledge both externally and internally.

External information and knowledge acquisition

i) External: conferences
Through interviews and observation, acquisition of knowledge through conferences was noted to be common. Respondents commented that the organisation was highly upfront in this aspect and willingly supported them in the issuance of time-off and finance. On average, employees reported to at least attend between one and four conferences in a year. The employees view attendance of conferences as a means of acquiring knowledge. This is an attitude that was noted to exist from the top to lower levels of the organisation. Recalling an incident that had occurred in my first week at Inter-Consult - whereby an employee returned to the office after attending a conference for only one hour; on being asked on his early return, he informed me that on studying the morning program he noted there was nothing much that he could learn in terms of knowledge. He stated however, he would attend the afternoon session as he could see there could be some gains on his part. This example shows that the attendance of conferences at least by this employee is not taken as an opportunity to get away from the office, but rather, one to acquire information and knowledge.

Another incident indicating individual employees acquiring knowledge through conferences was noted, when, between them they would ask for the literature from those who had attended a conference. Junior members were especially noted asking questions those that had attended a conference.

ii) External: consultants, suppliers, and clients
Inter-Consult as a consulting organisation, interacts a lot with various consultants in the carrying out of projects. Through both formal and informal interviews, respondents admitted to acquire information and knowledge through such interaction. This form of knowledge acquisition was stated to occur continuously in the carrying out of projects such as through site meetings, formal and informal discussions on progress reporting and correspondences. One of the technical directors in the organisation mentioned interaction with international companies enables them keep in touch with current specifications. Suppliers were reported as sources of acquiring information and knowledge on new building materials and specifications. A respondent cited
incidences where one would make enquiries with intent of purchase to a supplier on the specification of a particular material, and only to be informed of an alternative that was better.

Clients in construction projects were also identified as another source of information and knowledge acquisition. However, respondents stressed the extent of acquiring knowledge from clients very much depended on the nature of client; that, employment to a client who is knowledgeable and having good organisational skills, chances are high for gaining knowledge. This, it was elaborated as made possible by the fact that some clients have specialists or experts within. Such clients it was learnt are very forward and clear in setting the standards of what is to be delivered and hence by doing so, knowledge is acquired by the organisation through the respective individuals involved in the project. For instance a project with the Tanzania Harbours Authority was cited as one where specialists on marine works give specific requirements, and from such interactions information and knowledge is gained. Tanzania Roads Agency (TANROADS) and the Bank of Tanzania as clients were also cited as types of clients that impart knowledge to the organisation. The latter, as a client in a construction project was cited as one even going to the extent of advising the consultant where learning examples exist.

iii) External: technical reports and publications
Printed material as an external source of acquiring information in Inter-Consult exists in the form of manuals, subscribed journals, daily bulletins, magazines and newsletters. Printed material that give in-depth understanding of subject matters such as practice manuals or operational manuals for software, textbooks were noted stocked in the organisation’s documentary room. Daily bulletins and latest issues of prescribed construction journals and newsletters are kept at the entry hall next to the reception where employees could easily access. Noted the organisation subscribes to both international and domestic construction journals. Specific reference materials noted stocked in the respective departments, kept in individual's shelves for ease of reference and for safekeeping. Employees also acknowledged acquiring information through technical reports and searching the Internet.

iv) External: new members, mergers and acquisitions
Interviews indicated Inter-Consult occasionally recruits new members to acquire specialist knowledge. For instance informed of recent the organisation had recruited a junior graduate telecommunication engineer and a ‘business engineer’ so as to bring in this specialization. The business engineer, it was learnt, was an engineer who had acquired marketing knowledge. In
addition, the organisation employs on a part-time basis a senior transport economist consultant and a senior telecommunication engineer who comes in for some hours a number of days every week. Noted, although Inter-Consult has a permanently employed telecommunication engineer, a part-time senior telecommunication engineer is employed to bring in his experience and for the junior staff to learn from him. It was also acknowledged that the organisation recruits employees based on the workload. Learnt that there has been no acquisition or mergers by Inter-Consult Company.

v) External: joint ventures and consortia

The company has worked in various joint venture schemes in a number of projects. Refer, table 6.1.1. It was further learnt from the managing director, that, in order to enhance its capacity towards such ventures, the organisation intends in the near future to have an ISO certification.

<table>
<thead>
<tr>
<th>Project</th>
<th>Joint venture counterpart</th>
<th>Specialization</th>
<th>Scope of venture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban sector engineering project - Phase 2 (1994 - 1995)</td>
<td>COWI *</td>
<td>Feasibility studies</td>
<td>Preparation of a 5-year infrastructure rehabilitation programme including design and preparation of tender documents for the selected priority projects covering roads, water resources etc.</td>
</tr>
<tr>
<td>Flood prevention for Tanzania railway corporation (TRC)</td>
<td>Mott MacDonald* (United Kingdom)</td>
<td>Railways</td>
<td>Detailed design and construction, supervision of river draining, drainage structures and protection works for the TRC in Kilosa along the Mkondoa River</td>
</tr>
<tr>
<td>River basin management and smallholder irrigation improvement project</td>
<td>Norplan *</td>
<td>Water supply</td>
<td>Preparation of documents covering the use and development of existing resources for efficient utilization and development of alternative strategies towards strengthening river basin management (1995 - 1996)</td>
</tr>
<tr>
<td>Urban sector engineering project - Phase I</td>
<td>COWI consult</td>
<td>Water supply</td>
<td>Diagnostic study and 1 year rehabilitation programme for infrastructure in the 9 municipalities of Tanzania covering roads, water supply, drainage, solid waste and re-design of existing Master plans (1991)</td>
</tr>
<tr>
<td>Project support units</td>
<td>COWI consult</td>
<td>Road projects</td>
<td>Provision of technical support to Municipal engineers at Arusha, Tabora and Mwanza that included supervision of rehabilitation of bituminous roads (1998 - 2001)</td>
</tr>
</tbody>
</table>
i) Internal: founder members, prevailing technology

Through formal and informal interviews of individuals in Inter-Consult, it was gathered that the organisation among other internal sources, acquires knowledge from its founder members. Informed, the most senior founder member is now the board chairman and mainly plays an advisory as against an active day-to-day role. The managing director, being among the founder members offers his long experience amidst the various individuals in the organization. Learnt that, the founder members prior to the establishment of Inter-Consult had been working together in a government owned railway transport company, the Tanzania Railway Corporation.

The organisation also acquires knowledge through the technology that exists in the organisation. That is, it builds up on the existing knowledge and enhances its core competence. Core competence taken as a form of economy of scope that enables a firm to carry some types of activities well (Milgrom and Roberts, 1992). It was revealed through interviews that the core competence of Inter-Consult is attributed to: the history of the firm that has built up over time; experience held by founder members and long-term employees; and the human and capital resource. Respondents further perceive the available infrastructure support as significant towards their performance. Such support includes: ease of access to information through the use of IT, a variety of computer software packages and a low turnover rate of the human resource. The ease of access to the World Wide Web also reported to be an asset towards enhancing knowledge, in that employees easily access to new specifications and standards. A respondent mentioned among other factors that enhance the core competence of Inter-Consult, is the vision held by the founder members and their good governance. Cited as an example, the existing system of ownership transfer that gives one at senior level an opportunity for share acquisition highly motivates individual performance.

ii) Internal: dialogue and critical reflections

Dialogue, and questioning assumptions according to the study's modal are among the factors facilitating critical reflection. Observed that critical reflection at organisational and individual levels occurs both formally and informally:
Informal, critical reflection - this is done in the process of carrying out tasks. On occasion, individuals would reflect on their successes and failures. For instance when a tender is won - may sit down to reflect what strategy made the firm win, or at times loose. However, such information is never documented. At individual level, reported that critical reflection is aided by the fact that when individuals are given responsibility on a project, generally adopt a close monitoring strategy. For instance informed if there is an on-going project within the city's vicinity an engineer in charge of a project would visit a site in the morning and evening after office hours on a daily basis. Such monitoring would aid the reflection of what has gone wrong and why or what has gone smoothly and the factors that contributed to this. One architect reported to have his own self-reflection form. He elaborated such a form enables him to reflect on the sources of ‘re-design problems’ and the solutions adopted; in consequence the form acts as a self-evaluation form but only known to him and for his own use.

Formal critical reflection - is done through various scheduled meetings. Each department is expected to hold a weekly meeting; however learnt that contextually such meetings focus mostly on progress monitoring. Furthermore, at times, due to pressure of time, the formal meeting may not be held as scheduled. In some occasions a team working on a project may meet in the morning and evening to monitor progress of work, and in doing so, question assumptions, shortcomings and acknowledge reasons for successes achieved.

iii) Internal: successes and mistakes
Dixon (1992) considers that the view that organisations can learn from their experience as highly compelling. She categorizes such learning experience into mistakes and successes. With regard to Inter-Consult, the following was observed:

Mistakes – Informed overall, the organisation learns from its mistakes. However in emphasis, one director stated that this very much depended on the nature of the mistake. Technical oriented mistakes such as design faults, or errors may be dealt with at personal or departmental levels and the individuals concerned would have learned from such experiences. Furthermore such type of mistakes may not require documentation and some not even verbal communication other than the stroke of a pen. It was however emphasized that, there are types of mistakes that may be discussed at organisational level and such would definitely create an impact to the whole organisation and this would hence be a lesson learned. Quoting one departmental director regarding mistakes he stated: " Some mistakes are so visible that they would never be
repeated!" For instance sighted an example of complications that had occurred in the carrying out of a project that were brought about by a poor design. This, it was stated would be an example that the firm would have to live with and this would be quite a lesson.

Successes - With success it was learnt, the company does not deal much with this although in some instance a few incentives may be awarded to individuals as acknowledging successes. Overall, the respondents’ view was that it was more common for the organisation to consider "what went wrong" rather than "what made us succeed"

iv) Internal: R & D. and innovation
The pilot study done in the year 2001 had established that R & D activities are absent in construction organisations in Tanzania. The situation was found to still hold true for Inter-Consult. Respondents reported a number of constraints barring R & D activity. A major one being, the absence of R & D culture in the whole country and a limited financial capacity.

However, respondents acknowledged, although the organisation does not have adequate resource to conduct research and development activities, the organisation over time, has developed its own small adaptive positive changes. These featured in the way improvements have been made in various work processes. For instance the structural and bridge engineering department, and the mechanical and electrical engineering department, it was learnt, have developed their own way of conducting process checks that are set against stages of work and not against time. One assistant quantity surveyor in the quantity-surveying department reported to have established his own way of documenting the tendering documents so as to enhance and expedite this task. It was also learnt in the department of structural engineering, that, the department has established its own set of procedures on performing certain processes or tasks. However, noted although known to all in the department, such procedures are not documented anywhere.
From the data collected and the discussion, the knowledge acquisition process of Inter-Consult is as shown in Fig 6.1.1. As can be noted from the figure, new activities like

1. **Borrowing**
   - Consultants, Clients
   - Conferences
   - Internet
   - Technical Reports, Tours

2. **Searching**
   - New members/specialists,
   - Joint ventures,
   - Founders,
   - Long term employees

3. **Grafting**
   - Collaborating
   - Internal
   - Experiential
   - Mistakes
   - Experiments
   - Adaptive changes

4. **Collecting**
   - External
   - Internet
   - Technical Reports, Tours

**Fig. 6.1.1: Knowledge acquisition process - Inter-Consult**

travel tours emerge and for experimenting, adaptive changes are reported in lieu of R & D activities.

**Information distribution**

This is a process by which an organisation shares information among its units and members; taken to occur explicitly as in written communications, training or implicitly as in job rotation, task forces or informal networks.

**Communication** - Observed that in Inter-Consult, information is communicated in a variety of ways. This ranges from memos, letters, and verbal communication to electronic
networking. One respondent emphasized that the circulation of information was a very dominant culture in the organisation.

**In-training courses, on-the-job training and job rotation** - Inter-Consult has in-training courses for its graduate engineers. The training is structured and the organisation has produced a manual for this program titled "Professional training guidelines for graduate engineers" dated April 2002. The program is based on the Structured engineering apprenticeship program (SEAP) as given by the Engineers Registration Board (ERB), that requires candidates to have a 12-month field training and two years of professional exposure. Informed at the time of my fieldwork, Inter-Consult had two graduate employees sent for one year to Konoike Construction Company, an international construction company registered in Japan with a branch office in Tanzania. Also noted that the preparation of this graduate engineers' manual had involved three seniors from Inter-Consult; two technical directors and one senior engineer all coming from three separate departments: the mechanical and electrical engineering, the civil engineering and project management department, and structural and bridge engineering department. A majority of the respondents interviewed, viewed such ‘in-training programs’ as an equivalent to "on-the-job training". Also informed for fresh graduate-employees, the firm also facilitates training by giving them as much field exposure as possible.

However, it was noted in some departments, ‘on-the-job training’ is absent. For instance, graduates in the department of architecture and town planning and quantity surveying have no such tailored ‘in-training programs’ other than the regulatory obligation that they have to undergo a registration process through their statutory regulatory body, the Architect and Quantity Surveying Registration Board (AQRB) - that creates an apprentice kind of field training since one has to work under the supervision of a registered professional. From such a requirement, Inter-Consult offers these graduates a field-training environment. Unlike for the engineers in the organisation, there are no manuals specifically prepared for architects and quantity surveyors. ‘In-training’ courses are introduced to individuals with special requirements. Cited sometimes an in-training course would be made to a certain individual(s) so as to make her or him conversant to a special computer software programme. In some instances acquisition of knowledge to enhance performance in a particular specialisation may necessitate in-house training. The technical director of Mechelec department cited an example of an in-house workshop that was organized in sound and light testing as one of the examples.
Training from outside - Learnt, there are no clear procedures on how information gained by an individual could be shared by other employees after one had received training from outside, such as from a short course. Nevertheless, respondents stated, at individual level through interaction such knowledge may be shared.

Job rotation - is noted to mainly focus on fresh graduates, those who are obliged by regulation to undergo the SEAP program. However a technical director in the structural and bridge engineering department reported an implied job rotation in his department. He stated that he always makes sure that individuals are conversant to all processes in various tasks.

Work environment - Observed that the work environment is conducive to information sharing. This was noted attributed by the friendly environment that exists among individuals in the organisation and in the departments. It was only in one department where a less relaxed atmosphere was noted.

Sitting arrangement - Observed the sitting arrangement of individuals in some of the departments not conducive to information sharing and distribution. For instance noted one electrical engineer had to walk from one wing of the floor to another for consultation. This distance covered a long corridor of about 20 metres or more. Observed, when there was a submission to be made there was a lot of to and fro movement by the team working on the submission between the two wings. In addition to the disturbance created by the continuous shuttle, such an environment creates a prohibition to information sharing and distribution. One incident of a newly recruited architect in the company reflected how the sitting arrangement influences information sharing and distribution. When a new architect was allocated a working place where there were only an electrical, a transport and a communication engineer, the first thing the electrical engineer commented was - "It is good that they have brought you in this office- we are now going to be conversant with the ArchCAD!"

Team spirit - exists in the undertaking of tasks and this was noted through: individuals voluntarily coming in during weekends to catch up on work, discussions in teams, and consultations done between individuals. One incident galvanized my observation of the team spirit and the creation of belongingness imparted to employees when the managing director walked in casually to a junior member, a fresh graduate with a sketch, pulled a chair and sat next to him to discuss a submitted work.
Organization norms, culture, rules and procedures - One of the key norms of Inter-Consult is that "an assigned task has to be finished on time no matter what!" This, it was learnt, although not written anywhere was known by all employees in the organisation. A respondent further added that some norms were only specific to departments. This featured in the strictness of the standard of performance demanded such as in the standard and style of presentation expected, and the level of detailing of drawings. The technical director in the Mechelec department admitted although no manual or written document existed on how the presentation of technical drawings in his department should be, members were aware of the department's expectation. Individuals also reported to have their own working norms.

Information technology - noted and informed the use of electronic networking in the organisation as facilitating information distribution whereby project information is accessed by all through the networked computers. However, presently the networking exists only in the senior cadre but informed due to problems of queuing, plans are underway to network all the computers.

Informal discussions and networks – from the study’s model, this includes informal discussions during tea or coffee breaks or those around the water cooler or after-office hours. In Inter-Consult it was observed there is no common room where such informal discussions could take place. Also observed individuals go to different eating-places for lunch and some just stay in. A majority is noted to use the lunch hour for small personal errands. Fig. 6.1.2 shows the mode of information distribution in Inter-Consult.
Making meaning
Organisations on receiving information are obliged to give meaning to the information. Based on the study's model this occurs through dialogue, process checks, critical reflection, taking action, unlearning, reflection of past events and the use of decision support tools. These aspects were hence used in the investigation of how Inter-Consult makes meaning of information received at the organisational and individual level.

Dialogue and process checks - Observed there was a lot of spontaneous dialogue between teams working on the same task, hence creating grounds for collective interpretations. Also noted the checks done by a co-employee or superior facilitated interpretation. Recalling on an incident where a drawing was being checked by a superior, the exclamation "Oooh! So this is what you meant!" was heard a number of times.

Unlearning - Probst et al. (2000) had described "unlearning" as being ready to question one's own routines and let go of the familiar" while Dixon (1992) described it as the intentional process through which the organisation discards obsolete or misleading information. The advent
of computer it was reported has compelled the organisation to unlearn. It was cited with the introduction of computer aided design, the organisation in 1999 made a standing policy that the design offices should do away with drawing boards and every employee should be conversant with the use of computers and all engineers with the AutoCAD program. Informed there was hesitance in senior employees but once the electronic media was dominantly used in communication, those who were reluctant to learn eventually were forced by circumstances to do so. Within two years from the introduction of this policy, all employees were conversant with computers and all engineers conversant with the AutoCAD and some with CADD (Computer aided design and drafting) and a few architects with the ArchCAD.

Another example cited showing Inter-Consult unlearns, is the keeping of records. The organisation observing the massive information that they have to handle, store and retrieve, introduced magnetic tapes such as CD's, floppy diskettes and now the flash memory. Informed all drawings are backed up in such devices, a factor that has highly enhanced accessibility to stored information. Another example cited by the technical director Mechelec showing the organisation learns, is in the fire protection system. The respondent stated,

"Whenever a new and a better version of a fire protective mechanism is known, immediately the old version would be dropped and never specified and the new would be adopted".

Collective interpretation - In testing whether there is collective interpretation in Inter-Consult, the pre-requisites indicated below were sought if they exist:

i) Distribution of knowledge - Respondents through verbal interviews acknowledged that knowledge is widely distributed among employees; nevertheless they reported individuals hold different specialities and experience.

ii) Freedom to speak - noted that there is freedom to speak among members and one's ideas is not judged by his or her position but on the relevance of the contribution.

iii) Organisation's size - compared to a majority of consulting firms in Tanzania, Inter-Consult with a manpower of 43 permanent employees and five functional departments is a relatively big organisation, a fact supported by the study’s pilot study of year 2001. Collective interpretation at organisational level hence observed
limited by the organisation size, but possible at departmental level. Respondents cited departmental meetings as an example of forums where collective interpretation could occur. However, those interviewed mentioned the team working on a task as the most effective mode of collective interpretation.

iv) **Physical arrangement** - observed the current physical arrangement does not facilitate collective interpretation for departments and individuals. As mentioned previously, members of the same department are noted seated in rooms apart with some individuals having to walk 15 - 20 meters for consulting co-employees in the same department. Also noted there is no common room where employees could have relaxed informal discussions, that could induce interpretation of information or making meaning.

**Critical reflection, rational analysis and past events** - respondents reported critical reflection as a means of making interpretation, only done at personal level. One respondent stated in the process of reflecting past events, one makes meaning of new information. However, learnt that an individual never documents such reflections although it was admitted that an individual in reflection would consider: a previous task and reflect what facilitated the successful completion of the task; the problems encountered; and how the solution was achieved. A similar scenario is reported in making meaning through rational analysis, which is done mostly at personal level and rarely documented.

**Decision support tools** – There are no decision support tools to aid interpretation of information in Inter-Consult.

The making meaning of Inter-Consult is shown in Fig. 6.1.3. As can be noted, Inter-Consult has most of the features as appearing in the analysis model except for unlearning. Unlearning although mentioned, did not feature strongly since respondents prefer to understand it as ‘updating’ and most of the responses inclined to this definition. Furthermore, in demonstrating how the organisation makes meaning, the process has been further categorized into the explicit and implicit mode. This is because it was observed that in the process of making meaning, some of the activities were explicitly and some implicitly done with the latter mostly at personal level. It was considered imperative to show the situation as it occurred.
Organisational memory: Explicit storage of organisational memory
This is the repository of organisational knowledge. Literature has it that knowledge can also be stored explicitly and implicitly. Explicitly as in records, reports, policies, or core competence. Implicitly or tacitly as in culture, structure, ecology or theories of action as explained in the literature chapter (refer Fig. 2.7). Organisational knowledge can also be stored outside the organisation, basically in the external environment. This may occur through: competitors, allies, former members, or government reports.

Reports, documents, and drawings - Respondents revealed that the organisation stores what it has learnt in the course of conducting its business in the organisational reports and records of which some form the organisation’s databases. For instance informed each department has its own databases.

