Knowledge management in development projects

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Knowledge Management in Development Projects

by

Paul Oluikpe

A Doctoral Thesis

Submitted in partial fulfilment of the requirements for the award of

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Oct., 2007

ABSTRACT

Studies have shown that knowledge management is an enabler of organisational processes and helps achieve projected objectives. This research is aimed at investigating the role of knowledge management in enabling development project management to achieve the following objectives---project success, faster completion times, efficiency, innovation, knowledge sharing and best practices. The research conceptual model (The CRAI-Codification, Reproduction, Assimilation and Interpretation model) focused on four types of primary knowledge needed by development projects for successful execution. These are: Interpretative knowledge, Assimilative knowledge, Reproductive knowledge and Codified knowledge.

Using a mixed method approach, qualitative and quantitative data were collected from over 1000 respondents from development organisations in 8 regions in 11 development project areas. Data were obtained using web questionnaires, structured interviews and organisational documentation. The selection of case studies arose as a result of responses to the online survey. The research used four case studies which exhibited KM consciousness and other criteria which enabled the researcher to identify them as knowledge generating projects. The cases were drawn from Nigeria, Uganda and Senegal. The research applied the CRAI model within these case studies and also compared the results of the survey data with the case study data.

The survey achieved a 30.3% (303) response rate. The data gathered were analysed using quantitative analysis tools (SPSS) and techniques (regression,
correlation, hypothesis testing, analysis of the model and other general analysis techniques).

The survey and case studies focused on identifying best practices, knowledge sharing and management practices, knowledge processes in the project management cycle as reflected by the conceptual model, technology and other aspects of Knowledge Management.

Some of the findings made by the research are:

(a) No standard best practice exists across the board among development projects. Each project has a set of practices that represent best practices for managing their projects;

(b) KM was found to be a factor in speeding up project completion times. It was also linked to project success, knowledge sharing, innovation and efficiency; and

(c) The CRAI model was found to be applicable to development projects and the type of knowledge projects embody. The model positively correlated with each of the expected outcomes-innovation, completion times, efficiency, project success and knowledge sharing.

Recommendations made by this research include:

1. Development Projects should begin to design KM strategies as part of Project Management systems;
2. A development project should begin with mapping essential knowledge needed by the project;
3. Development PM should pay closer attention to the existence of communities in the project;
4. KM should be included in the list of critical success factors; and
5. DPs should use PM technologies which integrate KM capabilities.
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Secondly, I want to thank Loughborough University as an institution for providing me with the enabling environment to study. I have found Loughborough to be very conducive for study and research, the staff were very helpful and always rendered assistance when needed. I also found the resources in the institution very adequate for my research.