Organisational memory: Implicit storage of organisational memory
Discussions with employees revealed that knowledge in the organisation is also stored implicitly through working norms, rules and organisation culture. Standards put forward by the Mechelec department regarding the presentation of working drawings were cited as an example of knowledge stored implicitly. The technical director in this department informed that such
standards have been developed over time based on the departmental experience. Respondents considered the firmness on quality and adherence to submission dates as among the working norms that originated from what has happened in the past. Fig. 6.1.4 portrays the organisation memory of Inter-Consult as established from the collected data.

A significant aspect in the organisation memory of Inter-Consult is the absence of recognition of an external organisation memory. However, this does not mean that such external memory does not exist; a possible explanation is that the organisation does not identify itself to possess such a memory. Also noted respondents do not perceive culture, structure and the organisation’s physical environment as repositories of the organisation memory.

**Retrieval of information**
The re-use of certain engineering and architectural designs, details and specifications were cited as examples that, lessons learned previously are retrieved and made use of by Inter-Consult. The re-used examples stated to be those that had performed well. When asked when seeking information, where would an employee go for the information, only one respondent identified co-employees as a possible source of information. Others identified the more visible and explicit
sources such as the library, records and drawings. Also noted not every respondent re-called or identified a learning experience in a project. Some respondents admitted not to have specific lessons learned in previous projects, while others cited examples of lessons learned as shown in Box 4. The significance of the accuracy of a feasibility report was cited by one respondent as among the lessons learned by Inter-Consult in the carrying out of infrastructure projects. Other lessons cited included: adequacy of field investigation prior to assignment of players to a project, and early stakeholders participation in a project. A technical director in the civil engineering department cited an example of a bad experience in an infrastructure project. This was an urban sector engineering project that comprised a one-year rehabilitation program for infrastructure in nine municipalities of Tanzania, covering roads, water supply, drainage, solid waste management and re-design of existing master plans. This project was done with COWI consult, an international consulting engineering company established in Tanzania. In the course of rehabilitation, it was discovered that the existing drainage system was not functional completely; hence the work was not of rehabilitation but rather of having a completely new drain system. Such an experience was encountered in three of the nine municipalities and led to complications in the undertaking of the projects in these municipalities. Regarding how such an encounter is regarded as a learning experience, the respondent replied that the problem encountered has now become common knowledge to the organisation.

Box 4: Lessons learned examples - Inter-Consult

- Prequalification not an adequate screen for verifying a contractor's competence - not a watertight screening device.
- A proper and accurate feasibility study is an indispensable tool in the successful operation of an infrastructure project.
- Squatter problems along road reserves - have spill over effects such as instigating political debates and may delay a project.
- Utility service projects - water, power and telecommunications in urban areas are always problematic in the implementation stage.
The retrieval mode on organisation memory of Inter-Consult appears in Figure 6.1.5

As for making meaning, implicit retrieval of information could neither be verbally acknowledged by respondents nor observed during the field attachment. One presumption is that such mode of retrieval is tacitly held and could not be articulated. A possible implications for such a situation could be as cautioned in Dixon (1992); that, when such retrieval is left to individual’s tacit memory it could lead to errors of which the organisation could be unaware. The other implication is that, lessons learned are not deeply embedded in the organisation repositories such as culture, physical environment and structure and hence organisations may fall victims of repeating mistakes previously done or re-inventing the wheel.

End of case study 1
6.1.2. National Estate and Designing Corporation – (NEDCO)

Background - National Estates and Designing Corporation (NEDCO) was incorporated in 1968 as a limited liability company under the companies’ ordinance cap. 212 known at that time as National Properties Development and Management Company limited (NPDMC), being a subsidiary company of the then National Development Corporation (NDC). In 1968 it was removed from NDC and made a subsidiary company of National Housing Corporation where it remained until 1971 when it became an independent parastatal organisation under the Ministry of works and its name changed to National Estate and Designing Corporation limited. In 1983, NEDCO became a corporation by a presidential order made under the public corporation act of 1969 (Government notice nr. 41 published on the 25th of March 1983). On the 30th of June 1997 a privatization memorandum of understanding was signed between the NEDCO employees and the Parastal Sector Reform Commission (PSRC) for the employees to purchase the organisation following a Management and Employees Buy – Out (MEBO) system. The organisation is of the view that the new step of privatizing the organisation guarantees its clients a further improvement in its consultant activities.

The company offers a range of consultant services. This includes: feasibility studies, building design, civil works design, construction supervision, quantity surveying and land surveying services. A director general who is in charge of four directorates heads the organisation. These directorates are, the finance and administration, architecture, quantity surveying and engineering.

Resources and facilities

i) Staff – The staff component stands at 14 of which two are in the finance and administrative department. The remaining 12 constitute consultant architects, engineers, and one quantity surveyor. In essence there are two registered architects, two with advanced diplomas in architecture, one registered quantity surveyor and five registered engineers with university degrees and two civil engineering technicians.

ii) Computer technology – recently the company has acquired an AutoCAD software package for design work in architecture and engineering.
iii) Documentation room – the company does not have a common documentation room and documents are held in stock in heads of department’s offices. The bulk of such documents constitute project records.

iv) In-training programs – the company when having on-going projects, on request, provides industrial training for student from the University of Dar es Salaam, University College of Lands and Architectural Studies and the Dar es Salaam Institute of Technology.

Data collection
Data was collected through observation, interviews and from documents and archival information. Formal and structured interviews using a questionnaire were done to the respondents interviewed. Six interviews were made to professional consultants in the firm. The respondents’ selection was purposively made targeting professionals at both supervisory and non-supervisory positions. Hence all heads of departments were interviewed. This included the director general who heads the organisation, heads of architecture, engineering and quantity surveying departments. An architect with 17 years in the organisation and an engineer with a 26-year experience were taken to represent those not holding supervisory positions. The consideration of supervisory and non-supervisory position and the fact that respondents representation covered all departments, reduced the risk of results being biased in terms of length of time in the organisation, position held by an individual and professional specialization. An attachment to NEDCO was not possible which limited opportunities for informal interviews. However, the data collection process involved five working days of which a minimum of three hours was spent each day to enable a multi-data collection approach, especially the observation method; and informal interviews were done to two employees, an architect and an engineer, in a random manner.

As with the other cases, the case study protocol (Appendix “A”) formed the basis of the data collection whose findings are given below.

External knowledge and information acquisition
i) External: conferences
Learnt that NEDCO highly supports employees attend conferences, seminars and workshops. Respondents acknowledged attending a minimum of four conferences in a year. The relevance of a conference or workshop to an individual normally forms the criterion for awarding support.
However, mechanisms on sharing the information or knowledge acquired by the individual are left to informal discussions among individuals. It was mentioned as typical for one attending to bring in extra copies of literature and give to a colleague at work or at times inform a colleague if he is interested to make copies of the literature that has been obtained from the conference or workshop. However, informed previously prior to the streamlining of the organisation, it was typical for the organisation to organize a formal seminar for the individual to disseminate what was offered in a conference or workshop.

ii) External: consultants, suppliers and clients

Respondents acknowledged to also acquiring knowledge from the interaction of contractors and consultants. The head of the architectural department acknowledged acquiring knowledge from the contractors on constructability during site visits. Acknowledged to have improved a particular detail, which he constantly now uses based on such feedback information. Observed that he also keeps a self-made catalogue of sketches of various details. Such details it was learnt were acquired through his working experience. Further, it was also known that respondents learned from consultants in the course of working together. The type of information and knowledge acquired depending mostly on the specialization of the consultant. Cited of recent NEDCO had the opportunity of working on a community project on the upgrading of slums in Dar es Salaam whereby individuals had learnt a lot on the role of communities and the modalities of financing of such projects.

iii) External: technical reports and publications

NEDCO subscribes to a small number of journals locally and internationally. Informed the relevant journal would be directed to the relevant heads of department. At times copies would be made from the director general’s office of a certain journal and distributed to the heads of departments. However, informed this was at the discretion of the director general as the journals on delivery are all sent to his department. Responses from interviews of individuals in two different departments however, revealed that some individuals are not aware of any subscription done by the organisation.

Informed no documentation room exists for the organisation since 1997 when the organisation had restructured. Rather, valuable documents are held in stock by heads of departments in a cupboard in their offices. The stock of documents, being project records and technical reports done by the corporation and by other consultants whom they had worked with.
iv) External: new members, mergers and acquisitions
Since its formal restructuring in 1997, whereby the corporation had streamlined from the then largest consulting firm in the country constituting of architects, engineers and quantity surveyors, to the current manpower of only 14 employees, there has been no recruitment and none is expected in the near future.

v) External: joint ventures and consortiums
The corporation has had a number of joint venture schemes with other organisations. These include organisations in and outside Tanzania, especially the neighbouring countries. It was learnt, the purpose of NEDCO to enter into such venture schemes is purely for marketing strategies. Cited for instance the company had once ventured, solely for the reason that this other company was good in model building and NEDCO was aware for that particular client, it was an influential factor in its favour. On other times, the organisation had teamed up so as to meet the pre-qualification conditions in a bid. One architectural firm in Nairobi, Kenya, was cited as an example whereby the organisation had a number of joint venture schemes, while a local engineering consultant firm was cited sought in a venture scheme due to its expertise in preparing feasibility reports on infrastructure works.

Internal knowledge and information acquisition
i) Internal: founder members and prevailing technology
NEDCO considers the skills, know-how and technology possessed by the firm has originated from the history of the firm. It was emphasized that, NEDCO on its formation in 1968, was the first indigenous consultant company in Tanzania. During this time there was no training institution for architects or quantity surveyors in Tanzania. The very few Tanzanian professionals on this field had either trained in the UK or in Nairobi, Kenya. The organisation being the pioneer in these professions had to start from scratch to establish the practice. Further informed a major portion of the principals in consultant firms in the country from the three professions architecture, quantity surveying and engineering, had previously been employed with NEDCO. The history of the firm is also reflected in the human resource profile that has working experience stretching to 28 years with the shortest time being 14 years.
ii) Internal: dialogue and critical reflection
There is no formal reflection on tasks well done or what had contributed to their success. However informed, a technical committee exists and whenever there is a problem or an urgent issue, an ad hoc meeting will be formed. The technical committee is constituted of all heads of departments in the organisation. The knowledge acquisition process by NEDCO is indicated in Figure 6.2.1. As can be noted from the figure, the recruitment of new members to bring in knowledge, critical reflection, questioning assumptions or experimenting is non-existent. It should also be noted that, in the experiential attribute, mistakes are the only ones identified as a means of knowledge acquisition as against successes. Experimenting and small innovations although reported by some individuals, do not appear in the model as they are specifically done at personal level and never shared among individuals, and the organisation is never aware of such innovations.

iii) Internal: successes and mistakes
Respondents acknowledged the fact that a majority of employees know the mistakes, and successes of the organisation. This, it was stated, was common knowledge to all individuals. One departmental head cited the manpower turnover that was let to go by the organisation – as among the acknowledged mistakes, as these employees took with them a lot of knowledge that existed in the company. Occasionally the organisation has to contract out work due to the lack of manpower so as to meet a deadline or for a special service.

iv) Internal: R & D and innovation
In the department of architecture, which now has only three employees, it was learnt prior to the organisation’s restructuring, the department, had devised a way for individuals to come up with competitive designs by way of competition among the members. The internal competition would also invite people from outside the firm and comments received would be used to improve and reflect on the design. Currently at organisational level no such innovative efforts exist. However, acknowledged at individual level, individuals have devised own methods of improving their tasks. One respondent cited being a consultant supervising construction works, over time has come up with his own ways of tactically handling the client and contractor in a construction project whatever the problem, so as to ensure the project progresses to completion.
**Information distribution**

*Communication, on-the-job training, and job rotation* - Information is distributed in both written and verbal manner. Informed site meetings form a key form of distributing information within the various departments. Further informed, the skeletal structure of the firm facilitates a lot of verbal communication. This is also assisted by the sitting arrangement. That, the three heads are actually positioned in adjacent rooms hence sharing of information at times is spontaneous by one just going to the door next. In-training courses are absent and when an individual receives training from outside, mechanisms for sharing that knowledge are left to individual’s own initiatives. Regarding ‘on-the-job training’ prior to restructuring, the practice existed and it enabled a number of individuals to progress from technicians to full registered professionals. However, currently ‘on- the- job training’ does not exist. This is so since the organisation does not recruit any more and that a majority has over 15 years experience on average and hence the practice is perceived as irrelevant. Job rotation likewise is non-existent.

*Written material, organisation size, and task forces* - The only internal publications that NEDCO has is the company brochure that it uses for marketing purposes. The technical committee in NEDCO is seen as an equivalent to a task force. The size of the organisation informed facilitates a lot informal networks and information sharing. Another factor mentioned that facilitates information sharing is the length of time individuals have been in the organisation. For instance in the directorate of engineering, the employee with the minimum serving time is 19 years and
there are two employees who have served 28 years each. On average then the statistical mean serving time for employees is 23 years in this directorate.

An illustration of the information distribution process as practiced by NEDCO is shown in Fig. 6.2.2. One can note that communication through letters, memos, and verbal means is the dominant mode of distributing information explicitly, while informal networks are dominant in the implicit mode.

Making meaning:

*Dialogue and networking* - individuals make consultation amongst themselves as a way of making meaning of new information. Also informed individuals have their own networks outside the organisation where interpretation of new information is at times sought. One respondent elaborating how the organisation makes meaning of new information stated that special capabilities among themselves are known. Hence such information would be directed to one who has more expertise in an area.

*Sitting arrangement* - The pool-type sitting arrangement in the directorate of engineering noted relatively more conducive to collective interpretation than in the other directorates. For the quantity-surveying directorate however, with only one employee, the head of department, such internal interpretations are not possible. For the architectural department, manned by three employees, the head of the department and two architects, except for the sitting arrangement that separates the head of department and the departmental members, collective interpretation could occur. During the time of data collection, the organisation did not have much work other than post-contract supervision works hence much could not be observed on how the processes and skills in the tasks done facilitated dialogue.
Work processes - Through interview it was learnt that dialogue in the course of performing tasks was inevitable. A simple query from a contractor, a co-consultant, a client or a site visit and the regular site meetings, were all cited as typical examples of work processes facilitating a series of dialogue. Learnt that process checks are not scheduled nor documented. The type of client or nature of the works and conditions of contract may initiate periodical inspections, the latter being common for roadwork. However, for building works acknowledged the inspections are generally of ad hoc nature. Noted for roadwork, contract conditions necessitate the documentation of the inspections made, for instance distinct stages for inspections are made explicit in the specifications. However, it was made known that, whenever such process checks or inspections are made, rectifications if any, are not documented for future references.

Unlearning - An example was cited of an administrative aspect of how the organisation has reviewed some of its ways of doing things and come up with new, after some learning experiences. This concerned the management of financial proceeds from a project. Learnt that initially the administrative department dealt with the managing of such finances, but of recent it is no longer the case. The organisation has introduced a system that has an incentive for those who solicit jobs and for those who participate, thus the management of finances is not anymore by the administrative department.

Past events – Through the technical department it was learnt that past events play a key role in making analyses that aid decision-making. However, such analyses are not documented, although the outcome may feature in reports. Noted further, the mode of documentation focuses on reporting as against documenting for future use.

Collective interpretation - Information and knowledge in NEDCO is widely distributed. This was observed from the professional qualifications held by employees combined with their long working experience. As a result, in collective interpretation of information, there is freedom to speak by all and one is judged according to the contribution in the matter. The current small size of NEDCO further observed to facilitate collective interpretation of information and is done by the technical team. An illustration is given in Figure 6.2.3.

One of the interesting aspects noted is that making meaning through structured systems could not be explained at all by the respondents. No recollection from the respondents was done for unlearning in the core function of the organisation and hence although mentioned in the discussion above, it does not feature in the model illustrated.
Organisational memory: Explicit storage of organisational memory

Organisation records - The organisation has in store, records and materials related to its business in various modes. Drawings that have been used in past projects are stored in cupboards; and recently done projects in CD-ROMs. Observed every head of department stores materials relating to his department in his office while information of general nature and copies of all correspondences are stored in the administrative department. Important information stored in a steel cupboard that exists in heads of department’s office. Noted the size of cupboard in the two heads of department as approximating 1200mm x 1800 mm high. Further informed another organisational repository is employees, those in employment and those that had left the company and are practising elsewhere.

Ex-employee - Informed occasionally an ex-employee would be consulted when a project has aspects of which the individual is thought could provide expert opinion. Cited an ex-employee had to be called from the north region of the country to assist in tracing drawings for the building, which NEDCO is housed. It is common in the organisation for among them to make re-collections such as: ‘…………was good in this aspect, let us contact him and see if he can assist on this ’
Customers – that the organisation has served, are considered as among the organisational repositories. To date, informed when the army in Tanzania is thinking of constructing a building structure, in most cases it would come to NEDCO for them to either do the work, or request them to provide a briefing if the client intends to do it in-house. Informed for instance, this type of client can come to NEDCO and request for certain drawings that had been used 20 years back in a project.

Lessons learned - Since a ‘post-mortem’, (as one of the respondents referred to), is not done on completion of a project, it also follows that matters to what has been learnt from a project are lacking. Henceforth, the organisation does not have an inventory of what it has learnt. However, informed the organisation has its own database established over the years. Such databases largely not documented, exist at both organisational and individual level. For the former, this includes specialists inventory, professionals, actors in the construction industry and various stakeholders. Individuals have their own databases, and it was noted, these databases are of operational matters. This included, construction details of special interests or ones that they have improved, output standards for labour, material performance, and cost information such as rates for various items in building works. The organisation does not have a best practice manual created or adopted from other sources. However, individuals, have over time, developed own best practices that are only known to them.

Organisational policies - NEDCO admitted to have various policies that have originated from what has been learnt in the past. Policies cited covered those focusing on the social well being of employees like, accommodation, and medical and health schemes to those that focus on operational aspects. For instance regarding the latter, examples include: a policy that had it mandatory for counterchecking after a structural failure had occurred in a project and; policies that gave mandate to the professionals to have the ultimate decision on matters related to their profession. Noted such operational policies in the core professional activities have not been codified despite being known to all.

Organisational memory: Implicit storage of organisational memory

Norms, culture, procedures - Respondents reported that norms and cultures that are related to the knowledge possessed by the firm that it thrives to posses are more visible and known in relation to the administrative aspects of the organisation. At the senior level, it was known that norms exist in procurement practices specific to NEDCO and have evolved through knowledge gained
over time. However, informed such norms are confidential and private to the organisation and hence could not be revealed. Other respondents identified certain norms that they considered to be common: that of producing good quality work, effective supervision and timely delivery of projects. In addition the advent of IT was identified to have influenced certain working norms. For instance design in the organisation is currently done using various software packages such as the AutoCAD, ArchCAD and one sees less work on the drawing board. Informed prior to streamlining, the draughtsmen with their drawing boards would occupy a whole floor in the building that now accommodates all employees. Again it was perceived by some that the nature of certain tasks remain the same disregard how long they have been carried. Setting up of a building was cited as an example whereby the process was stated not to change although the equipment used for the setting out might change. In such situations it was felt that an individual did not have much room for creativity or improvement of the process.

Learnt that the organisation has from what has been learnt in the past introduced certain organisational procedures. For instance, informed professionals have a more dominant role to play in decision making than the administrative staff currently. The latter’s role being explicitly supportive of the core professional services offered by the organisation. The organisational memory of NEDCO is illustrated in Figure 6.2.4. One of the interesting features is the dominance of the human resource. That, the existing and ex-employees feature in both the internal and external organisation memory.

**Retrieval of information**

Learnt that in going back to previous information intending to use now, individuals first consider how that information was used prior to making decision. And that retrieval of such past information was generally sourced from memory, in individual’s heads or know-how. A structural engineer in the engineering department gave an example of the carrying over of a good learning experience from a project in Arusha municipality. The structural engineer had creatively innovated a steel structural roof with large spans to one that uses timber in lieu of steel. Informed, the use of a computer-aided design program facilitated the success of such an endeavour. The innovation produced a roof structure that was relatively economic with improved aesthetic values. Such an experience has been shared by others in the department and has been repeated in another project.
Hence Figure 6.2.5 apply to the retrieval mode of NEDCO. Individuals retrieve information through explicit means from lessons learnt in projects. Implicit retrieval is done from memory through individual’s tacit knowledge.

Fig. 6.2.4: Organisational memory - NEDCO

Fig. 6.2.5: Retrieval of information - NEDCO
6.1.3 Masasi Construction Company Ltd.

Background - Masasi Construction Company limited is a contracting company incorporated by the Tanzania registrar of company in 1981 and registered in the same year in the now defunct National Board of Architects, Quantity Surveyors and Building Contractors as a building contractor class five. Progressively the company has upgraded itself and by 1992 had acquired a class one registration. In 1998 Masasi acquired registration for undertaking civil works as well under a class three registration.

Resources and facilities

i) Staff – The staff component stands at 37 for permanent and six on contract bases that have a university degree or equivalent in either engineering or quantity surveying. Civil engineering technicians are six in number with five foremen having trade test certification, while 15 employees have O–level certificates.

ii) Computer technology – A computer room with three computers exist. However informed the computer has not been connected to the Internet at the office although the managing director has such facilities at home and hence communication through such media has to go through such arrangement.

iii) Documentation room – no documentation room exists in the company

iv) In-training programs – the company regularly provides industrial training for students from the University of Dar es Salaam, University College of Lands and Architectural Studies and the Dar es Salaam Institute of Technology.

v) Plants and equipment - being a class one contractor under the registration process of the Contractor’s Registration Board the company is expected to have adequate plants and equipment to perform works under this category and such inventory appears in the company brochure.
Data collection
Data was collected from Masasi like in the preceding cases through formal and informal interviews, documentation and archives, questionnaire administration and direct observation. A total of five interviews were conducted targeting those officials that could improvise the information required. This included office based staff - the chief quantity surveyor and his assistant; the site based staff - that included a project manager, site manager, and a clerk of works. To facilitate the observation mode and the collection of documentation and archives, three days constituting a maximum of three hours were spent in the company’s headquarters, and seven days in one of its project sites. As the company had a number of on-going projects, I was assigned to a project, which it was thought would provide adequate information, as it was quite active at that time. The project involved the construction of a centre for enhancement of interventions for malaria at Ocean road, Dar es Salaam. The client for this project was the National Institute for Medical Research (NIMR) and the project constituted the construction of two storey buildings for office, laboratory, conference, library and lecture theatre rooms. The case study protocol (Refer appendix “A”) formed the basis of data collection that is discussed in the section that follows.

External knowledge and information acquisition
i) External: Conferences
Occasionally employees attend conferences, especially workshops organised by the TCRB. However, learnt that the organisation does not necessarily do this so as to bring in information and knowledge to the organisation, but mostly it occurs as a response to an invitation by TCRB, which for purposes of keeping its image and good public relations would send representation. On sending an individual to a conference or workshop the organisation does not have a mechanism of ensuring the knowledge so gained by the individual is tapped by the organisation. However, through own initiative, an individual may inform a superior of certain information if considered beneficial to the organisation.

ii) External: consultants, suppliers and clients
Knowledge is reported by respondents acquired in some instances, through pre-imposed conditions of contract. The World Bank conditions and the European Union conditions were among the sources of knowledge identified as enriching the firm. It was learnt that the company
would as a competitive strategy adopt some of the conditions imposed to the firm when tendering in such projects to other projects, and provide it as additional information. Egbu et al. (2003) in a UK study similarly reported such contract conditions as a source of knowledge acquisition by construction firms.

The firm acknowledged to also acquiring information and knowledge through enquiries to client or his agents. Pre-bid meetings and site visits prior to bidding were cited as venues where the organisation also acquires information and knowledge. The company admitted to also acquire knowledge through client specific requirements, and from suppliers of material and components. It was cited from suppliers one may acquire information on new materials in the market. Learnt that, a supplier of a certain material may advise a contractor against a purchase and offer advice for one that provides a better alternative. It was hence acknowledged by respondents that, a lot of performance characteristics of materials and components were obtained from suppliers. Sharing of information or knowledge between Masasi and other contractors was stated as non-existent. However, respondents acknowledged at individual level this could occur but would not be known in the firm, as it was highly discouraged.

iii) External: technical reports and publications

The organisation does not subscribe to any journal. Observed no reading material such as journals, magazines visibly available in the firm both at office headquarters and at site offices.

iv) External: new members, mergers and acquisitions

To meet the present demand of IT knowledge, Masasi reports of recruiting an engineer who possesses such skills. No acquisition no mergers have ever occurred in Masasi. In one interview of a joiner at site, an acknowledgement of recruiting to bring in knowledge was observed. The admittance of the joiner that he had been employed with ‘Coastal steel’ which is a reputable firm in Dar es Salaam that makes wood furniture, gave the applicant a lot of credibility for his recruitment.

v) External: joint ventures and consortiums

The organisation reported to have worked previously with a South African company and admitted to have acquired knowledge in certain aspects such as: preparation of joint venture agreements and the art of negotiating. Furthermore, informed, the venture created a two-way opportunity for acquisition of knowledge for both sides. This was so, as Masasi had a lot to offer regarding local conditions and logistics, while the counterpart were more experienced in
tendering strategies. The firm also reported to have entered into a joint venture scheme with a local contracting firm, for the purpose of pulling up resources. Also informed that, since the partners in the venture had more experience in irrigation schemes, being a class one civil works contractor and Masasi being a class three civil works contractor, the latter felt they could learn from them. Informed the two companies, have currently ventured together for another civil work in the southern parts of Tanzania.

**Internal knowledge and information acquisition**

**i) Internal: founder members, prevailing technology**

Respondents were of the view that the key contribution of the founder members as largely advisory. However, acknowledged since 1981 the organisation has maintained about three to four employees who are considered a great resource to the organisation. The prevailing technology in Masasi it was learnt is attributed by the human resource capital employed by the organisation and the organisation’s greatest asset – the entrepreneurial skills that it possesses. Such skills include, ability to acquire credit from financial institutions and to competitively procure construction projects.

**ii) Internal: critical reflection, dialogue, questioning assumptions**

Observed dialogue within the organisation exists formally and informally both in the office and at site. Noted the focus of dialogue is largely on the task at hand and not on critical reflection. The same situation noted in questioning assumptions, that this is done in the carrying out of tasks or when there is a problem.

**iii) Internal: successes and mistakes**

Respondents admitted to acquire knowledge experientially through successes and mistakes. Individuals know factors that have attributed to various successes or mistakes but could not guarantee if also known by the organisation. Some of the factors mentioned to have attributed to success stories as: projects that had good cooperation between consultants, contractor, client and donor(s); some donor conditions that are imposed on the main parties to a contract; and team effort in preparation of tender bids. Mistakes made were acknowledged as among the facilitators of knowledge acquisition in the organisation; for instance the significance of making a site visit prior to bidding in a project was learned the hard way.
iv) Internal: R & D. and innovation

Noted experimenting as a means of knowledge acquisition completely absent. However, informed in attempts to enhance performance, Masasi has now an improved organisation structure and has introduced a project coordinator for each of the on-going projects. An illustration of information and knowledge acquisition of Masasi modelled by the study is as given in Figure 6.3.1. As can be noted, opportunities for internal acquisition of knowledge exist largely from its long-term employees and entrepreneurial skills.

Information distribution: explicit

*Internal formal courses* - Information distribution through internal formal courses, internal publications or on-the-job training, is non-existent in Masasi. A document giving the company profile is the only printed document that it produces. This company profile is produced solely for marketing purposes and contextually does not serve as a devise of information distribution.
Communication - Informed the verbal communication is the dominant mode of sharing information in the office. At site level, observed use of verbal and at times instantaneous illustrative sketches is common.

Job rotation - is non-existent in the organisation. Observed, by the main contractor selling out all the work to small domestic sub-contractors or skilled craftsmen, incentives for imparting knowledge such as the use of job rotation become of no use. In addition, except for specialized work that is assigned to nominated sub-contractors, the site manager or the office headquarters normally employ skilled craftsmen under a domestic contract who become gang leaders. These skilled craftsmen hence become responsible for recruiting and supervising own labour or gangs. The site manager is hence left with the coordination of the various trades through their gang leaders.

Task forces, teams - at managerial level, these are formed not exceeding two individuals to specifically take responsibility for certain projects. Such a practice it was noted was to enable the pulling up of resources rather than sharing of information. At site level work is done typically in teams determined by the special nature of the work. A trade for instance might be constituted of a team of two or three individuals. At the Malaria project site, it was observed that the carpentry trade had two teams, one that planes the surfaces of cupboard shutters and other, fixing them to position. The team doing the painting was also noted to constitute those doing the smoothening of the surface and those doing the painting. As specific trades are sold out, Masasi is not involved in constituting team members.

Sitting arrangement - at Masasi headquarters, this is based on the functions being performed; different departments are hence seated next to each other. It is only the administration staffs, which constitute about four to five people and the accounts department that has about three employees that sit in a pool like set up. The major pattern is that individuals are seated in a conventional way where each person has his/her office.

Organization structure, work relations - Noted information sharing flows in a hierarchical manner. Those at more or less the same level share information easily when compared to those in differing hierarchical levels. Also observed, the working atmosphere is divided into those who own or those related to the owners of the organisation, those who have skills in specific operational requirements, and those who hold positions but are not adequately qualified to perform certain duties that go with such positions.
**Informal networks** - reported to exist and that the managing director highly encouraged a lot of first hand information and as such most individuals could directly approach him. However, informed that although the managing director welcomes a lot of ideas from subordinates, he makes the final decision based on his personal judgment. Venues of sharing information such as tea/ coffee rooms are absent and observed that individuals never go to the same lunch places and if they meet by chance would rather discuss politics or other social issues.

Figure 6.3.2 illustrates the different modes of information distribution in Masasi. Other than informal networks, no other implicit means of distributing information exist.

![Information distribution diagram](Fig. 6.3.2: Information distribution - Masasi)

**Making meaning**

Learnt further, the mode of interpreting new information or knowledge in the organisation is determined by the nature of the information or knowledge. Matters regarding the organisation as a whole are dealt with by the managing director and if for instance there were any matters relating to issuance of government policies or regulations or by-laws an individual will be assigned to pursue the interpretation of the new policy or regulation from the authorities concerned. However, such feedback it was learnt would never be formally distributed to all in the company, but the individual concerned may be called in by the managing director and furnished of the interpretation of the policy or regulation and how it would affect his section operations. Distribution of such information henceforth will be left to chance in the organisation through informal networks.
**Dialogue** - At site level, observed the nature of site activities made dialogue inevitable in the interpretation of information in a casual manner. Also noted through the continuous rampant and ad hoc inspection done by the site manager, dialogue occurred. Dialogue also noted to exist between the teams especially those who are working side by side – or where teams have to coordinate their tasks.

**Critical reflection** - Both at office and site it was learnt critical reflection only occurred at individual level, in the individual’s mind. Formal reflection on tasks well performed and what had contributed to the successes are non-existent in Masasi. Furthermore, informed there was always pressure on performance and meeting of deadlines such that at times such reflective discussions were not possible.

**Collective interpretation** - is non-existent both at site and office. Observed in the organisation, it is strongly perceived that knowledge resides in certain individuals only. At site level knowledge was considered as residing only with the clerk of works and the site manager; while in the office residing in the professionals employed such as engineers, and quantity surveyors. However, observed at site though there is no collective interpretation of information, individuals when prompted, they are free to speak.

At site level workers are assigned into tasks in teams and hence one would expect collective interpretation to occur. However, noted the constituent of the teams as barring collective interpretation as knowledge and skills in teams is not equally distributed; in that, typically a team consists of a skilled senior member and the rest are unskilled juniors, more or less like apprentices.

**Checks and inspections** - Learnt that in the course of carrying out work by individuals, checks and inspections are made. At site level, observed inspection and checks occur as sub-tasks of each and every task. An individual would make his own check several times on certain measurements; and a supervisor will conduct another check during inspection. Observed checks are not scheduled and hence checklists are non-existent. At the head office, informed individuals themselves know their checklists although not written anywhere. Cited for instance in preparing a qualification bid or tender bid, individuals involved would know what is supposed to be prepared based on their experience (tacitly held knowledge!).

**Unlearning** - The organisation admitted to change its old habits and adopt new ways when a potential benefit was perceived by the organisation. It was cited again, many of the conditions
that had come with projects funded by the World Bank, The African Development Bank (ADB) have contributed to the organisation changing in a number of its organisational aspects. For instance, the organisation will provide some of the information that was obligatory in these multi-lateral funded projects as additional information to other sought contracts whenever this was allowed. Masasi for instance would submit an affidavit on non-association with the consultant, a statement of commitment of bidder even though not required in the belief that such information boosts the company image.

Another unlearning behaviour of Masasi is seen in how it has responded to the scarcity of work in the building industry in the country by diversification. Initially registered in 1981 as a building contractor, when work in the building industry became scarce, in 1998 acquired registration in civil works. Currently the organisation has ventured in seeking jobs in neighbouring countries as an implementation of its diversification strategy. Of interest to the study’s problem is the fact that such a strategy is not found documented anywhere and is only known to a few senior management staff. However, some individuals in the organisation perceive the diversification as simply a response to market conditions, and not a learning experience.