Third, I want to thank my family—my beloved wife Ngozi, who stood with me through thick and thin and our daughter, Anuri and our son, Ugochukwu who were both born during the course of my PhD research. Their arrival spiced up our life and the variety they bring enabled me cope with the difficult times of a research programme. I will not forget my church family (Christian Worship Centre) who were there for me throughout. I would not forget my parents, Simeon and Christiana Oluikpe, my siblings Chioma, Chinwenu, Nwabueze, Nnenna and Chukwuemeka, Chinonye my later elder brothers daughter who all reside in Nigeria. I also want to thank my Mother and Father In-law, Godwill and Mercy Iroegbu and my sisters and brothers in-law, Aku, Chiedozie, Nnenne, Alozie, Nneoma. Thank you all for being there for me. Thank you for your spiritual and moral support throughout this period. God bless you all.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>II</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>IV</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>V</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>XI</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>XII</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS AND ACRONYMANS</td>
<td>XIII</td>
</tr>
<tr>
<td>CHAPTER 1</td>
<td>2</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>2</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>2</td>
</tr>
<tr>
<td>1.1.1 Innovation</td>
<td>3</td>
</tr>
<tr>
<td>1.1.2 Completion times</td>
<td>4</td>
</tr>
<tr>
<td>1.1.3 Project success</td>
<td>5</td>
</tr>
<tr>
<td>1.1.4 Operational efficiency</td>
<td>5</td>
</tr>
<tr>
<td>1.1.5 Generation of new knowledge</td>
<td>6</td>
</tr>
<tr>
<td>1.2 Research Context</td>
<td>6</td>
</tr>
<tr>
<td>1.3 Development projects</td>
<td>6</td>
</tr>
<tr>
<td>1.3.1 Challenges of development projects</td>
<td>7</td>
</tr>
<tr>
<td>1.4 Development Organisations</td>
<td>9</td>
</tr>
<tr>
<td>1.5 Aim of the research and statement of the problem</td>
<td>9</td>
</tr>
<tr>
<td>1.5.1 Aim of the Research</td>
<td>9</td>
</tr>
<tr>
<td>1.5.2 Statement of the Problem</td>
<td>10</td>
</tr>
<tr>
<td>1.6 Research Questions and Objectives</td>
<td>11</td>
</tr>
<tr>
<td>1.6.1 Research Question</td>
<td>11</td>
</tr>
<tr>
<td>1.7 Hypothesis</td>
<td>11</td>
</tr>
<tr>
<td>1.8 Expected Outcome/Research Audience</td>
<td>12</td>
</tr>
<tr>
<td>1.8.1 Expected outcome</td>
<td>12</td>
</tr>
<tr>
<td>1.8.2 Research audience</td>
<td>12</td>
</tr>
<tr>
<td>1.9 Thesis Layout and Contents</td>
<td>13</td>
</tr>
<tr>
<td>1.10 Operational Definition of Terms</td>
<td>15</td>
</tr>
<tr>
<td>CHAPTER 2</td>
<td>18</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>18</td>
</tr>
<tr>
<td>2.0 Introduction</td>
<td>18</td>
</tr>
<tr>
<td>2.1 Knowledge Management (KM): An Introduction</td>
<td>18</td>
</tr>
<tr>
<td>2.1.1 Definitions of KM</td>
<td>19</td>
</tr>
<tr>
<td>2.2 KM-the underlying concepts</td>
<td>21</td>
</tr>
<tr>
<td>2.2.1 The concept of knowledge</td>
<td>21</td>
</tr>
<tr>
<td>2.2.2 The concept of management</td>
<td>23</td>
</tr>
<tr>
<td>2.2.3 The concept of tacit and explicit knowledge</td>
<td>23</td>
</tr>
<tr>
<td>2.2.3.1 Can knowledge be managed?</td>
<td>25</td>
</tr>
<tr>
<td>2.2.4 KM and intellectual capital</td>
<td>25</td>
</tr>
<tr>
<td>2.2.5 The concept of KM as strategy</td>
<td>26</td>
</tr>
<tr>
<td>2.2.6 Knowledge Management models and Processes</td>
<td>27</td>
</tr>
<tr>
<td>2.3 Differences between KM and Information Management</td>
<td>33</td>
</tr>
<tr>
<td>2.3.1 Interplay between information and knowledge</td>
<td>33</td>
</tr>
<tr>
<td>2.3.2 IM and KM projects: different approaches, measurements and scopes.</td>
<td>34</td>
</tr>
<tr>
<td>2.3.3 Intellectual capital : IM and KM perspectives</td>
<td>34</td>
</tr>
<tr>
<td>2.4 Philosophies of KM</td>
<td>36</td>
</tr>
<tr>
<td>2.4.1 The Custodian Philosophy</td>
<td>37</td>
</tr>
</tbody>
</table>
CHAPTER 3