The dominant mode of how Masasi makes meaning based on the data collected is illustrated in Fig. 6.3.3. As can be noted, like in NEDCO, respondents could not identify how they make meaning through a structured or formal manner.

```
Making meaning

Individual position
\                                    \ Work processes
/                                    / Unlearning
Interpretation
\                                    \ Structured analysis
Making meaning

Fig. 6.3.3: Making meaning – Masasi
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Organisational memory: Explicit storage of organisational memory

Records, reports, and databases - The organisation memory resides in records of projects largely stored in project files and correspondences. Such storage is done to facilitate retrieval. Respondents admitted at organisational level, databases varied from prices, rates for various items of work, to contacts of suppliers of materials and components. At individual level respondents have their own databases that are largely used and known by oneself only. The site manager acknowledged the database that he possesses has been built over time through different employers; and that such data is not written anywhere. Noted this data as constituting mostly output standards. Examples noted include: the quantity of nails in one kilogram, the number of cement sand blocks that can be precasted from a 50 kilograms bag of cement, etc. The site manager further added that such databases served as a control measure against pilferage and waste of materials.

Lessons learned - the storage of specific lessons learnt in a project is done by individuals in isolation and remains known to the individual.

Policies, norms, rules etc - Respondents although not able to cite distinctly, explicit policies, norms, or rules, they alleged for them to exist and that although not written are known. A cited norm that was known although not explicitly made in verbal or written manner was the association of an employee with a competitor. This was a taboo known to all in the organisation. It was further observed; Masasi does not have a best practice manual.

Organisational memory: Implicit storage of organisational memory

Respondents could not respond to whether implicit memory that is tacitly held existed in the organisation or not. The same occurred for the external organisational memory. From the above discussion, Masasi organisation memory is hence as indicated in figure 6.3.4. The question marks in the figure illustrate grey areas whereby respondents could not ascertain whether a probed situation existed or not. An obvious indication from the figure is the limited organisation base memory. Other than organisation reports, organisation memory in terms of policies, culture, structure or customers did not feature from the respondents.
**Retrieval of information**

Through interview it was learnt that individuals access to project files for retrieval of information. Individuals acknowledged to also retrieving information from memory. Again noted, no acknowledgement of retrieval of information from culture, structure, procedure, norms or rules of the organisation. Respondents could not recollect at the time of interview, experiences that had positively influenced changes in culture, structure or rules of the organisation.

The explicit mode of retrieval of information for Masasi is done through individuals accessing to project files. For the implicit retrieval it is from individual memory. This mode of retrieval is similar to that of NEDCO and hence illustratively Figure 6.2.5 of NEDCO will also apply to Masasi.

End of case study 3
6.1.4 Konoike Construction Co. Ltd

Background - This is a Japan based international company. The history of the company goes as far back as 1871 when it was founded in Japan. Among the five diverse lines of business of Konoike Construction Co. Ltd are the planning, surveying, designing and supervision, constructing and consulting in construction projects. This line carries works in the various fields of construction such as: civil engineering, building and specialist work. The company carries work in the various corners of globe facilitated by the company's international division that has established overseas business and project offices. The company has a number of affiliated firms and has representatives and offices in its various operational areas. Konoike Tanzania Ltd. is one of the affiliated firms and has a representative and its headquarters office in Dar es Salaam, Tanzania. The company, Konoike Construction Co. Ltd has a vast experience in working overseas and for the last ten years has undertaken worldwide a total of 192 projects, some of which are still on-going (Konoike, 2003). Of interest then to this study are projects that had been undertaken in Tanzania.

Although Konoike Construction Co. Ltd is an international company, the number and the diverse nature of the projects it undertakes in Tanzania alone and the fact that the workforce at all levels in its Tanzania branch is dominated by Tanzanians while the Japanese are a minority, it makes an ideal unit of observation for the study's research questions. In actual fact it offers an opportunity for reflecting the mode of knowledge transfer between local construction organisations and international construction organisations working in the industry.

Data collection
Data was collected from Konoike through formal and informal interviews, documentation, archives, questionnaire administration and direct observation. Formal and structured questionnaires were administered to the chief engineer and one civil engineer from Konoike’s headquarters office in Dar es Salaam, and to one site engineer in its project site in Arusha. Informal interviews were conducted at site level to three civil engineers with experience in construction works ranging from eight, three and one year and to one roads foreman with over eight years experience in roadwork. A ten days attachment at site enabled the carrying out of the informal interviews that were randomly done throughout this period. Like in previous cases, the case study protocol (Refer appendix “A”) formed the basis of collecting data.
External knowledge acquisition

i) External: conferences, workshops and seminars

Informed acquisition of knowledge through attendance of conferences, workshops or seminars does not exist in Konoike.

ii) External: consultants, suppliers, and clients

Konoike has not much interaction with other construction organisations, but largely interacts with the sub-contractors that it employs. However, respondents’ perception is that not much knowledge is shared or acquired from this contractual relationship with sub-contractors on their side, but from the sub-contractor’s side they consider they acquire a lot of information and knowledge from Konoike in fields of construction and management of projects. This, it was learnt noted by the fact that sub-contractors working with Konoike have gradually been upgrading their classes of registration. The imparting of knowledge as reflected in the upgrading of classes by sub-contractors working with Konoike is as shown in table 6.4.1

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Year/Class</th>
<th>92’</th>
<th>93’</th>
<th>94’</th>
<th>95’</th>
<th>96’</th>
<th>97’</th>
<th>98’</th>
<th>99’</th>
<th>00’</th>
<th>01’</th>
<th>02’</th>
<th>Remarks - Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upgraded from class 4 to 3</td>
</tr>
<tr>
<td>B</td>
<td>Civil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td></td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upgraded from class 4 to 1</td>
</tr>
<tr>
<td>C</td>
<td>Civil</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upgraded from class 7 to 4; has applied for class 2</td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Civil</td>
<td></td>
<td>7</td>
<td>6</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upgraded from class7 to 5; has applied for class 4</td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.4.1: Sub-contractors class upgrading – Konoike
At site level observed that knowledge sharing existed between the main contractor and the subcontractors employed. At organisational level, it was further learnt that the company acquires different information and knowledge from clients and their representatives. For instance in externally funded projects the client at times provided information on the various interest areas of a funder and the client with technical support of Konoike may prepare a proposal.

Acquisition of knowledge from consultants was relatively acknowledged at site levels than in the organisation’s headquarters office. The site engineer at the Arusha site working on the Kaloleni project admitted to acquire knowledge from the frequent interaction with the project consultant – Norconsult (T), the Arusha Municipal engineer and other statutory authorities like DAWASA. Observed occasionally, on a visit by the consulting engineer to the project site, in the discussion, instinctively one would take a piece of paper and sketch certain details for ascertaining clarity of an issue in the ensuing discussion. Furthermore, the site engineer at the Arusha site admitted, having to construct roads in the urban area, he had to rely on the assistance of special statutory authorities - as drawings of the network of utility services are mostly unavailable or difficult to acquire from the municipality. The blockage of pipes after paving of a road was cited as a common situation in urban areas. However it was known, over time, Konoike engineers can now perform the unblocking of pipe work by themselves, although, occasionally they would seek assistance from specialized authorities.

**iii) External: new members, mergers and acquisitions**

Observed with the managing of projects through employment of sub-contractors as practiced by Konoike, recruitment at lower operational level does not exist. At office level, informed recruitment may occur for various reasons such as increase in workload, bringing in new skill or knowledge. Cited an example where the company on winning a World Bank project in 1997 in Tanga and Moshi (northern east regions in Tanzania), that required knowledge on sewerage, the organisation recruited an experienced sewerage engineer from DAWASA who was conversant
with the local conditions. Informed, this engineer has been retained even though the works are complete and has, by working with other specialist engineers in the organisation, is now doing bridge works.

iv) External: technical reports and publications

The organisation’s headquarters in Dar es Salaam is well stocked with documents ranging from technical reports, manuals to company profiles and project records. The organisation subscribes to various construction journals as observed in the organisation’s headquarter offices. However, site offices do not have a ready access to these subscribed journals or other printed material like newsletters.

v) External: joint ventures and consortiums

Konoike has never worked on a joint venture basis but admitted as always thriving to enhance its core competence - that of good organisation. A design and build contract was cited as close to any joint venture scheme. Informed, as a firm in Japan did the design and Konoike did the construction, the frequent communication and queries created an interaction that facilitated a lot of knowledge sharing.

Internal knowledge acquisition

i) Internal: founder members, prevailing technology

Individuals interviewed were of the opinion that the performance of Konoike was largely attributed to the organisational skills that the organisation possesses. In probing both the Chief engineer and an engineer with a seven-year experience with Konoike on the question

‘What if the capital resources of the organisation were to be given to another class one contractor and the human resource retained- would this company have the same performance level?’

The answer was a definite and succinct,

‘No, not all – as Konoike’s performance is not attributed to the equipment it possesses but rather to its organisational skills’
Other factors identified as giving Konoike an upper hand over other firms include: an in-built policy that completion of a project is paramount, an agreement that the final product has to be at the agreed cost and quality, a culture of ‘gentleman agreement’; the eighteen years of experience of the managing director in Tanzania and the human resource capital.

**ii) Internal: dialogue and critical reflections**

At the organisation’s head office in Dar es Salaam, project team leaders meet on a daily basis from 1:00 – 1:30 pm. This gives opportunity to review progress on a daily basis and plan for work in the following day. All key project personnel attend this daily update meeting whose membership constitutes: i) site engineers ii) general foremen iii) transport officer iv) base camp officer and v) a quality control officer.

The sub-contractors employed in the project likewise meet daily for an update of working progress. At site level, observed since the base camp was at a distance from the site office, a closure meeting was also held at the base camp after receiving a report of the meeting from the site office in Arusha. This base camp served as the source of material supply between the two towns of Arusha and Moshi, for which Konoike had work in progress.

Learnt further, although these meetings are done throughout the implementation period of a project, on completion no critical reflection is done by the project team neither at site level nor at the organisational level. Informed, at times in the last few weeks prior to practical completion, the project manager in some instances may have been assigned to another site, possibly in another country or even another continent. Respondents were of the opinion that, critical reflection on the aspect of customer focus, such as reflecting on the clients the organisation has been able to maintain was highly attributed by the personal skills of the managing director.

**iii) Internal: successes and mistakes**

Examples cited showed that the company learns from its successes. This observed in the practice of the organisation of identifying a project manager who had done well in a certain branch to be assigned to a project that is similar to the one carried successfully. Someone may be flown from Honduras, South America to say, Mozambique, which is in the South East of Africa, if it is felt that the project manager had done well in a similar project. Another example was a project in the North Eastern side of Tanzania – the Ngorongoro Makuyuni road that included 77 kilometres of work. This project was considered tricky as it involved working in pozzolana soils (a type of soil with cement-like characteristics), a situation that Konoike in Tanzania has never had prior
experience. Learnt the project has been carried successfully and the contractor expects to complete on time hence it is anticipated that the same team would be assigned to a recently acquired road project in Dodoma region, which is in the central part of Tanzania. Another project cited as showing that Konoike learns from its successes – is the project for development of school facilities for Dar es Salaam primary schools – phase II. It was learnt that the lessons learnt from phase I has made it easier to carry out phase II and the contractor is expecting to finish before the set completion time.

**iv) Internal: R & D and innovation**

The firm has created its ways of how best to perform certain tasks. For instance, the organisation has devised standard ways of conducting inspections and checks for various tasks. These checklists exist to aid accurate checking of work in progress in various tasks. For instance a standardised checklist format for various items of work was noted in the primary school project. Table 6.4.2 illustrates an example of an inspection record for plasterwork. In the same manner the organisation has likewise devised own system of controls in material requisition and delivery. All process checks, inspections are scheduled and are well illustrated in the form of standard tables and other similar presentations.

**Table 6.4.2: Inspection record for plasterwork - Konoike**

<table>
<thead>
<tr>
<th>Konoike Construction Co Ltd.</th>
<th>Project: Development of school facilities for Dar es Salaam Primary Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person in charge:…</td>
<td>Approved/ Head:………………Date:..</td>
</tr>
<tr>
<td>Type of work: Plaster work</td>
<td>Confirm/ Change:………………Date:…</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Inspection item</th>
<th>Content</th>
<th>Photo</th>
<th>Result</th>
<th>Confirm</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>…….</td>
<td>…….</td>
<td>Plaster of bonding test</td>
<td>Knock with hammer</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QUALITY TARGET/SOUND**
Based on the information collected, the knowledge and information acquisition by Konoike is illustrated in figure 6.4.1.

**Fig. 6.4.1: Information and knowledge acquisition – Konoike**

**Information distribution**
Forms of information distribution range from verbal to written. The use of telephone, fax, Internet, letters, memos are all predominant, depending on the nature of information to be distributed. However, informed direct verbal communication is extensively done through the telephone.

*In-training courses* – as such do not exist in Konoike, however informed that the organisation has a practice of sponsoring an employee who has worked with the organisation for a period of between six to ten years to a one-year program in Japan. Learnt that the individual on such training will be exposed to a full time practical exposure at a construction site. Publications made by Konoike Construction Company include the company brochure, profile and newsletters. However noted that although the head office regularly receives newsletters from the organisation’s main headquarter in Japan, these newsletters are in Japanese language; so in the
Dar es Salaam office, Japanese employees and only one Tanzanian, the chief engineer could read them.

*Job rotation* - Noted the incentive for job rotation for the main contractor at site level does not exist, as the physical part of the work is done by domestic sub-contractors under the supervision of Konoike’s general foreman and a site supervision team headed by a site engineer of Konoike. In the office headquarters in Dar es Salaam, learnt that, for a newly recruited employee a brief orientation is normally done, with the orientation mode differing depending on one’s job description. For one having a supervisory position, at least the orientation ensures that one is oriented to all subordinates tasks.

*Task force* - The organisation considers the team members chosen in a project as synonymous to task forces. The teams, informed are chosen strategically to accomplish tasks allotted to them. The success of such teams is attributed to the team spirit that exists among them. Such a spirit was observed in the Arusha supervisory team working in the rehabilitation and improvement of additional roads and drainage works in the municipalities of Arusha and Moshi. Learnt at the office headquarters, the benefit of different functional departments working together has been reaped as engineers in the organisation can to some extent now undertake quantity-surveying tasks for small projects. Informed, graduate engineers are not able to perform such tasks but after working for some time with quantity surveyors, they find themselves being conversant with the cost aspects of construction works that are generally carried by the quantity surveyor.

*Procedures, standards,* - Further observed, Konoike has set up procedures that facilitate information sharing and distribution. At site level the daily morning and winding up meetings facilitate this. The team spirit existing between the supervisory team also noted to create an atmosphere conducive to sharing and distribution of information. Noted, among the members of the supervisory team at site, a colleague-like atmosphere existed for all except for the project manager. At the organisational headquarters, informed an orientation meeting is held every two weeks whereby each site engineer is expected to present an update of his project. In such presentations information on matters pertaining to cash flow such as the actual expenditure, profit/loss made so far, material consumption and projected profits, are made. Such meetings are perceived by the organisation to highly facilitate information sharing amongst the various site engineers.
**IT -** All supervisory staffs in Konoike have a direct access to the Internet, and for those working upcountry, a dial-up networking has been improvised. Departments also possess different software packages; for instance the engineering department uses the AutoCAD and other related packages. Informed, the use of IT has enabled the accounts section to report daily to Konoike’s headquarters in Japan.

**Sitting arrangement -** At the Dar es Salaam office, a pool like sitting arrangement is used while at site offices no facilitation is made for the sitting of the supervisory team other than one room that serves as the site engineer’s office and probably for use by the team. However a multi-purpose room exists that serves for meetings, the clerical staff’s office, storekeeper’s office and also partly as a store for materials. Further noted, information sharing regarding the work, and previous experience between the working teams such as the sub-contractors and the supervisory team, between the supervisory team itself are informally and casually done.

**Norms, culture –** A key norm of the organisation and one that employees are aware of, is the timely completion; responding individually, employees both in Arusha and Dar es Salaam identified this as a key norm of Konoike. The chief engineer of Konoike acknowledged this information and stated, ‘*It is a norm that is taken very seriously by Konoike*’.

Learnt that the Japanese system of respecting seniority as judged in the years one has been in the organisation is also reflected in Konoike. Everyone knows the promotion ladder, it was learnt, and this is perceived to create an incentive for employees to remain in employment. The modality of information distribution of Konoike is illustrated in figure 6.4.2
Making meaning

Regular meetings carried at site and offices in Konoike facilitate interpretation of new information and knowledge through dialogue and discussion. In collective interpretation of information, the Japanese culture of seniority comes to the fore since the most senior individual is considered to have more knowledge. Noted at site level, the process carried does not give much time for dialogue – once at site the process involves instructions and pursuant of those instructions by small teams.

An analysis of Konoike’s various control documents appearing in standard formats revealed a potential of invoking interpretations for those using them. For instance a form will not only note down a default, but will also improvise how to rectify it (Refer inspection record table for plasterwork given in Table 6.4.2). Noted further, the purpose of noting the corrections is for rectification and less so documenting for future reference. Figure 6.4.3 illustrates Konoike’s mode of making meaning of information and knowledge.

From the figure, it can be noted that making meaning through analysis forms a grey area, appearing with question marks. This is so, showing how respondents could not implicitly acknowledge or even express explicitly how such mode occurs. Making meaning through the seniority ladder also features as an interesting aspect in interpretation so as to make meaning.
Organisational memory: Explicit storage of organisational memory

The company, over time has created its own database at various levels. At project level observed the data is largely of resource consumption patterns. Further informed that since Konoike has registered itself with various international standards, namely: ISO 14001:1996 and JIS Q14001:1996 adherence to such quality requirements enables the organisation to have reliable databases. Informed that the organisation has an explicit policy on quality that is reviewed annually. Given an example of the quality policy for the year 2003 the policy is as appearing in Box 5.

Box 5: Quality policy - Konoike Construction Co. Ltd.

<table>
<thead>
<tr>
<th>QUALITY POLICY FOR THE YEAR 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective application and improvement of the quality system</td>
</tr>
<tr>
<td>Accurate grasp of and rapid response to customer needs</td>
</tr>
<tr>
<td>Preventive and corrective management by completion of internal quality audits</td>
</tr>
</tbody>
</table>
Such a policy and others it was learnt were introduced to enhance performance and not necessarily as a result of what has been learnt in the past. As processes are guided by the various ISO certification held by Konoike and that no specific attempts of identifying lessons learned exist – reviewing of processes in reflection to what has been learned in the past at organisational level is non-existent; subsequently the issue of documenting such lessons does not exist. However, at project level this was noted to exist in the way tasks were carried and reviewed. Reflecting on an incident in the rehabilitation and improvement of roadwork in Arusha and Moshi municipalities, an application of first hand lessons learnt was noted. This project involved doing a number of short-lengths of roadwork in both municipalities covering a total of 14 kilometres. Hence it constituted roads networking in the two municipalities. The inter-connecting nature of such roads resulted to having a lot of junctions mainly with some other roads not included in the rehabilitation project. Since the junctions were considered to sort of break the continuity of the rehabilitation works, as its process was slightly different, the junctions were left out until later on when the roads in that area were paved. When the main contractor was now returning to complete the junctions - a lot of anticipated hassles occurred. Control of traffic was difficult as the newly rehabilitated road was now open. While Konoike crew was working on the junctions, motorists would hoot demanding to be given way while some motorists would use the pedestrian paths posing danger to pedestrians, the workmen and to themselves.

The incident narrated was observed in the Kaloleni and Unga limited roads; the latter being a busy industrial area, working on the junctions became quite a cumbersome task. At this point the site supervisory team among themselves made a strong stand never to leave junctions behind when paving a road. The working fleet on moving on to another road near the fire brigade post of Arusha, the road locally refereed to as the ‘fire road’ the site manager emphathetically gave instructions to the foreman, ‘Make sure all junctions are done as we progress along’

Organisational memory: Implicit storage of organisational memory
Observed Konoike’s organisation culture is known to employees, and that a key culture is, no matter what, it has to make a timely delivery of a construction project. The Japanese culture of seniority was noted adopted as well. That, seniority being reflected by the length of time one has worked with the company. Honouring of agreements, as one respondent had expressed ‘having a gentleman’s agreement’ is also one among others mentioned. In elaboration to the latter culture, a respondent stated that, an agreement might be as simple as having only two lines, but that would
be suffice for the company. An image of building trust to clients and customers is highly
honoured by the company. Such cultures could not however be related to what the company has
experienced in the past, i.e. lessons learnt - but respondents felt the cultures were more influenced
by the firm’s Japanese background that has imported some of the Japanese values. Basing on the
data collected, Konoike’s organisation memory mode is illustrated in figure 6.4.4.

![Fig. 6.4.4: The organisation memory pattern - Konoike](image)

**Retrieval of information**

Retrieval of information in Konoike occurs in the explicit and the implicit mode. For the explicit
occurs through groups of individuals in the various scheduled meetings in the organisation.
Retrieval of information in implicit mode is embedded in the culture and structure of the
organisation. Observed some of the company’s culture as influencing operational decisions at
project level. For instance a culture that a project had to be delivered within an agreed time was
observed in the roadwork project in Arusha. Since the project was behind schedule, a 12–15
hours working day and a seven-days working week was adopted. Observed a shared knowledge
regarding this urgency existed between the supervisory team and the sub-contractors. Learnt that,
it was a taboo for the organisation not completing a project on time. A response to what if three-
quarters of employees leave Konoike, received the opinion that performance would not be
hampered, a response that reinforced the view that knowledge is deeply embedded in the organisation such that retrieval is implicit or automatic. In emphasis to this view, informed that a team of new graduates in a project have performed excellently and in actual fact based on personal judgment of a senior staff, it was felt the performance was even better than one comprised of long service members. Rules and regulations exist for various sections in the organisation. Noted explicitly written rules and regulation exist for work sections and that organisation values such as encouragement of team effort, cooperation and working standards are incorporated within. The retrieval mode of Konoike is as portrayed in figure 6.4.5. An interesting feature noted is the existence of implicit retrieval mode in the organisation.

Fig. 6.4.5: Retrieval of information - Konoike
6. 2 Summary of findings of the knowledge transfer process from case studies

Information and knowledge acquisition

- All four firms identify varying sources of knowledge acquisition. With the contracting firms acknowledging imparting knowledge to the sub-contractors they work with.
- Masasi and Konoike recruit only when they have a job requiring particular skills but Inter-Consult has incidences of recruiting as a knowledge strategy for the organisation.
- Joint ventures observed in Inter-Consult, but are done to pull up resources and as a bidding strategy.
- Long-term employees feature more as sources of acquisition of knowledge than founder members.
- The human resource acknowledged for an organisation’s core competence than prevailing technology in Masasi, Konoike and NEDCO.
- More common to learn from mistakes than from successes, with the exception of Konoike.

Information distribution

- All four firms identify varying patterns of information distribution.
- Of the four firms, only Konoike has information distribution featuring in its norms, culture, standards etc.
- Space management in enhancing information distribution is observed not optimal and where it occurs, is incidental and set up by functions or size of firm.
- Preservation of organisation cultural knowledge by the absence of significant changes in organisation structures exists in all organisations except for NEDCO, which had an extensive streamlining.
- Use of IT noted in Inter-Consult and Konoike and occurs as an enabler of sharing what knowledge the company possesses.
- Strategic rotation of employees is absent except for the job rotation that is done to graduates in Inter-Consult and the orientation to newly recruited employees in Konoike.
Media capacity (Vito et al, 1999) is strongest in Konoike followed by Inter-Consult and less so in NEDCO and Masasi. The latter having the weakest media capacity i.e. the ability to process information.

Media velocity (Davenport and Prusak, 1998), that is, how information spreads quickly and widely in an organisation is good in Inter-Consult. For Konoike it only works in the supervisory team and very poor in NEDCO and Masasi.

Konoike has the highest of the four media richness by its dominance in written communication that complements verbal communication.

Making meaning

Inter-Consult has the closest resemblance to the analysis model of all the four organisations.

In NEDCO making meaning is mostly left to individual’s own initiative.

In Masasi informal networks in the organisation have a dominant role in this activity.

Strategic interpretation exists in Konoike.

Pursuant of short-term goals by organisations noted in the critical reflections that are only done during the progress of work – and not after a project is completed.

Organisation memory

Inter-Consult is upfront in storing information and knowledge in the explicit mode such as reports, records and uses IT to support this. Implicitly knowledge observed to be stored in norms and rules as well.

For NEDCO, the human resource, the existing and ex-employees feature as important organisational memory, supported by reports and records.

Masasi shows very limited organisation memory in explicit form.

Konoike shows a strong memory base in both the explicit and implicit form.

Retrieval of information

Except for Konoike, individuals in the organisations mostly retrieve information through explicit means.
For Konoike strategic retrieval of information noted through individuals, groups, and codification of knowledge.

6.3 Summary:
This chapter in addressing the first research question that analyses how construction organisations in Tanzania transfer knowledge has used sub-processes of the knowledge transfer model explained and illustrated in the literature chapter. Data collected from each case has been used to establish the specific knowledge transfer process for the respective organisations. The chapter has illustratively shown how each organisation: acquires information and knowledge, distributes information, makes meaning, stores and retrieves information and knowledge.

The discussions of such analyses are given in chapter eight that has the conclusion.
7. Practices and knowledge creation of construction organisations in Tanzania

7.0 Introduction
As for chapter six, this chapter is part of data collection and analysis of the study and addresses the second research question. The knowledge creation process forms the basis of analysis from which an exploration is made as to what extent organisations facilitate such a process. The existence in the organisations of the four modes of the knowledge creation process, together with enabling conditions and knowledge conversion triggers are henceforth used to facilitate the analysis. The knowledge creation modes explored include the: socialization, externalization, combination, and the internalization.

Research question 2:
How do construction organisations in Tanzania facilitate knowledge creation in their organisations?

7.1 Knowledge creation process - Inter-Consult

Socialization mode
For university graduates who join the organisation, Inter-Consult provides ‘on-the-job’ and an apprenticeship kind of training. Noted, learning skills from others by observation and imitation only possible in certain departments, mostly where junior and more experienced staff are seated together. Such an arrangement was noted in the civil engineering and project management department. However, learnt that the organisation was about to move to a new premise where such a shortcoming will no longer exist. A drawing of the new office premise for the organisation noted to have provided for functional departments side by side and members in each department clustered together.

Informal meetings in Inter-Consult are held spontaneously in departments and comprise teams of two to four individuals depending on the nature of the issue discussed. However, such meetings cannot be equated to the brainstorming camps of Honda referred to in Nonaka and
Takeuchi (1995). An approach similar to peer assist, referred to as peer review is however practiced. Informed, a peer review had in the previous years been undertaken with a structural engineering consulting company from the United Kingdom - Mott MacDonald. The director of Mechelec was also of the view that peer review at individual level existed in the organisation, as it is common for an individual to call upon a colleague to discuss an issue or seek assistance.

**Externalization mode**

Learnt that pressure of work does not lend the organisation time for reflective reflection on successes and mistakes, or what had contributed to the same. Referring to the exact response by a senior in the organisation,

> “Due to pressure of jobs, we are not able to do the final touches of what we are doing; nor documenting our best practices. Nevertheless, each department has a set of own established procedures”

For instance it was cited that, on any given occasion apart from on-going jobs, the organisation would be preparing or sending out about ten proposals. This exercise itself, it was reported was very much time consuming. Further learnt, in order to be effective in this activity, the organisation had employed an engineer with a marketing orientation to enhance the marketing strategies of the organisation. As a result a position known as business engineer now exists in the organisation.

As mentioned in previous sections, at organisational level, there are no checklists for tasks being done. Implicit checklists exist in departments, and some individuals make spontaneous checklists prior to performing tasks and only one architect in the organisation reported to have a checklist that was permanently maintained. Observed, charts and models are used mostly in reflecting work progress and are pinned against notice boards in offices and corridors.

**Combination mode**

Inter-Consult being a multi-disciplinary consultant with three professions, architecture, engineering and quantity surveying, re-configuration of information to enable performance is done in the routine work of the various professionals. The structural and architectural drawings produced by engineers and architects, the bills of quantities produced by quantity surveyors and the regular meetings in departments are, all forms of information re-configuration that convert project information into an operational language.
Internalization mode
The organisation internalizes its knowledge base in various ways. This includes: the production of the graduate engineers SEAP manual, production and working with - working drawings, bills of quantities, specifications, feasibility and evaluation reports. Success stories, and the dialogue in meetings also build on the internal knowledge base of individuals. Furthermore, graduates employed in the organisation get an opportunity to internalize their knowledge base through learning by doing. The knowledge creation process matrix of Inter-Consult can hence be viewed as shown in Fig. 7.1

<table>
<thead>
<tr>
<th>Tacit knowledge</th>
<th>Explicit knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socialization mode</strong></td>
<td><strong>Externalization mode</strong></td>
</tr>
<tr>
<td>Apprenticeship</td>
<td>Charts, models</td>
</tr>
<tr>
<td>Imitation (sitting arrangement)</td>
<td>Dialogue</td>
</tr>
<tr>
<td>Peer review</td>
<td></td>
</tr>
<tr>
<td><strong>Internalization mode</strong></td>
<td><strong>Combination mode</strong></td>
</tr>
<tr>
<td>Production &amp; working with working drawings; graduate manuals; Meetings; dialogue</td>
<td>Training for specialist courses</td>
</tr>
<tr>
<td>Success stories</td>
<td>Drawings, charts, specifications, bills of quantities</td>
</tr>
<tr>
<td>Learning by doing (graduates)</td>
<td>Meetings</td>
</tr>
</tbody>
</table>

Fig. 7.1 Knowledge creation matrix – Inter-Consult

7.2 Knowledge creation process - NEDCO

Socialization mode
Apprentice kind of training does not exist in NEDCO largely due to the long working experiences that all employees hold and that the organisation does not recruit. However, occasionally students from universities or other academic institutions would be given a chance for attachment and that is the only time such kind of apprentice-master relationship occurs. Employees perceive themselves not in a senior-junior relationship but more on specialization–relationships. Informed, the learning of skills from others by observation and imitation is not common, as one would rather inquire verbally from a colleague. Pressure of time as an obstruction to learn from others through observation and imitation does not exist; a situation respondents view as attributed by the few jobs in the company. On-the-job training reported
highly practiced prior to structuring of NEDCO and as mentioned previously, some employees through the practice, and formal training, advanced from technical to professional levels.

The organisation does not have a peer assist practice *per se* in the sense given by Dixon (1999a); though, acknowledged, to meet deadlines it might bring in individuals so as to pull-up resources. Informed also at times this might be the other way round where NEDCO will be called in by another company. Hence noted the relationship not being of a “knowledge importation”, but rather of a “resource pulling”.

A meeting proxy to a brainstorming camp noted in the technical committee meetings as among the aspects of the socialization mode. As briefed by respondents this committee would convene whenever there are situations that demand professional discussions and decisions.

**Externalization mode**
The organisation does not hold reflective discussions on the organisation’s successes or mistakes or what factors had contributed to these. However, respondents were of the opinion this existed at individual level and in an informal manner a colleague may discuss this with another. Further noted since there is no common tea/coffee room, and a working hour of 7:30 am to 3:30 pm with no official provision for lunch breaks, with individuals informally taking time off at differing times for their lunch, potential forums for informal sharing are inhibited. The organisation does not have a best practice manual that is documented. The director general in an interview session however related the sustenance of the organisation since 1968 to an existence of an implicit best practice manual. In emphasis, he mentioned NEDCO being the pioneer in consultancy in the country where it had nowhere to learn from, hence from day one the organisation had to establish its *modus operandi*. Hence admitted, implicitly, there has always been a practice manual that is evolving with time but only that it has not been documented. Checklists for tasks are left to individuals concerned. Hence an individual may choose to write a checklist down for his own ease of using, or just use it from memory. Noted there are no visible charts or illustrative devices in any of the offices.

**Combination mode**
Re-configuration of project information is seen by respondents to occur in the various contract documents. This includes drawings, bills of quantities, specification notes and clients briefs. No written procedures exist for various tasks done by the organisation. Since the restructuring of the
organisation, other than site meetings, there are no regular meetings. Technical meetings are held when there is a problem and a solution has to be sought.

**Internalization mode**

Regarding the form of knowledge within NEDCO, it is perceived to be a rich tacit knowledge of a skilled worker or expert. In emphasizing this view, the director general of NEDCO cited, on the occasion of privatization of the organization in 1997, one of the resources he was adamant to part with were the professionals in the organisation. He stated he was willing to part with buildings and other properties but not let the professionals be taken over. Conclusively he stated although many later left on their own accord, he attributed the current performance of the company to the professionals that had been retained. The internalization process in NEDCO is hence in the production and working with drawings, bills of quantities and in meetings and dialogue.

<table>
<thead>
<tr>
<th>Tacit knowledge</th>
<th>Explicit knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socialization mode</strong></td>
<td><strong>Externalization mode</strong></td>
</tr>
<tr>
<td>Brainstorming</td>
<td>Dialogue</td>
</tr>
<tr>
<td><strong>Internalization mode</strong></td>
<td><strong>Combination mode</strong></td>
</tr>
<tr>
<td>Production &amp; working with working drawings, bills of quantities, specifications Meetings, dialogue</td>
<td>Drawings, specifications, bills of quantities Meetings</td>
</tr>
</tbody>
</table>

*Fig. 7.2: Knowledge creation matrix - NEDCO*

(End of case 2)

### 7.3 Knowledge creation process - Masasi

**Socialization mode**

An apprentice kind of training was observed in the sub-contracts engaged by Masasi in one of the organisation’s site that was studied. However, noted the apprenticeship was not intentionally done to impart skills but done for economic reasons. The work at the site was organized that tasks
requiring skilled labour would have a team leader who was skilled and supported by assistants. These assistants were young men, mostly unskilled and those likely to work for a cheap pay. In the process it was known, these young men would acquire skills on the particular tasks and eventually market themselves in the same trade as ‘skilled’. The main contractor then has nothing to gain in such apprentice practices.

Also observed, the site manager doing a lot of demonstration to both the skilled and unskilled labour during spot checks that were done as the work progressed. Team constituent for various tasks noted as conducive for individuals to learn skills from others by observation and imitation. At organisational level, Masasi does not provide opportunities for on-the-job training. However noted on-the-job training existing at task and trade levels for sub-contractors. Peer assist practice reported to exist with another contracting firm although noted the basis of such a relationship as purely personal as the owners of the two organisations are related and is mostly done to pull up resources. One cannot hence identify it as peer assist practice as described in Dixon (1999a) and Davenport and Prusak (1998) where the relationship is based on skill or know-how from the peer.

Externalization mode
Dialogue observed to be the only means of individuals and the organisation making explicit, tacitly held knowledge. The organisation does not hold reflective discussions on successes or mistakes, or what contributed to either of them or what has been learnt in a project. Furthermore, Masasi does not have a “best practice” manual of its own or from any other source. No models, metaphors are used; observed at site an outdated bar chart at the site office being the only illustrative device. In the office, progress photographs were a main illustrative feature of the works. Checklists as a tool to guide performance are absent and the site diary was not being filled in as required. When prompted on this, a response from the site manager was that their was too much pressure and hence no time to fill it in. A shortcoming in the exposition of the tacit knowledge is hence observed.

However, an incident at a project site showed how codification was used to bring out tacit knowledge. This was noted when a joiner declared to know how to fix a particular component, was instructed by the site manager to draw the detail so as to proof his knowledge. Such codification through the sketch brought out the tacitly existing knowledge in the joiner and
converted it to explicit knowledge that was readily accessible to the site manager. An additional benefit was also the fact that it reduced equivocality that could occur through verbal explanation.

**Combination mode**

No written procedures, checklists, practice manuals exist for any tasks. At the office there are no regular meetings, unless an urgent issue emerges then an ad hoc meeting will be called. At site level, project site meetings are the only regular meetings by Masasi. An organisation motto exists and appears in the company profile. Understood that not all in the organisation know the motto or are even aware of its existence. Lack of re-configuration of existing information was also observed in site meetings.

**Internalization mode**

Opportunities of internalization of explicit knowledge as through learning by doing observed in unskilled workmen in the various groups employed under a sub-contract agreement. Internalization through the use of diagrams, documents or manuals is non-existent. Learnt the consistent pressure to deliver projects did not give one a chance of internalization of explicit knowledge through success story telling. Further observed, although at the site level workers had their lunch together, the conversation did not dwell on issues related to work – but rather on other aspects like sports. However, respondents acknowledged that the specific demands of each project created new knowledge that was internalized.
### Tacit knowledge

<table>
<thead>
<tr>
<th>Tacit knowledge</th>
<th>Explicit knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socialization mode</strong></td>
<td><strong>Externalization mode</strong></td>
</tr>
<tr>
<td>Imitation</td>
<td>Dialogue</td>
</tr>
<tr>
<td><strong>Internalization mode</strong></td>
<td><strong>Combination mode</strong></td>
</tr>
<tr>
<td>Project specific requirements</td>
<td>Meetings</td>
</tr>
</tbody>
</table>

Fig. 7.3: Knowledge creation matrix - Masasi

(End of case 3)

### 7.4 Knowledge creation process - Konoike

**Socialization mode**

As all work is sub-contracted, and main contractor’s role is left to supervisory only, an incentive for apprenticeship kind of training does not exist at the lower operational site level. However, at supervisory level, the team constituency facilitates such form of training. For instance in the Arusha rehabilitation of roadwork project, the supervisory team had varying construction experience, constituting of eight, three years and a fresh graduate. Noted, such a variation of working experience being reflected in the way the supervision was being carried and hence provided an opportunity for the junior members to learn by observation, and imitation from the senior. However, learning by imitation or observation at the lowest operational level of plant operators and the manual labour for both skilled and unskilled observed to be difficult. For the manual labour once at site, the situation resembled a machine being switched on, the workers had to work at a particular tempo under direct instructions of a foreman.

Konoike practices “on-the-job training” more or less as an incentive for its employees who have served for a reasonable length of time with the company. The company also provides opportunities for university fresh graduates to obtain practical training. Learnt at the time, for instance, there were two such graduates from a consulting firm, Inter-Consult who were on practical training for one-year periods. Donor conditions have also facilitated ‘on-the-job training’ within Konoike. Learnt that the World Bank condition that has a component of capacity
building for international firms working in developing countries had obligated the supervisory team in the Arusha and Moshi municipalities rehabilitation project to be supervised by a team constituted of local professionals. For the team, this being their first endeavour in a supervisory role, felt that it was an opportunity to learn ‘on-the-job’ or rather, a ‘learn-by-doing’ experience.

At project level among the unskilled labour ‘on-the-job’ training is common. This occurs due to the fact that the unskilled labourers on being recruited, issue of skill is not paramount but more for the individual to show indications of being hardworking and obedient. Over time, these unskilled labourers acquire skills by working alongside experienced workers or through repeated instructions. As it was learnt, the practice of the sub-contractors was to move along with more or less the same gangs, this further created the opportunity for building up of skills. However noted such knowledge creation accrues to the sub-contractors and their team. Table 6.4.1 again is proof of such gain.

Peer assist practice exists within the various branches of Konoike Construction Company. This occurs through its various companies under its international divisions. For instance, it was cited that in one of the company’s project, the Kitonga Gorge rehabilitation work, a project manager had to be called from Konoike branch in Mongolia. The complex physical terrain found alongside the project necessitated this. Since it was recalled that the project manager had previous experience in working successfully in such terrains, he was hence assigned to the project in Tanzania. Such a practice exists also for all kinds of specialists in the various branches of Konoike. A synonym to brainstorming camps exists in the two weekly obligatory presentations that have to be made by Dar es Salaam project managers for each on-going project.

**Externalization mode**

The daily progress meetings carried out at both the site offices and the headquarters office in Dar es Salaam provide an opportunity for reflective reflection through the dialogue and discussions that ensue. At site level ad hoc meetings by the site supervision team to discuss urgent issues are also common. Through the progress reporting meetings both problematic and successful areas are noted. In an informal manner, observed, in the supervisory team, mistakes are acknowledged and discussed. There is no best practice manual for Konoike in Tanzania. However individuals are of the opinion that most of the explicit procedures set for managing various tasks were close to a best practice manual of the company. Konoike extensively uses charts, diagrams and models as devices for illustrating organisational relations, tasks and processes being undertaken. Examples
include: detailed data flow diagrams showing the processes involved from when a material requisition note is filled to the point the material is delivered to destination. Observed the diagram is adequately detailed to cover all possible occurrences such as – what if the material requested is not available in stock - or in the local market; detailed flow diagrams showing the flow of information on a material request from the company’s section, main store, security, site and supplier of materials; and detailed flow chart diagrams showing the sequence of involvement of various sections from the time a material is ordered to the time it is delivered on site and a feedback of delivery received.

Konoike uses charts extensively to show organisational relations. For instance observed in one of the projects, the Makuyuni-Ngorongoro road rehabilitation project that constituted construction of 77 kilometres of road, the project had a total of 14 different organisational charts. The organisational charts ranged from the overall that showed all sections in a project, to the organisation chart for the local staff quarters such as house cleaners and housekeepers to chefs and cooks in the canteen. In another project by Konoike for rural drinking water supply in Hanang’, Singida rural, Manyoni and Igunga districts a chart was even devised of the emergency communication system which did not only involve the company but depending on the magnitude of the emergency, the channel of communication also included notification of offices in Japan, the Tanzania government district government offices, the district hospitals, the relevant ministry in the government of Tanzania and the embassy of Japan.

Such examples implicate efforts towards establishing clear lines of responsibilities in the organisation. In addition to the zeal of demarcating lines of responsibilities, the organisation has explicit written job descriptions to all positions held in the company. In emphasizing on the lines of responsibilities, the staff responsibility chart shows also who reports to whom. Such an emphasis noted to be further pursued in the rules and regulations given to all persons engaged in the workshop and main store whereby three distinct and explicit rules appear:

- “Understand the organization chart”
- “Understand your position and line of communication”
- “Understand your responsibilities of work”

At site level codification features in the daily operational work such as: the daily report form that is filled in by the site engineer; the work requisition form that is filled daily and sent to
the consultant to approve the planned work for the day by the main contractor, weekly schedules indicating targeted progress and resource allocations. Occasionally observed among members, instantaneous hand drawn sketches are used to elaborate on a technological requirement in a task.

**Combination mode**
This mode of knowledge conversion involves combining different bodies of explicit knowledge (Nonaka and Takeuchi, 1995). In Konoike such conversion occurs in a variety of ways. These include the various contract documents used by the organisation such as working drawings, specifications and bills of quantities that re-configure project information into a more operational language. Other supportive modes are the various illustrations such as the bar charts, flow charts, flow diagrams, sketches and the various written procedures, checklists and daily meetings.

**Internalization mode**
Observed the various diagrams, charts and instructions form a key aspect for Konoike in the conversion of the knowledge that is embedded in such explicit modes. The specific nature of each project was also cited as an attributing factor to enriching the tacit knowledge held in the organisation. Manipulation of such tacit knowledge is manifested when an individual will be called upon from a different division to come and coordinate a particular project.

![Fig. 7.4: Knowledge creation matrix – Konoike](image)

<table>
<thead>
<tr>
<th>Tacit knowledge</th>
<th>Explicit knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socialization mode</strong></td>
<td><strong>Externalization mode</strong></td>
</tr>
<tr>
<td>Apprenticeship (managerial level)</td>
<td>Charts, models, diagrams</td>
</tr>
<tr>
<td>On-the-job training</td>
<td>Dialogue</td>
</tr>
<tr>
<td>Peer assist</td>
<td>Job descriptions</td>
</tr>
<tr>
<td>Brainstorming presentations</td>
<td>Policies, rules</td>
</tr>
<tr>
<td><strong>Internalization mode</strong></td>
<td><strong>Combination mode</strong></td>
</tr>
<tr>
<td>Drawings, Charts</td>
<td>Drawings, charts, diagrams</td>
</tr>
<tr>
<td>Meetings, dialogue</td>
<td>specifications, bills of quantities</td>
</tr>
<tr>
<td>Project specific requirements</td>
<td>Checklists, standards</td>
</tr>
</tbody>
</table>

180
The subsequent section gives a summary of the knowledge creation process of the four organisations as discussed. A tabular presentation has been adopted to ease understanding.

### 7.5 The knowledge creation process – a cross case analysis of case studies

Symbols have been used to represent the presence of an attribute in each mode as indicated in key.

*Table 7.1: The socialization mode – a cross case*

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Inter-Consult</th>
<th>NEDCO</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice</td>
<td>√</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Imitation, observation</td>
<td>√</td>
<td>X</td>
<td>√ X</td>
<td>√</td>
</tr>
<tr>
<td>On the job training</td>
<td>√</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Peer assist</td>
<td>√</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Brain storming</td>
<td>X</td>
<td>√</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Total</td>
<td>4/5</td>
<td>1/5</td>
<td>0.5/5</td>
<td>5/5</td>
</tr>
</tbody>
</table>

Key: √ = Attribute exists  
X = Attribute not existing  
√X = Attribute partially existing

From Table 7.1, Konoike has more attributes of socialization than any of the four organisations followed by Inter-Consult. Knowledge creation through socialization is insignificant in NEDCO and Masasi.

*Table 7.2: The externalization mode – a cross case*

<table>
<thead>
<tr>
<th>Attribute</th>
<th>NEDCO</th>
<th>Inter-Consult</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collective reflection</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Charts, models, diagrams</td>
<td>X</td>
<td>√</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Job description, best practices</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Explicit procedures, rules, checklists</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Total</td>
<td>0/4</td>
<td>1/4</td>
<td>0/4</td>
<td>4/4</td>
</tr>
</tbody>
</table>
Creation of knowledge through externalization mode is higher in Konoike than in the other three organisations. For the latter it is absent except for Inter-Consult that has at least one attribute.

Table 7.3: The combination mode – a cross case.

<table>
<thead>
<tr>
<th></th>
<th>NEDCO</th>
<th>Inter Consult</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working documents (Drawings, charts, diagrams, specifications, bills of quantities)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Checklists, standards, written rules</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Meetings</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Total</td>
<td>2/3</td>
<td>2/3</td>
<td>1/3</td>
<td>3/3</td>
</tr>
</tbody>
</table>

Both Konoike and Inter-Consult significantly use the combination mode in the creation of knowledge. Masasi again appears to be low in such a practice.

Table 7.4: Internalization mode – a cross case

<table>
<thead>
<tr>
<th></th>
<th>NEDCO</th>
<th>Inter-Consult</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning by doing</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Production and working with diagrams, charts, specifications, projects etc</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Success stories</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Dialogue</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Total</td>
<td>2/4</td>
<td>4/4</td>
<td>2/4</td>
<td>4/4</td>
</tr>
</tbody>
</table>

As can be seen from Table 7.4 Konoike and Inter-Consult have the most attributes in creating knowledge through the internalization mode. NEDCO and Masasi in this instance fair modestly.
7.6 Knowledge conversion triggers - a cross case analysis of case studies

Nonaka and Takeuchi (1995) had not only identified how knowledge is created through a conversion process of tacit and explicit knowledge, but had also identified knowledge conversion triggers in the process. See Table 2.7. Such triggers were hence explored if they existed in the organisations that were studied. The subsequent section discusses the data collected and the observation made.

Knowledge conversion triggers in the socialization mode – All the four organisations possess triggers for knowledge conversion in the socialization mode. Sharing of experience as an attribute in this trigger noted done in Konoike in its peer assist practice, while for Inter–Consult, in its peer reviews. Experience sharing however, is absent in NEDCO and Masasi.

Knowledge conversion triggers in the externalization mode – In NEDCO, this occurs in the technical meetings that convene to address specific problems in the organisation. Meaningful dialogue also noted in the scheduled meetings of Inter-Consult and Konoike. The same cannot be said for Masasi at the Malaria project site.

Knowledge conversion triggers in the combination mode – Taking networking of knowledge as the sharing of inventions, discoveries, and better ways of performing tasks – such initiatives are absent in all four organisations. However, with Konoike the calling of an individual from its various divisions to a particular project that has certain requirements, comprise an implicit networking of knowledge; and its circulation of newsletters and research activities in Japan headquarters to all its division is also networking of knowledge. With the latter, however the purpose of networking is defeated by the fact that some of this information is in Japanese language that employees in the division cannot comprehend. Respondents themselves consider time as a constraining factor to network knowledge acquired, as their main obsession is to complete projects.

Knowledge conversion triggers in the internalization mode – Graduates employed in Inter-Consult have an opportunity of internalizing knowledge acquired through learning by doing. The same opportunity noted in the supervisory team of the Konoike project in Arusha. The only difference is that, for Inter-Consult the initiative was its own, hence internally motivated while for Konoike it occurred as an obligation to the organisation in abiding to donor conditions.
A summary of the knowledge conversion triggers as portrayed by the organisations is given in Table 7.5.

Table 7.5: Knowledge conversion triggers – a cross case

<table>
<thead>
<tr>
<th></th>
<th>NEDCO</th>
<th>Inter-Consult</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: Socialization mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Experience sharing</td>
<td>X</td>
<td>√</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>II: Externalization mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meaningful dialogue</td>
<td>√</td>
<td>√</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>III: Combination mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Networking knowledge</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IV: Internalization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning by doing</td>
<td>X</td>
<td>√ . X</td>
<td>X</td>
<td>√ . X</td>
</tr>
<tr>
<td>Total</td>
<td>2/5</td>
<td>3.5/5</td>
<td>1/5</td>
<td>3.5/5</td>
</tr>
</tbody>
</table>

7.7 Enabling conditions for knowledge creation - a cross case analysis of case studies

The existence of the five enabling conditions for knowledge creation identified by Nonaka and Takeuchi (1995) was also explored in the data collected. These enabling conditions as referred to in chapter two of this study includes: intention, autonomy, fluctuation and creative chaos, redundancy and requisite variety. An exposition of the data collected is discussed hereunder.

Intention

An investigation as to what extent individuals were aware of the organisation’s intention, particularly the organisation’s business strategy and commitment was made. Two aspects were investigated: one was whether such intent or business strategy existed, and other, was whether employees in the organisation were aware of such strategy.

In Konoike it was noted the various working documents such as inspection records, material requisition forms, organisation and responsibility charts, quality policy, all attribute
towards enhancing awareness of the organisation’s business strategy and hence commitment. In Inter-Consult intention is less explicit, but commitment observed in employees attitude towards work; for instance, at 6:30 a.m. a majority of employees are seated on their desks although officially the working hours start at 8:00 a.m. Interviews of individuals for Masasi and NEDCO indicate intention differing within the seniority ladder, and on average is poor.

**Autonomy**

Stronger features of autonomy exist in Inter-Consult, noted when one is assigned a task, a lot is left to the individual on how the task is done provided it is delivered according to the time and quality required. The example cited earlier on in the text of the managing director coming to a junior’s office, pulling a chair and sitting next to discuss a submission, also attributes a lot to enhancing autonomy in the organisation. A typical scenario one would expect is for the managing director to summon the junior to his office! On the other hand in Konoike the seniority culture that exists bars autonomy. Masasi being a family business most of the positions in the top of the organisation are held by owners of which a major portion do not have academic qualification relating to the construction field, a factor that does not make the organisation’s environment conducive to autonomy. In NEDCO, no indications of autonomy noted.

**Fluctuation and creative chaos**

In probing this aspect, it was taken to refer to challenges introduced in the organisation so as to spike creativity and new ideas. This feature is absent in all the four organisations.

**Redundancy information**

This was explored based on organisation’s effort to facilitate its employees capture additional knowledge other than the operational knowledge that they have. Nonaka and Takeuchi (1995) had cited it as “learning by intrusion”. Features such as strategic job-rotation, sitting arrangements, working side by side were explored. No strategic effort to acquire knowledge through this mode was observed. The sitting arrangement in Inter-Consult where functional departments work and sit side by side to some extent could facilitate the sharing of additional information among individuals.

**Requisite variety**

Existence of features that enables an organisation to diversify so as to cope with the complexity of the external environment was explored. Requisite variety hence observed in three of the
organisations. In Konoike, its international affiliation identified as giving it leverage on the environment of which it works. For Inter-Consult, requisite variety lies in the multi-disciplinary feature of its professionals; that it has in-house civil, structural, mechanical, electrical, telecommunication, business, and water engineers, architects, and quantity surveyors. For Masasi its diversification into undertaking both building and civil work is an attempt towards requisite variety.

A summary of the enabling conditions for the four organisations is given in Table 7.6 and shows conditions for enabling knowledge creation are not at their best in all the four organisations. However of the four, Inter–Consult, has the most enabling condition.

Table 7.6: Enabling conditions for knowledge creation – a cross case

<table>
<thead>
<tr>
<th></th>
<th>NEDCO</th>
<th>Inter-Consult</th>
<th>Masasi</th>
<th>Konoike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>X</td>
<td>√, X</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Autonomy</td>
<td>X</td>
<td>√</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fluctuation and creative chaos</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Redundancy</td>
<td>X</td>
<td>√, X</td>
<td>X</td>
<td>√, X</td>
</tr>
<tr>
<td>Requisite variety</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Total</td>
<td>1/5</td>
<td>3/5</td>
<td>1/5</td>
<td>2.5/5</td>
</tr>
</tbody>
</table>

7.8 Summary:

This chapter has addressed one of the research questions posed by the study using the four case studies. In addressing the question on how construction organisations in Tanzania facilitate knowledge creation and transfer in their organisations, the knowledge creation process through its constituent modes: socialization, externalization, combination and internalization has been used and specific knowledge creation matrices for each organisation has been established. A cross-case analysis of the four organisations’ knowledge creation process has also been made. To further the analysis, knowledge conversion triggers and enabling conditions for knowledge creation have been explored and established for the organisations. The conclusion from the analyses is given in the chapter that follows.
8. Conclusions and recommendations

8.0 Introduction
This chapter ultimate the work set forth in this study. The study commenced in the first chapter by giving the profile of the problem being studied, chapters two and three that reviewed the extant literature and its relation to construction, followed by the research methodology, a pilot study and a presentation of data collection and analysis chapter. The chapter now discusses and concludes on: specific contribution to knowledge achieved by the study; the study’s propositions and questions; implication of the outcome of study to theory, policy and practice; limitations of the study, implications for further research and lastly, gives recommendations.

8.1 Contribution to knowledge
The distinct contributions to knowledge made by the study are as follows:

- The identification through empirical testing of the potentials of knowledge creation and transfer within the confines of construction organisation’s business activities.
- The mapping of an “as – is” knowledge transfer process in a real life situation of four organisations in the Tanzania construction industry.
- The development of an optimal process model for a knowledge transfer process that can be adopted by construction organisations in Tanzania.
- The establishment of the fact that: organisations in construction can understand how knowledge is transferred through a simple model as the one used in the study and hence improve their understanding of the process and give opportunities for improvement in their organisations.
- The use of replication logic as a key methodology in studies of construction organisations in the Tanzania construction industry.
8.2 Testing of the study’s propositions

This forms a key aspect of the case study approach that has been adopted in this investigation and according to Yin (1994) the crust of such an approach lies in testing what has been theorized. In this section a replication logic (Yin, 1994) has been used to test the propositions set earlier on in chapter one. For each organisation, it is established to what extent a posited proposition is demonstrated (literal replication) or not demonstrated (theoretical replication). The first three cases that portray the literal replications are discussed first. These cases are Inter-Consult, NEDCO and Masasi. However, it is to be further noted, although the three cases support the propositions, the pattern of the knowledge transfer process among them, is not identical. Of the three cases, Masasi and NEDCO more strongly portray the proposition features than Inter-Consult while Konoike though representing the theoretical replication of the proposition, traces of literal replication are also noted. A latter section gives an interpretation of such findings.

8.2.1 Proposition 1

The knowledge transfer process of construction organisations in Tanzania is incidental, unstructured and implicit

A similar approach of viewing the knowledge transfer process in organisations through its subprocesses is adopted and discussed in this section.

Information acquisition - Inter-Consult

Inter–Consult has shown various ways in which it acquires knowledge both internally and externally. However, such knowledge acquisition is not done strategically. Noted although highly upfront in the support of its employees to attend conferences, the sharing and hence tapping of information acquired by such an activity is left to personal initiatives. The organisation though acquires information and knowledge through its interaction with consultants, suppliers and clients in the carrying of construction projects, such acquisition occurs as one of the outcome and not intentionally solicited. This is so since such tapping occurs in site meetings, formal and informal discussions and correspondences. Printed material as a source of acquisition is not significantly relied upon. External acquisition of information occurs instigated by clients with specific specialization and not by the organisation’s initiative. Strategic efforts by Inter-Consult are nevertheless seen in recruitment of new members with specializations. The reported joint venture
schemes although impart knowledge to Inter–Consult such schemes original intent is to pull up resources and not acquire knowledge.

The organisation having identified its core competence as being based in the history of the firm, experience held by founder members and long-term employees, still, it is being noted no explicit efforts are done for the organisation to acquire knowledge from these anchors. Mistakes are being acknowledged as a means of acquiring knowledge, but no explicit strategies exist on how the organisation can best gain from such experiences. Adaptive changes, what the study has taken as equivalent to small and simple inventions are made, but these are left to individuals and no strategic forums are set up for the distribution or sharing of such innovations.

Remark:

Conclusively, although various activities done by the organisation result to knowledge acquisition, only a few of these activities are done intentionally to acquire knowledge.

Information distribution - Inter-Consult

Based on the model of analysis, Inter-Consult distributes information largely through explicit as against implicit means. However, such a situation is done strategically partially as it is only planned in the graduate in-training courses, job rotation of graduates, specialist courses of in-house training and through the networking of computers in the organisation. The organisation’s modest support of IT infrastructure is also a strategic feature for information sharing. Other than for the fresh-graduate programme, strategic rotation to enable the distribution and sharing of tacit knowledge is absent in Inter–Consult. The general sitting arrangement is planned for sharing information and knowledge in general, and since it is based on functional aspects, it is noted conducive for sharing redundant information of mostly tacit base (Nonaka and Takeuchi, 1995). Similarly observed, since its inception, Inter-Consult has not had a significant or an abrupt change in its organisation structure, a feature attributing positively to the preservation of the organisation’s cultural knowledge.

An implied strategy is seen in ensuring that what is communicated is absorbed. That is, media capacity and richness as expressed by Vito et al. (1999) is portrayed by the professional qualification and experience of employees in the organisation. On the other hand, apart from the observed face-to-face communication, no explicit strategies exist to enhance the media richness
for conveying information, that, written rules, standards forms and procedures, are not that
dominant. Although the media viscosity could not be established during the field investigation,
that is, how much of what is communicated is absorbed and used (Davenport and Prusak, 1998),
the friendly working environment in Inter-Consult indicated a good media velocity, that,
knowledge could quickly and widely be distributed.

Remark:

With limitations, strategic efforts of information distribution are observed together with
elements of implicit distribution and sharing of information.

Making meaning - Inter-Consult

Of the four organisations, Inter–Consult illustrates the closest resemblance to the analysis model.
Shared assumptions that aid interpretation (Garvin, 2000) are noted at departmental levels.
Conditions that facilitate collective interpretation (Dixon, 1999b) are also prevalent. The issue of
concern is whether: these had been planned for as vessels of making meaning or had happened by
chance; or have there been concerted efforts to ensure their existence? The organisation has not
strategically set such conditions to facilitate interpretation of information and make meaning, but
has ensured it has qualified personnel, an optimal physical arrangement and size so as to
effectively run its business. Hence by having such conditions, the organisation has implicitly
enhanced this process.

Remark:

Making meaning is dominantly done implicitly.

Organisation memory - Inter-Consult

Inter-Consult organisation memory according to the model of analysis is largely internal and
occurs both explicitly and implicitly. It’s maintaining of organisation records and reports to some
extent comprises an explicit intent for its memory base while implicit means of storing
information are observed in its working norms and rules. However, individuals as distinct
reservoirs of organisation memory do not feature. The external memory as found in its
competitors, previous clients, or former members, as illustrated in figure 6.1.4, portrays a grey
area. This is so as the organisation does not identify itself with any of the external repositories appearing in the analysis model.

**Remark:**

*The organisation strategic efforts for enhancing organisation memory dominant in the explicit mode through records and reports while implicit memory reservoirs exist in working norms and rules.*

**Retrieval of information- Inter-Consult**

Retrieval of information in Inter-Consult is of controlled mode and occurs explicitly by use of previous drawings, specifications and lessons learned in projects. However, it is left to individuals when prompted by a task while retrieval in groups is absent. Implicit retrieval of information could not be established from the data collection and remains as a grey area. Such retrieval includes retrieval through culture, structure, and individual memories. One of the presumptions is that, automatic retrieval cannot completely be absent in an organisation but it is possible it is so implicitly done that respondents cannot express it.

**Remark:**

*Retrieval is dominantly done by individuals explicitly but prompted incidentally by tasks.*

**NEDCO**

**Information acquisition - NEDCO**

As in Inter-Consult the support given by NEDCO for employees wanting to attend conferences, is not continued to tapping of the knowledge acquired, but is rather left to individuals’ initiatives. Absence of a documentation room, implicates reliability on printed material, as a source of acquisition is trivial. Acquisition of knowledge externally from other consultants, or contractors as in Inter-Consult is incidental and occurs in the course of the business undertaking. Venture schemes though may impart knowledge, are done as marketing strategies. Mistakes as examples of experiential acquisition of knowledge, exist in an implicit manner, in that they remain only known to individuals, and are not documented. Likewise for individual’s initiatives of enhancing performance, remain with individuals in an informal manner.
NEDCO acknowledging its history as contributing to the knowledge it possesses, being the first indigenous consulting firm in the country formed in 1968, no aggressive efforts are noted on building up from such a base. What is seen is just history, as just history. The critical reflections that are done in NEDCO’s technical meetings since they only convene to address specific problems, whatever knowledge is acquired from them is then incidental. Similarly as previously implicated in Inter-Consult, mistakes as an experiential form of knowledge acquisition remain known to individuals only.

Remark:

No strategic efforts exist in the organisation for acquisition of knowledge.

Information distribution - NEDCO
NEDCO distributes information through the various modes of formal communication and informal networks. In the formal communication since it occurs through memos, letters, or verbal means is hence strategic - in that, it is meant to distribute or share information and knowledge. However, one can argue that such form of distribution is merely procedural, and may be an indirect or passive distribution of information and knowledge, as one cannot compare it with training, internal workshops, seminars, or publications. The size of the organisation is noted conducive for information sharing although no strategic efforts exist to maximize on this aspect.

Remark:

The information distribution in NEDCO is mostly of passive nature.

Making meaning – NEDCO
At least a few explicit features in making meaning exist in the organisation; these include, consultation amongst working colleagues and individuals’ own network outside the organisation. Passive means of making meaning like in the work processes and recalling on the past exist. Structured, formal and use of tools in making meaning such as appearing in the analysis model are not known in the organisation.
Remark:

In this sub-process, the dominant mode for NEDCO in making meaning is through individuals’ initiatives. At organisational level no explicit strategic or structured efforts exist.

Organisational memory - NEDCO

Like for Inter–Consult, NEDCO relies on records and reports in its internal organisational memory. Policies in the core activity of the organisation focus on operational matters, and hence feature more or less like procedures. For instance a cited policy by a respondent that a structural drawing has to be counterchecked prior to submission, in my view is basically an operational procedure, taking the definition of procedure as “a way of acting or progressing in a course of action” (Wordfinder, 2000). Lessons learnt and best practices are tacitly held in individuals. Even among themselves individuals are not aware of what databases others hold. Consequently, whatever individuals learn does not guarantee that the organisation has learned (Argyris and Schön, 1978). Furthermore, there is also a danger of loosing knowledge held at individual levels when the individuals leave the organisation. As mentioned in a previous section by one respondent in NEDCO, the letting go of many of its employees when re-structuring the organisation was a mistake. NEDCO’s experience has similarly been experienced in organisations that had gone for leaner organisations (Davenport and Prusak, 1998). Davenport and Prusak (1998) cited how experienced aerospace engineers in the US encouraged to leave during downsizing periods took valuable knowledge out of the door with them that in some instances they had to be re-hired so that essential work could continue. They also cited how Ford failed a customer requirement when new car developers wanted to replicate the success of the original Taurus design team. It happened that no one remembered or had recorded what was so special about that effort.

Conclusively apart from records, reports, norms and rules, the continued existence of other cited organisational repositories of NEDCO such as existing employees and ex-employees cannot be guaranteed, since no efforts are done of codifying the knowledge possessed by these repositories. For the former repository, unless there is significant organisational re-structuring process, the norms, rules, reports and records will continue to be relevant repositories. However, the same cannot be said for the latter. What if ex-employees contacts are lost and they become
out of reach? What if a substantial turnover of employees occurs in the organisation? These as mentioned are some of the limitations that make individuals unreliable repositories for an organisation memory base.

Remark:

The organisation memory base of NEDCO is largely unstructured.

Retrieval of information - NEDCO
Retrieval of information in NEDCO occurs through the explicit and controlled mode in lessons learnt by individuals. Controlled retrieval by individuals is also used when an ex-employee is consulted. However, this latter move is incidental, and at organisational level there are no structured procedures on how or when such retrieval is to be done.

Structured means of automatic retrieval such as those embedded in organisation structure, culture are absent. Automatic retrieval is through individuals’ memory, retrieving what is tacitly held. The pros and cons of the automatic retrieved knowledge are again referred to (Dixon, 1992) - that, an automatic retrieval could imply what is learnt, is so well learnt, that it enhances the cognitive capacities of the organisation for new learning. On the other hand since this retrieval mode is tacit, it is not made available for reflection or challenge and hence may be risky. However, for NEDCO the fact that the automatic retrieval is only from memory of individuals and not identified in the organisation’s culture, structure, physical environment and/or transformations, make the afore mentioned benefit, insignificant and the negative aspect, stronger.

Remark:

Retrieval is implicit, mainly from individual memory.

Masasi Construction Company

Information acquisition - Masasi
For this organisation, not only is the knowledge acquisition process incidental, un-structured and implicit, relative to the analysis model, it is also weak. To reflect on some of the features that had emerged from the data, one notes that: employees are not encouraged by the organisation to
attend conferences; printed material, publications or technical reports are not identified as a source of acquisition of knowledge, hence are not available; recruitment is done only when a particular skill is needed; and venture schemes are only for the purpose of pulling resources. Like for the other three firms discussed in the previous section, experiential acquisition of knowledge by the organisation is through mistakes and this is noted, uncodified.

Remark:

A general weakness observed in activities that facilitate information acquisition.

Information distribution - Masasi

Masasi like NEDCO’s facilitation of information distribution is very limited. The rich media of communication, face to face, is the dominant mode in the explicit distribution of information. To complement the verbal communication and reduce equivocality, written material is essential (Vito et al, 1999); however, written materials such as standard procedures or rules are noted absent in Masasi.

At site level although site operations offer more opportunities for distribution and sharing of information than its headquarters’ office, this is more or less of procedural nature. It occurs through work that is done in teamwork and the frequent dialogue that ensues. Such teamwork offers an opportunity for workmen to share tacit knowledge. However, due to the fact that Masasi sub-contracts to domestic sub-contractors and remains only as the coordinating manager of a project, such sharing is not guaranteed to enrich the knowledge base of Masasi. The reliance on informal networks in the distribution of information as reflected from the data collection, does not make the organisation sure of what information is being distributed and to whom. Such a mode cannot be compared to the benefits of a task force or the use of job rotations that is missing in this organisation.

Remark:

A very limited form of information distribution, one that relies on an informal network.

Making meaning - Masasi

In the interpretation of information as a stage in the making meaning sub–process, Masasi uses individuals, work processes and unlearning behaviour. In summoning an individual for the
interpretation of particular knowledge, the implication is that the organisation identifies the individual as its knowledge asset. Of interest then is how many in the organisation are aware of such knowledge assets? Has Masasi done any strategic effort to make them known so as to effectively use them? The work processes identified as channels of making meaning done in the inspection and checks of tasks are also incidental. No information could be obtained on how the organisation makes structured analysis in this sub-process. The implication henceforth is that, there are no specific strategies that the organisation has made in this process and the analysis of information is left to chance.

**Remark:**

There are no known strategies for making meaning. Un-structured, informal interpretation of information is made through specific individuals that are taken as organisation’s knowledge assets.

**Organisation memory - Masasi**

Explicitly individuals build up their own databases. However, the organisation does not have a system of tapping such information. This as earlier mentioned is a danger to the organisation since these databases established and known to individuals only, pose as a potential loss of knowledge when these individuals leave the organisation. Furthermore such inventory and inventions by individuals do not imply that the organisation learns from them. In the procedural work, the limited documentation, further limits the organisation’s memory base. Surprisingly, although Masasi in the process of making meaning, individuals’ knowledge is sought and acknowledged, in the identification of organisation memory, respondents did not identify individuals’ as repositories for the organisation.

**Remark:**

Strategies in storing knowledge in explicit form are limited.

**Retrieval of information - Masasi**

The retrieval mode of Masasi closely resembles that of NEDCO in that individuals do it through organisation reports and from memory. No strategies exist on how best to retrieve information, as this is only left to individuals to retrieve directly from reports and records or from memory. No
automatic retrieval modes such as in structure or culture exist. Conclusively, the organisational retrieval mode is mostly un-structured and implicit.

**Remark:**

**Retrieval of information is implicit and is from an individual’s memory base.**

**Konoike construction company**

**Knowledge acquisition - Konoike**

Konoike works together with some clients in proposal writing whereby the organisation’s input is in the technical aspect. In such schemes the organisation subsequently acquires information relevant to its performance. However like for the other three organisations, such acquisition is incidental. With its international background, respondents do not perceive the organisation as acquiring knowledge through interaction within the country, but rather the contrary is perceived. However field observation gave a different scenario as knowledge acquisition noted to occur in interaction with consultants, and statutory authorities. Recruiting new members is made to bring in specialists, however done when there is a job that requires specialization, and not for enriching the knowledge base of the organisation. Hence one cannot identify such action as a knowledge strategy. Experiential acquisition of knowledge is noted by the organisation making use of success stories. Konoike’s devised standard documents for managing construction projects such as the checklists for various tasks, inspections and responsibility charts, can be perceived as a strategic action towards enhancing performance.

**Remark:**

**Implicit acquisition of knowledge dominant through experiential means.**

**Information distribution - Konoike**

Aspects of strategic distribution of information in Konoike are seen in areas such as the one-year programme of its employees in Japan for practical training, on-the-job rotation done for a newly recruited employee, teams assigned as task forces in projects and the numerous scheduled meetings. Of the four organisations studied, Konoike is the only one that has shown more sources
of implicit distribution of information as portrayed by the analysis model. This occurs, through its norms, culture, procedures and standards. For the first two, the interpretation is that, such a process is so embedded in the organisation that it appears in such modes as culture and norms. For procedures and standards it is noted that it indicates a strategic move by the organisation in ensuring that particular information is distributed unequivocally. Like in the other organisations, information distribution through the day-to-day formal communication occurs.

Remark:

**Strategic distribution of information existing, and is strongest of the four cases studied.**

**Making meaning - Konoike**

Strategic interpretation of information in Konoike is observed in various activities. These occur in the regular scheduled meetings that are done both at site and office levels, in its culture of seniority and the various standard documents that it improvises. The meetings at site level noted not only of discussing procedural matters, but also serve for interpretation and analysis.

Remark:

**Strategic interpretation in making meaning exists.**

**Organisation memory - Konoike**

Konoike’s organisational memory, like for the other three organisations according to the analysis model is largely internal and explicit. The explicit memory is mostly structured and appears in the form of ISO certifications, policies, reports and databases. Of the organisations studied, Konoike is the only one that has an ISO certification and also one that has an explicit policy that is reviewed each year. Konoike hence stands to gain by having a structured organisation memory such as that in the ISO certifications as it acts as a vessel for shared maps of values, and the subsequent acting of individuals in the organisation such that what the individuals learn, become embedded in the organisation memory. Such a situation is what Argyris and Schön (1978) had referred to as “organisation learning”. Its strong culture, norms, procedures and standards also implicate an implicit memory reservoir in existence.
Remark:

A structured, strategic explicit memory base exists together with a strong implicit memory.

Retrieval of information - Konoike

Strategic retrieval of information occurs in codified policies, standards and procedures that the organisation holds. The organisation in retrieval of information does not leave much to chance as written rules and instructions dominate.

Remark:

Strategy in retrieval of information exists through a variety of codified documents.

Conclusive remarks for Proposition 1:

The three organisations, Inter-Consult, NEDCO and Masasi demonstrate though in varying magnitudes that the knowledge transfer process of construction organisations in Tanzania is incidental, un-structured and implicit. Konoike on the other hand being an international organisation active in the construction industry in Tanzania demonstrates with limitations, features that do not strongly replicate the proposition.

8.2.2 Proposition 2

Construction organisations in Tanzania do not facilitate knowledge creation

The same replication logic was used for the second proposition; whereby Inter-Consult, NEDCO and Masasi were tested as to whether they supported the proposition, while Konoike was investigated as to whether it behaved as expected by not demonstrating features given in the proposition. The knowledge creation process discussed in chapter two section 2.8.1 has been used in the testing of the proposition and the results are as discussed here.

- **Socialization mode** – Konoike has shown to have more attributes of the socialization mode than any of the four organisations, followed by Inter-Consult. Knowledge creation through socialization is insignificant in NEDCO and Masasi. Refer Table 7.1.
- **Externalization mode** - Creation of knowledge through externalization mode is higher in Konoike than in the other three organisations. Inter-Consult has at least some features of
externalization and for NEDCO and Masasi externalization is almost absent completely. Refer Table 7.2

- The combination and explicit mode - Both Konoike and Inter-Consult significantly use the combination and explicit mode in the creation of knowledge. NEDCO and Masasi appear to be low in such a practice. Refer Table 7.3

- Internalization mode – In this mode of creating knowledge, Konoike and Inter-Consult not only show existence of the internalization mode in the creation of knowledge, but also show this mode features strongly. Refer Table 7.4

To further test the second proposition, the existence of enabling conditions for knowledge creation and triggers for knowledge conversion in the organisations were analyzed. The outcome is as given below:

- Triggers for knowledge conversion – triggers for conversion of tacit to/from explicit knowledge in the knowledge creation process are highest in Konoike and Inter-Consult and lowest in NEDCO and Masasi. Refer table 7.5

- Enabling conditions for knowledge creation - conditions for enabling knowledge creation are not at their best in all the four organisations. However, of the four, Inter–Consult, has the most enabling condition. Refer Table 7.6

Conclusive remarks proposition 2

Inter-Consult, NEDCO and Masasi again in significant but varying magnitudes have shown to support the proposition that facilitation of knowledge creation in construction organisations in Tanzania is insufficient. Konoike on the other hand, has shown features though to some limitations that does not replicate the proposition. An issue of interest that emerges from these outcomes is that, both propositions give more or less the same results from which an interpretation is subsequently made.

Organisation culture - It is interpreted that such results are attributed by the influence of organisation culture of the cases studied. The organisation that did not support the proposition and more or less portrayed a formal and strategic knowledge transfer process is an international company with its base in Japan but has been working in the Tanzania construction industry for slightly over a decade. It is hence logical to presume that Konoike will have organisational
attributes that reflect its international orientation and competitive experience working in an international market that domestic organisations in Tanzania would not have. In addition being a Japan based organisation, a country renowned for its organisational or corporate management skills that are reflected in high performance, all these are viewed as an added advantage to this organisation. Furthermore, if knowledge management initiatives are linked to performance of an organisation (Robinson et al, 2004; Argote and Ingram, 2000; Vito et al, 1999) then it is expected of Konoike to portray better knowledge management initiatives than organisations that do not have the stated advantages. The other three domestic organisations do not have the international advantage that Konoike has or the background of an advanced construction industry, but are rather typified by limitations prevalent in a construction industry of a developing country (Ofori, 2001).

8.3 Concluding remarks on research objectives

As set forth in chapter one, research questions were formulated to enable achieve the research objectives. The questions were used in the data analysis chapter and the findings are presented here.

8.3.1 Research question 1

“How do construction organisations in Tanzania transfer knowledge” How do they

- Acquire
- Distribute
- Make meaning
- Organize to memory (store) and
- Retrieve - information and knowledge

The general overview of the knowledge transfer process from the study’s findings is that:

The knowledge transfer process of construction organisations in Tanzania is incidental, un-structured and implicit - and that

i) The process is not identical but differs from one organisation to another, with organisations showing in various magnitudes: different sources and patterns of
acquiring, distributing, making meaning, storing and retrieving information and
knowledge. Refer chapter six.

ii) The typical knowledge transferred is the day-to-day knowledge that is found in the
business undertaking of the organisation hence making the knowledge situational.

iii) There is limited codification of knowledge thus knowledge remains, unstructured
and implicit.

iv) Organisations are more concerned with short-term goals hence time for critical
reflections and unlearning is not given due significance.

v) The mode of “selling jobs” being practiced in contracting firms does not create an
incentive for the main contractor to improve on the labour resource - such as the
imparting of knowledge to the labour force.

8.3.2 Research question 2

How do construction organisations in Tanzania facilitate knowledge creation in their
organisations?

The conclusion made is that:

Construction organisations in Tanzania do not facilitate knowledge creation – that in the
conversion of knowledge, (the premise being, knowledge is created through a conversion process
of tacit and explicit knowledge, and occurs in four modes: socialization, externalization,
combination and an internalization mode (Nonaka and Takeuchi, 1995)

i) Socialization attributes are few – there is limited practice of on-the- job training,
peer assist, learning by imitation, observation and apprenticeship. In consequence
acquisition of tacit knowledge such as that in skills and work of craft-man nature
becomes limited.

ii) Externalization attributes are limited – that, collective reflections, best practices,
codification of procedures, rules, checklists are insignificantly done or completely
absent. The externalization attribute being key to knowledge creation (Nonaka and
Takeuchi, 1995), the implication is that tacit knowledge existing within
individuals, and in the organisation does not get a chance to be externalized and
shared. That is, existing knowledge in tacit form remains inaccessible to
individuals in the organisation.
iii) Combination attributes existing but not codified – re-configuration of existing information as that occurring when working with documents, drawings, or when operationalizing business plans, organisational objectives, or even in conversation exists but is mostly not codified and in some instances exists tacitly in individuals’ heads. As for the expected outcome of this mode is to build on existing explicit knowledge, lack of codification bars its effectiveness.

iv) Internalization attributes are limited – that, learning by doing, through success stories, sharing of experiences, values, beliefs and acting together is low. The implications are that, individuals do not have an opportunity of internalizing the knowledge that exists in their environment.

v) Knowledge conversion triggers are limited in all the four modes of the knowledge creation process (refer table 7.5). In the four organisations

- Networking of knowledge is very poor
- Experience sharing is low
- Learning by doing is low
- Meaningful dialogue is moderate

vi) Enabling conditions for knowledge creations are few – that, organisation’s intentions such as the business strategy is known only to a few and is not documented. There is limited autonomy given to workers, and opportunities for capturing information and knowledge other than the operational knowledge are limited. The overall implication is that knowledge creation is hindered. Requisite variety – that, how an organisation responds to challenges posed by the environment, noted to exist in all four organisations, but linked largely to survival versus knowledge initiative.

8.3.3 Research question 3

*What is the optimal knowledge creation and transfer process for construction organisations in Tanzania and how can it be presented in a form that can be communicated effectively?*

**The business process knowledge transfer model**

This section proposes a knowledge transfer process considered optimal for construction organisations in Tanzania. The proposed model has adopted the IDEF0 business process model as
a presentation tool. Such a position has been taken based on the advantages that are offered by the IDEF0 model. These are:

i) The level of detail that the IDEF0 modelling can provide - that the IDEF0 uses a top-down approach and organisations can hence go to lower levels of detail to a point where their purpose of developing the model is achieved; whereby it is expected in the modelling process, the potential of identifying needs and opportunities for improvement occur.

ii) Activity identification – that for every activity in the model, one is compelled to identify its input, resource requirement, and constraints or controls that exist for the activity and lastly identify the inferred output. Such a requirement enhances the understanding of activities being done and also provides room for improvement.

iii) The simple graphical language – the graphical language of boxes and arrows used by an IDEF0 model is simple to develop and understand. This, the study considers as an essential tool for the implementation of a model by organisations. In addition, the fact that a corresponding node tree diagram can be produced with an IDEF0 diagram provides a complementary tool for organisations to better understand a model.

The model proposed in this section although stated as suitable for construction organisations in Tanzania is considered applicable to organisations in other developing countries whose industries like Tanzania are typified by constraints that hinder performance. Constraints in the Tanzania construction industry among others include:

- An institutional weakness – to date the construction industry policy is just about one and half years old, both the Building Act and regulations are still in preparation and the enforceability of some of the regulations and by-laws related to construction organisations is still a problem.
- Inadequate infrastructure – this refers to resource availability. For the contracting firms it refers to finance, plant and equipment and for the consulting firms mainly, IT infrastructure.
- Low level of human resource development – this refers to organisational and technical skills, and qualifications of the human resource.

It is henceforth considered, apart from the inherent technical benefits that exist in a process model, the proposed model will address the mentioned constraint on human resource development and improvise better organisational skills for construction organisations.
The proposed model

The theme of the model is that, for organisations to enhance performance, they have to sustain knowledge and take knowledge as a key asset. To achieve this, they need to have a knowledge management vision, knowledge strategies and to improvise an effective knowledge transfer process that would realize the organisation’s strategic goals. (Refer to the theoretical framework section 1.4 and Fig. 8.1). In building up the model, two of the pre-requisites of an IDEF0 model, the identification of the model’s purpose and the choice of a viewpoint have been made. The purpose of the model being, to develop a knowledge transfer process for sustaining knowledge in the organisation so as to perform business; and a viewpoint of a construction organisation has been taken.

However, it is acknowledged that the specificity of a model to a particular group such as construction organisations in Tanzania will feature more as one goes down the level of detailing as more specific information emerges. For instance resources such as manpower or finance at lower levels of decomposition will give more qualitative and quantitative information relevant to the organisation(s) that may appear in terms of the qualification of manpower or the magnitude of the budget. As this requires specific information for every organisation, while the model developed is intended to be of general nature and hence applicable to construction organisations as one entity, the decomposition has been done retrospectively. The model commences by a primary objective, “Perform business” diagram that shows key inputs required: organisation management of which an incentive system is a core part, external and internal information, and finance. It also shows how they are transformed into products or services the business offers, or organisation goals. The model acknowledges that in converting inputs to products and services such a transformation is controlled by external constraints of which the market reward system for performance is central, organisational policies, procedures, rules, norms, and budgets.

As stated in the theoretical framework, for firms to perform they need to take knowledge management as a key asset, and thus established knowledge strategies have to be made operational. One of the ways this can be achieved is to have an effective knowledge transfer process in place. Figure 8.2 Diagram A0 illustrates how firms can perform with such a strategy whereby three key activities are identified: establish a knowledge vision, establish knowledge strategies and transfer knowledge.
For the activity “transfer knowledge” to be useful to an organisation it has to be in a form that can easily be understood and effected. This can be achieved by detailing it through what the model refers to as a decomposition process. In decomposing the transfer of knowledge activity as appearing in figure 8.3 diagram A3, one notes that although the transfer process constitutes the
five sub-processes as the model that had been used in the analysis of the case studies, the sub-processes in this case are relatively more informative. They now show inputs and resources required to achieve the desired outputs and the constraints that exist for each sub-process. For instance in making meaning, best practices in the firm are an important resource while the making meaning process is constrained by organisation’s set procedures, processes, rules, norms and budget.

![Diagram](image-url)

*Fig. 8.3, diagram A3: Transfer knowledge*

The level of detailed information is increased in the model when a decomposition process is further made; that is, when sub-activities within are identified and illustrated producing what is known as a child diagram. Decomposing the first sub-process, “acquire knowledge”, more information is provided on what the organisation can do to achieve this condition and the constraints available. See Figure 8.4 diagram A31. Looking at the recruitment process when done specifically to bring in expertise in firms, the diagram shows that it is important for organisations: to be up to date with what is happening both within and outside the organisation that is - the external and internal information; and to be clear on the organisational standing on recruiting for bringing in knowledge in the organisation. With the latter, involving recruitment procedures, skills and expertise that is sought; improvising the necessary finance, and being current on market and professional information.
Diagram A32 of figure 8.5, shows a decomposition of the “distribute information” activity identified by four sub-activities: job rotate, identify task forces, hold meetings and critical reviews and distribute circulars, memos and publications. Again it is noted at this level of the process, the inputs, resources, controls and outputs are further decomposed to more detailed forms hence enhancing the communication even further.
Further detailing to enhance the process when done to the activity “identify task forces” provides more information for the organisation to undertake the parent activity “distribute information” more efficiently. See figure 8.6 diagram A322. For instance looking at the “select team” sub-activity, the required mechanisms (resources) of both specific and general nature are identified and include: skills portfolio of individuals, task specifications for the former, and for the general mechanism include, the organisation, manpower, finance and time.

When a further decomposition of the sub-activity “assign task to team” is made, activity relations that appear as shown in figure 8.7 diagram A323, feature. Four sub-activities have been identified in the model: prepare plan of work, divide task between members, perform task and report on task.

Fig.8.6, diagram A322: Identify task forces

In the “assign of task” activity, an important feature that is commonly forgotten is a feedback feature of an assigned task and is included in the model as, “report on task” activity. Another feature of interest in this level of decomposition are the constraints that are subjected to the sub-activities. For instance, in the “prepare plan of work” sub-activity, this activity is constrained by: regulations and by-laws, physical conditions of site, organisation database and the task complexity and detail made available.
A decomposition of “prepare plan of work” to be carried by the task force at an even lower level identifies more relations as shown in figure 8.8, diagram A32231. It is noted at this lower level more detailed information is required on all the four parameters that constitute an activity, the input, mechanism, control and output. In preparing a programme the task force has to be aware of the constraints prevalent in the corresponding parent diagram and carried over to this level.
For subsequent parent activities in the model, the making meaning, organisational memory and retrieval, a similar decomposition process is done and the complete model is as indicated in the appended node tree diagram (See appendix ‘C’)

The node tree diagram
A node tree has been produced to illustrate the content of the model and enable organisations to grasp the breadth and depth therein, and appears in appendix ‘C’. Feldman (1998) had considered whenever a particular aspect of a model needs to be changed or understood the node tree serves as a quick reference. Hence it has been produced to give an overall picture of the model and detail of composition to aid understanding by construction organisations in Tanzania.

Conclusively, the preceding section has developed a knowledge transfer process model that communicates more effectively to organisations that aspire to enhance performance through knowledge management initiatives based on the theoretical framework of the study. It has adopted the IDEF0 business process model that identifies each activity in a process by four parameters: inputs, control, output and mechanism (ICOM). Overall, the model has developed 42 activities at various levels of detail (See appendix ‘C’). Choice of decomposition between activities was aided by observing the added advantage of decomposition in the respective activities. Furthermore, the levels of detail also took into account the possibility of construction organisations in Tanzania adopting the model and improve. In this, decomposition was limited to facilitate these organisations produce the model manually.

8.4 Implications to theory
Adaptivity of knowledge management initiatives - The study has taken knowledge management in organisations as the creation of a thriving work and learning environment that fosters continuous creation, aggregation, use and re-use of both organisational and personal knowledge in the pursuit of new business or enhancing organisational value (Egbru et al, 2003). From such a definition, it hence follows that, concepts on organizational learning, learning organization, and knowledge transfer fall under the knowledge management initiative. The study has furthermore acknowledged similarities in the literature on the mentioned concepts. In mapping these initiatives the study traced the literature as far back as Argyris and Schön’s work (1978) slightly
more than a quarter of a century back. A gap in time is noted until 1990 whereby Senge (1990) emerges with his 5th discipline concept of learning organizations that stimulated discussions and interests, and one sees works in knowledge creation (Nonaka and Takeuchi, 1995), working knowledge (Davenport and Prusak, 1998), organizational learning (Argyris, 1999; Dixon, 1999b), and knowledge transfer (Cordey-Hayes and Gilbert, 1996; Vito et al., 1999) joining in. This pattern continues with the works of Argote and Ingram (2000), Sverlinger (2000) on knowledge transfer and Probst et al. (2000) on knowledge management. Narrowing of the knowledge management initiative is observed there-from, where a focus on project environments is noted (Bresnen et al., 2003; Schindler and Eppler, 2003; Anheim, 2003). A key observation is that, these contributions focus on the developed countries and are hence expected to reflect situations that apply in such economies. One of the outstanding revelations made from the outcome of this study is in the conformity of various features in the study, to some of the concepts of the developed world. Such conformity has been observed in:

- Factors that influence the knowledge transfer process (Jacob and Ebrahimpur, 2000; Goh, 2002; Davenport and Prusak, 1998) – of which organisational culture, pressure on time and lack of incentives for sharing knowledge had featured strongly. For instance the influence of organisational culture on modality of knowledge transfer noted to differ in Konoike, which is an international organisation from Japan working in Tanzania, from the other cases studied that are Tanzanian.

- Triggers of knowledge creation – in that “problem solving” being identified as a key factor that instigates knowledge creation, followed by “the management of change” by organisations; a situation equally observed in Egwu et al. (2003). Managing of innovation as a trigger for knowledge creation in the organisations however, did not feature out strongly. This is to be expected since innovation in construction is at low key and where it exists, it is led largely by “problem-solving” (Gann, 2000).

Likewise, despite acknowledging the significance of cultural differences between the Western and African countries on ideas, or techniques imported from the former (Muriithi and Crawford, 2003), the analytical tool used in the study - the knowledge transfer process model though imported, has effectively performed in studying the research problem. A number of interpretations are plausible in explaining the conformity henceforth noted. Either:
The characteristics of the construction sector and the organs that act within it (organisations) are strong and hence surpass the influence of local conditions or

Such results portray the “neutrality” of a knowledge management initiative or

The tool of analysis does not accommodate the reflection of local conditions

The first of the three points mentioned appears more likely as it reflects the inherent “typical” features of activities in the construction sector. Recalling an incident during an interview of a respondent’s reply that elaborates the point further that

“Despite the advancement in technology, the setting-out procedure in the construction of a building has remained the same”

Such a revelation is a positive situation acknowledging the fact that developed countries are more active in Research and Development (R& D) and the non-existence of R & D activities in construction organisations (contractors and consultants) in Tanzania as established by the pilot study – one then expects solutions or inventions made in knowledge management elsewhere, that are applicable to construction would within limitations, be applicable to construction organisations in Tanzania. It also implicates that universally teams can come up together to work towards enhancing further knowledge management initiatives.

The theory of action (Argyris and Schön, 1978) - The deployment of the theory of action that is noted in the organisations such as when an organisation supports activities that enable individuals to acquire knowledge such as participation of conferences, but not having any identified mechanisms of how the organisation would benefit from such participation, can have a number of interpretations. It is possible that the organisation is portraying the espoused theory, behaving in a manner that is expected, but in actual fact, its theory in use or what it believes in, is that the gain of such action by the organisation is insignificant. This implicates that organisations do not as yet link particular activities to acquisition of knowledge by the organisation. The other interpretation is that, organisations assume knowledge acquired by the individual will dissipate and be captured by others and used for organisational gain – a situation that has no guarantee (Argyris and Schön, 1978).

The implication to the organisation is that, knowledge remains within individuals and as Argyris and Schön (1978) had stated, “individuals may learn but organisations may not learn”.

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Hence the organisation may not benefit from the knowledge held by individuals. Such a prediction has similarly been given by Dixon (1992) when she cautioned organisations against a presumption that when knowledge is widely available within individuals in organisations, then it is assumed it is going to be used.

**Knowledge reservoir bias** - The noted reliance of organisational repository in the form of records such as in files in the organisations studied – has an inherent shortcoming in that; such records rarely document the underlying reasons behind events. Seldom will the records document why certain mistakes occurred, or what were the underlying reasons behind the success story. This has an implication to construction organisations in that chances for learning from mistakes become limited hence “re-inventing the wheel” becomes a common phenomenon while no assurance exists of maintaining successes.

**Absence of codification of knowledge** – meaning, a lack of codification of lessons learned, discoveries, or inventions at the organisation’s level. This can be explained as a result of organisations not having the practice of identifying lesson’s learned in works that are undertaken; and construction organisations being project oriented organisations, it hence follows that the identification of lessons learnt from projects is absent. The pressure on time and lack of motivation are observed to attribute to such a shortcoming, a situation also noted in Schindler and Eppler (2003) who explained it as a consequence of organisations not seeing the direct use of the experiences gone through. One of the implications to the organisations is that, lessons learnt and knowledge acquired by individuals and/or the organisation remains largely in tacit form - a form that is difficult to access and share. The other implication to the organisations is that they may loose such acquired knowledge when individuals leave the organisation or when there is a significant re-structuring of the organisations such as a downsizing (Davenport an Prusak, 1998).

**Media of distributing information** - the dominant method of face-to-face communication although is being upheld as an effective communicating mode, has limitations, in that knowledge cannot be shared fully within the organisation since some of the tacit knowledge cannot effectively be articulated verbally and in consequence certain knowledge only exists with particular individuals only.

To address limitations discussed above, the theoretical model proposed by this study is considered a point of departure. In effect, the proposed optimal knowledge transfer model discussed in the preceding section could be adopted. The subsequent section hence discusses
what are the implications for construction organisations in adopting such a knowledge transfer strategy.

8. 4.1 Implications for organisations

Incentives as a priori to transfer knowledge in construction organisations in Tanzania - Taking knowledge transfer as a strategy for competitive advantage (Argote and Ingram, 2000; Vito et al, 1999), it is justifiable to contemplate that every organisation aspires to a competitive advantage against its competitors. If this is true as an issue of interest, why are certain organisations more strategic in the knowledge transfer process and others less so? Why for instance do NEDCO and Masasi portray a less strategic transfer process than Inter–Consult or Konoike?

Davenport and Prusak (1998) had identified incentives while Goh (2002) had referred to “visible rewards” for sharing knowledge as one among the facilitators of knowledge transfers in organisations. Although these authors’ focus is on knowledge transfer at a functional level within say departments, units or individuals in the organisation, the same variable applies at the strategic level or the decision making level. Henceforth, for organisations to be motivated to strategically transfer knowledge, the gain for such an approach should be clear to the organisation; a view that concurs with Robinson et al’s (2004). Essentially then, an organisation has to believe that such a move does incur minimal cost or no cost at all. Based on Milgrom and Robert’s (1992) conceptualization on the efficiency effects of parties to a contract when there are potentials of moral hazards, it is anticipated that the organisation would adopt a cost-effective approach. By this, an organisation will do just enough in knowledge management initiatives that would not lead to extra costs, but yet give the organisation a competitive advantage; which for a construction organisation implies more projects won by a contractor or more consultancy commissions acquired by the consultant firm.

From such a predicament then, the award criterion of contracts is of significance to these construction organisations that will henceforth aim to adopt knowledge management initiatives just enough to boost its position in the criterion scale. The problem then lies on monitoring how much to increase its potential for award that is gauged on: i. Capability (technical, resources, experience) ii. Price (lowest evaluated i.e. most competitive). On the other side, the tender award panel does not go into details of the process that an organisation has gone to achieve the capability or to the price it offers, rather the focus is on the outcome. Hence an incentive for construction organisations to adopt processes or practices such as the knowledge transfer process
that are considered optimal for enhancing performance is not very strong – unless the organisation strongly believes or has proved through experience that there is a direct link between the adoption of particular practices such as the knowledge management initiatives and the market reward system.

The award parameter that focuses on “price” and “completion times” hence explains the submission of under-priced bids or unrealistic completion times by contractors. For consulting firms, the award process is even more vulnerable with regard to the issue discussed in that – it is not as clear or formalised as the one for contractors, in that the client at times approaches a consulting firm or in some instances for design work a design competition might be made and award made on the brief provided. Like for the contracting firms, the award process is not directly linked to how the organisation manages its practice, and the notion of award based on how the organisation manages knowledge, is far-fetched.

However, taking the concept that those organisations that have a strategic knowledge transfer in place will have an enhanced performance and a competitive advantage in the market, the situation discussed above will be short-lived. It is thus anticipated that in the short-term the industry would award less able organisations but over time the poor performance will show up and these will be dropped from the market’s short-list. That is, the potential of even being invited to bid will be non-existent and those organisations that have adopted a strategic knowledge transfer process would hence come up with competitive bids and are the ones that would get contracts.

If the situation is visualized in such a manner - two obvious questions emerge:

- Why don’t construction organisations in Tanzania adopt a strategic knowledge transfer process?
- Why don’t those organisations that have a less strategic knowledge transfer process emulate or copy those that have one in place?

With regard to the first question, the pilot study established that construction organisations in Tanzania in varying magnitudes have a knowledge transfer process in place. What the main study pursued is the nature of this process in the organisations and how the organisations work to facilitate knowledge creation and transfer; from which it established that the knowledge transfer process is largely incidental, unstructured and implicit; and that there is insufficient facilitation of
knowledge creation. One of the interpretations taken is that although the transfer process exists within organisations, they still fail to pursue the process in a strategic manner, as they do not identify activities as the transfer media of the knowledge transfer process. However this in itself is not adequate since in identifying activities as medias of knowledge transfer, unless organisations link the carrying of these activities with an improved performance for the organisation - their strategic pursuant is unlikely.

Regarding the second question, copying from those that adopt a strategic knowledge transfer as not occurring can be explained as a result of:

- The typical fragmental nature of the construction industry – that the Tanzania industry is typified with: small but many organisations having around 2900 registered contracting firms and about 414 registered professional consulting firms; and competition that harbours undue secrecy and mistrust making an organisation’s strategy known only to itself.
- The difficulty of linking performance to adoption of a strategic knowledge transfer process, making the incentive to emulate redundant.
- The absence of explicit indicators on how the market rewards those who pursue knowledge management initiatives.

Hindrances in the adoption of a knowledge transfer strategy for construction organisations hence results in an inefficient management of knowledge that means: organisations fail to link activities to the management of knowledge, individuals learn but organisations do not, knowledge in organisations largely remains in a tacit form, the chances for learning from mistakes and successes are limited, and the codification of knowledge is non-existent. Overall, organisations do not take advantage of opportunities for learning that exists in construction activities and in consequence are lacking in a key resource of organisational competence (Argote and Ingram, 2000; Vito et al, 1999). With the on-going globalization and regionalization move, this is a threat to the survival of construction organisations in Tanzania. Unless organisations in Tanzania take affirmative actions, the intensification of such a shortcoming will continue to cripple organisations and the industry to the detriment of the economy.

An adoption of a strategic knowledge transfer model (approach) is hence to be made at organisational policy level whereby the following is recommended:

- Organisations to identify the significance of activities as medias of knowledge transfer.
• Organisations to develop incentives that encourage the pursuance of knowledge strategies within their organisations.

• Since at the heart of any incentive system there has to be a measure of performance (Milgrom and Roberts, 1992), observable measures of a strategic knowledge transfer process for organisation has to be developed to facilitate reward - a suggestion similarly made in Bröchner et al. (2004) on cross-border post-acquisition knowledge transfer among construction consultants.

• Organisations to develop, a reward mechanism that is linked to the established knowledge transfer indicators.

At organisational functional level it is recommended that organisations devise means of:

• Tapping tacit knowledge in the organisations such as through job rotation and codification of knowledge.

• Broadening the knowledge reservoir base, by storing knowledge in a wider spectrum such as in culture, structure, norms and rules.

• Learning from mistakes and successes.

• Codifying knowledge that is created and one that exists in the organisations.

8.5 Implication for policy and industry

The discussion in the subsequent sections has shown that an incentive for organisations to have knowledge management initiatives is somehow controlled by external conditions and has identified the market awarding system of contracts as a key to this. For as long as the parameters for award lack a knowledge management initiative portrayal from organisations, the strength for such initiatives would always be weak. It is hence recommended that:

• A knowledge management vision and strategies be considered for explicit incorporation in the Tanzania construction industry policy of 2003 from which it is envisaged would form a base of follow up for the industry’s agents and statutes such as:
  o The recently enacted (2001) Public Procurement Act could review award parameters and incorporate those that would be in line with such a policy.
The Tanzania Contractors Registration Board – in its classification and upgrading of contractors could incorporate indicators that would reward knowledge management initiatives by contractors.

Professional registration boards for consultant firms – could devise a means of awarding firms that have a knowledge management initiative. The current continuous professional development (CPD) crediting system introduced to professional architects and quantity surveyors by the AQRB could be extended to organisations.

The Construction industry policy directive, that the government in collaboration with the private sector has to promote the application of best practice standards on productivity, quality management and the appropriate state of the art delivery management (URT, 2003) need be acknowledged that, it can successfully be implemented once knowledge management initiatives are incorporated into the two sectors.

8.6 Limitations

Although the outcome of this study has shown how construction organisations in Tanzania create and transfer knowledge, such results are only limited to a knowledge transfer process pertaining to an organisation and do not apply to the transfer process between organisations. This is a limitation that fails to acknowledge the interrelationship and interdependence of the intra- and inter-firm knowledge transfer processes, but viewed to insignificantly influence the results obtained in the study. In addition it is anticipated that the limitation of levels of abstraction in the tool of analysis, the knowledge transfer process model used, has to some extent influenced the results – in that it is envisaged, a detailed model would have explained more of the knowledge transfer process in the cases.

8.7 Implication for methodology

The influence of research strategy on outcome was observed between the pilot and the main study. The analysis of the survey in the pilot study enabled the identification of sample organisations for the main study, whereby four organisations were selected that had shown features that could be tested against the propositions. Specifically the analysis indicated that NEDCO and Masasi could support the proposition while Inter-Consult and Konoike indicated
features that would not. However, the outcome of the main study that had adopted a case study approach yielded slightly different results in that, Inter-Consult with some limitations also supported the propositions set forth. Such an outcome was interpreted as attributed to the in-depth investigation that is made possible by a case study approach and also strengthens the notion given by Creswell (2003) on the benefits of mixed methods research approaches.

The knowledge transfer model is observed to have some limitations, though the model has identified activities that are perceived to facilitate knowledge transfer in organisations, these activities are not detailed enough to facilitate an effective knowledge transfer process to be observed or understood. Furthermore the model does not explicitly show inputs or resources that are required for the activity to take place, nor does it show constraints for undertaking the activity. Further noted that terminologies used in the model have a potential of equivocal interpretation and could be improved to enhance understanding. Some of the terminologies have been simplified in the course of the study while some have been clarified and maintained. Acknowledging the significance of semantics for re-use of business process models (Lundgren, 2002), it is considered further simplification of the communicating terms could be done to the proposed optimal knowledge transfer model has hence considered the limitations discussed. Overall, the nature of the modal used is simple so as to enable organisations visualize how they fit or can improve the model so as to adopt it.

Further, critique exists on the IDEF0 method used in the proposed knowledge transfer model that it is considered more useful to researchers than practitioners due to its relative complexity (Karhu, 2001). The difficulty in having a model understood and accepted for re-use has also been mentioned in Lundgren (2002). Such a limitations however has been controlled by limiting the level of abstraction at this initial stage (without compromising the achievement of purpose) when introducing the idea to construction organisations; simplification of the terms used; and also by the production of a node tree diagram for the entire model.

8.8 Implications for future research

Since the measurement of performance indicators is key to any reward system and having argued that for organisation to be motivated to adopt a knowledge management strategy such as the knowledge transfer process, a reward system has to exist - it is hence recommended for:
• Research to be carried out at the industry level in the establishment of performance indicators of knowledge management initiatives for contractors and consultant firms in Tanzania.

• Research to be carried out at industry level on how the market could accommodate the reward of knowledge management initiatives taken by construction organisations.

• Research to be carried out at organisational level to enable organisations interpret such performance indicators at operational levels so as to motivate individuals, units or departments to abide to knowledge management initiatives such as the strategic pursuance of a knowledge transfer initiative.

In acknowledging the interdependence of inter- and intra-firm knowledge transfer and to complement the current study it is hence recommended for:

• Research in inter-firm knowledge transfer in construction organisations in Tanzania to be pursued.

Taking that the construction industry can learn from other sectors, it is thus recommended:

• Research in knowledge management initiatives to be carried out in other sectors such as manufacturing or other service industries, so as to explore the potential for the construction industry to learn from them.
References


### Appendix A - Case study protocol

**Appendix A.1- Case study questions (knowledge transfer process)**

**Q.1. How is information and knowledge acquired in the organisation**

**Sources of data:**
- i) Director of company; 
- i) Employees in the Co.; 
- iii) Documents in the Co.

**Strategies:**

Obtain information on how the organisation acquires information and knowledge through:

I. **Borrowing** such as in -

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Employees attendance to conferences, seminars, workshops</td>
<td>Interview, questionnaire</td>
</tr>
<tr>
<td>b) Interaction with other consulting or contracting firms</td>
<td>Interview, questionnaire, direct observation</td>
</tr>
<tr>
<td>c) Printed material such as- construction journals, technical reports and</td>
<td>Interview, questionnaire</td>
</tr>
<tr>
<td>enquire what subscriptions the company has on various journals</td>
<td></td>
</tr>
</tbody>
</table>

II. **Searching** such as in -

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Reports, economic, technical or social</td>
<td>Interview, questionnaire</td>
</tr>
<tr>
<td>b) Interaction with customers</td>
<td>Ditto</td>
</tr>
<tr>
<td>c) Interaction with competitors</td>
<td>Ditto</td>
</tr>
</tbody>
</table>

III. **Grafting** such as in-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) The recruitment of new members</td>
<td>Interview, questionnaire</td>
</tr>
</tbody>
</table>

IV. **Collaborating** such as in-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Joint venture arrangements</td>
<td>Interview, questionnaire</td>
</tr>
</tbody>
</table>

V. **Congenital means** such as -

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Existing technology in the company</td>
<td>Interview, questionnaire</td>
</tr>
<tr>
<td>b) Experience know how of founder members</td>
<td>Interview, questionnaire</td>
</tr>
</tbody>
</table>
VI. Experiential such as-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Successes and mistakes</td>
<td>Interview, questionnaire, documentation</td>
</tr>
</tbody>
</table>

VII. Experimenting such as -

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) The development of own innovations</td>
<td>Interview, questionnaire, direct observation</td>
</tr>
</tbody>
</table>

VIII. Continuous process improvement

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Process checks and inspections</td>
<td>Interview, questionnaire, direct observations, documentation e.g. checklists of processes</td>
</tr>
</tbody>
</table>

IX. Critical reflections such as in-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Dialogue</td>
<td>Interview, questionnaire</td>
</tr>
<tr>
<td>b) Questioning assumptions</td>
<td>Interview, questionnaire</td>
</tr>
</tbody>
</table>

Q.2 How is information distributed in the organisation?

**Sources of data:**
1) Directors; 2) Employees; 3) Documentary evidence

**Strategies:**
Obtain information on how the organisation distributes information through:

I. Individual written communication as in-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memos, reports, letters</td>
<td>Interview, questionnaire, documentation</td>
</tr>
</tbody>
</table>

II. Training as in

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) The conduction of formal courses</td>
<td>Interview, questionnaire, documentation</td>
</tr>
<tr>
<td>b) On the job training</td>
<td>Interview, questionnaire, documentation</td>
</tr>
</tbody>
</table>

III. Internal conferences

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence:</th>
</tr>
</thead>
</table>

a) Internal conferences | Interview, questionnaire, documentation

IV. Internal publications

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Newsletters, brochures</td>
<td>Interview, questionnaire, documentation</td>
</tr>
</tbody>
</table>

V. Job rotation, stories, myths, and task forces

| a) Job rotation of employees told/shared | Interview, questionnaire, documentation |
| b) Stories | Interview, questionnaire, documentation, direct observation |
| c) Task forces | Interview, questionnaire, documentation, direct observation |
| d) Informal networks | Interview, questionnaire, documentation, direct observation |

Q.3 Obtain information on how the organisation makes meaning as through:

I. Interpreting information

| a) Dialogue | Interview, questionnaires, direct observation |
| b) Critical reflection | Interview, questionnaires, direct observation |
| c) Process checks | Interview, questionnaire, documentation, direct observation |
| d) Taking action | Interview, questionnaire, documentation, direct observation |
| e) Unlearning | Interview, questionnaire, documentation, direct observation |

II. Analysing information as in -

| a) Making rational analysis | Interview, questionnaire, documentation, direct observation |
| b) Problem solving processes | Ditto |
| c) Extrapolating from past events | Ditto |
| d) Strategy formulation | Ditto |
| e) Decision support tools | Ditto |

Q.4 Obtain information on the organisational memory or knowledge reservoirs that are:

Internal –through:

Intentional means such as through

231
<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Stored records, reports</td>
<td>Interview, questionnaire, documentation, direct observation</td>
</tr>
<tr>
<td>b) Policies</td>
<td>Ditto</td>
</tr>
<tr>
<td>c) Core competencies</td>
<td>Ditto</td>
</tr>
<tr>
<td>d) Processes</td>
<td>Ditto</td>
</tr>
</tbody>
</table>

Unintentional, tacit means such as through

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Culture of the company</td>
<td>Ditto</td>
</tr>
<tr>
<td>b) Structure of the company</td>
<td>Interview, questionnaire, documentation, direct observation, archival records</td>
</tr>
<tr>
<td>c) Theories of action</td>
<td>Interview, questionnaire, documentation, direct observation</td>
</tr>
</tbody>
</table>

External repositories as through

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Competitors</td>
<td>Interview, questionnaire, documentation, direct observation</td>
</tr>
<tr>
<td>b) Government records</td>
<td>Ditto</td>
</tr>
<tr>
<td>c) Financial reports</td>
<td>Ditto</td>
</tr>
<tr>
<td>d) Former members of the organisation</td>
<td>Ditto</td>
</tr>
</tbody>
</table>

Q.5 Obtain information on how the organisation retrieves knowledge through:
Controlled means as those done in-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Individuals</td>
<td>Interviews, questionnaire, direct observation</td>
</tr>
<tr>
<td>b) Groups of individuals/ teams</td>
<td>Interviews, questionnaire, direct observation</td>
</tr>
</tbody>
</table>

Automatic retrieval as featuring in the-

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Culture of the organisation</td>
<td>Interviews, questionnaire, direct observation</td>
</tr>
<tr>
<td>b) Structure of the organisation</td>
<td>Ditto</td>
</tr>
<tr>
<td>c) Ecology (physical space)</td>
<td>Direct observation</td>
</tr>
<tr>
<td>d) Individual tacit knowledge</td>
<td>Interviews, questionnaire, direct observation</td>
</tr>
</tbody>
</table>
Appendix A.2- Case questions (the knowledge creation process)

Q.1 How does the knowledge creation process take place in the organisation?

Sources of data:
i) Directors; ii) Employees; iii) Documentary evidence

Strategy: Obtain information how the company creates knowledge as through:

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Sources of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Apprentice practice</td>
<td>Interview, questionnaire, direct observation</td>
</tr>
<tr>
<td>b) Shared experience</td>
<td>Interview, questionnaire, direct observation (e.g. organisation environment if conducive to facilitate the mentioned aspects of shared experience)</td>
</tr>
</tbody>
</table>
  - The form of shared experience practiced by the firm such as:
    i) Informal meetings, brainstorming sessions
    ii) Observations and imitations
    iii) Interaction with customers- prior to product development and after market introduction
    iv) Formal meetings

Q.2 How does the externalization mode take place in the organisation?

Sources of data: as in Q.1 above

Strategy: Obtain information on how the organisation articulates tacit knowledge into explicit concepts such as through:

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Sources of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Dialogue</td>
<td>Interview, questionnaire, direct observation</td>
</tr>
<tr>
<td>b) Collective reflection (does the organisation provide time for collective reflection)</td>
<td>Interview, questionnaire, direct observation</td>
</tr>
</tbody>
</table>
| c) Use of metaphors- what are the metaphors used in the day to day business activities- to consider to what extent are
  i) Organisation charts used
  ii) Use of tools and techniques such as bar charts, critical path diagrams, models etc

Q.3 How does the combination mode occur in the organisation?

Sources of data: as in Q.1 above

Strategy: Obtain information on how the organisation expresses explicit knowledge into explicit concepts such as through:

<table>
<thead>
<tr>
<th>Evidence:</th>
<th>Sources of evidence</th>
</tr>
</thead>
</table>
a) Analysing documents and learning from them - e.g. checklists, site records, cost data, tender success rate records, cost analyses actual against tendered etc.

b) Meetings

c) Telephone conversations

d) Computerised communication networks

Q.4 How does the internalization mode occur in the organisation?

Sources of data: as in Q.1 above

Strategy: Obtain information on how the organisation internalises explicit knowledge by converting it to tacit knowledge as through:

| a) Socialization within members | Direct observation |
| b) Verbal communication of knowledge | Direct observation |
| c) Explicit knowledge being diagrammed and hence internalised by those using or studying the diagram | Direct observation |
| d) Working manuals- where the explicit knowledge in the manuals is being internalised by the users | Direct observation |
| e) Oral stories | Direct observation |
Appendix B – Verification of access procedures

TO WHOM IT MAY CONCERN

Dear Sir/ Madam,

RE: FACILITATION OF DATA COLLECTION FOR RESEARCH

The below named is an employee of the University College of Lands and Architectural Studies (UCLAS) in the department of Building Economics who is currently undertaking a doctoral research on how construction organisations transfer knowledge within their organisations.

The object of her research is based on the presumption that:

- Construction organisations are continuously exposed to opportunities for learning.
- That in the course of carrying out construction projects organisations create and transfer skills, knowledge and know how.

How such learning occurs and the mechanisms for acquiring, distributing and sharing skills, knowledge and know - how within construction organisations form some of the research questions being pursued.

It is from this background that your organisation is requested to provide possible assistance so as to facilitate her data collection process.

Yours faithfully,

[Signature]

Prof. F. Halla
DEAN,
FACULTY OF ARCHITECTURE AND PLANNING
UCLAS.