RESEARCH METHOD

3.0 Introduction

3.1 Research methods, design and strategies

3.1.1 Research Methods
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1.1.2 Applied Research</td>
<td>69</td>
</tr>
<tr>
<td>3.1.2 Research Approaches</td>
<td>69</td>
</tr>
<tr>
<td>3.1.2.2 Descriptive Approach</td>
<td>70</td>
</tr>
<tr>
<td>3.1.2.3 Explanatory Approach</td>
<td>70</td>
</tr>
<tr>
<td>3.1.3 Research Techniques</td>
<td>70</td>
</tr>
<tr>
<td>3.1.3.1 Qualitative Technique</td>
<td>70</td>
</tr>
<tr>
<td>3.1.3.2 The Quantitative Technique</td>
<td>73</td>
</tr>
<tr>
<td>3.1.3.3 Triangulation Technique (Mixed Research Method)</td>
<td>75</td>
</tr>
<tr>
<td>3.1.4 Methodology adopted</td>
<td>76</td>
</tr>
<tr>
<td>3.1.5 Research Strategy and process</td>
<td>77</td>
</tr>
<tr>
<td>3.1.5.1 Research process</td>
<td>80</td>
</tr>
<tr>
<td>3.1.5.2 How objectives are to be achieved</td>
<td>81</td>
</tr>
<tr>
<td>3.1.5.3 Expected outcomes</td>
<td>82</td>
</tr>
<tr>
<td>3.2 Model Development</td>
<td>83</td>
</tr>
<tr>
<td>3.2.1 The model constructs</td>
<td>86</td>
</tr>
<tr>
<td>3.2.1.1 Interpretation (Interpretative knowledge)</td>
<td>86</td>
</tr>
<tr>
<td>3.2.1.2 Assimilation (Assimilative Knowledge)</td>
<td>88</td>
</tr>
<tr>
<td>3.2.1.3 Reproduction (Reproductive knowledge)</td>
<td>90</td>
</tr>
<tr>
<td>3.2.1.4 Codification (Codified knowledge)</td>
<td>91</td>
</tr>
<tr>
<td>3.3 Justifying the CRAI model</td>
<td>92</td>
</tr>
<tr>
<td>3.3.1 The CRAI model and other KM processes</td>
<td>93</td>
</tr>
<tr>
<td>3.3.2 Conclusion</td>
<td>94</td>
</tr>
<tr>
<td>3.4 Survey Design</td>
<td>94</td>
</tr>
<tr>
<td>3.4.1 Project Selection</td>
<td>95</td>
</tr>
<tr>
<td>3.4.2 Project Type</td>
<td>96</td>
</tr>
<tr>
<td>3.4.3 Project Region</td>
<td>97</td>
</tr>
<tr>
<td>3.4.4 Questionnaire Design</td>
<td>98</td>
</tr>
<tr>
<td>3.4.5 Population</td>
<td>99</td>
</tr>
<tr>
<td>3.4.5.1 Sampling</td>
<td>99</td>
</tr>
<tr>
<td>3.4.5.2 Question coding</td>
<td>100</td>
</tr>
<tr>
<td>3.4.5.3 Pilot studies</td>
<td>101</td>
</tr>
<tr>
<td>3.4.6 Survey Administration</td>
<td>103</td>
</tr>
<tr>
<td>3.4.6.1 Response</td>
<td>103</td>
</tr>
<tr>
<td>3.4.6.2 Non response</td>
<td>104</td>
</tr>
<tr>
<td>3.4.6.3 Invalid responses</td>
<td>104</td>
</tr>
<tr>
<td>3.4.6.4 Results of the survey-a caveat</td>
<td>104</td>
</tr>
<tr>
<td>3.5 Case Study Design</td>
<td>105</td>
</tr>
<tr>
<td>3.5.1 Standardisation</td>
<td>105</td>
</tr>
<tr>
<td>3.5.2 Indicators of KM</td>
<td>105</td>
</tr>
<tr>
<td>3.5.3 Case Study Selection</td>
<td>106</td>
</tr>
<tr>
<td>3.5.4 Approach to case studies</td>
<td>107</td>
</tr>
<tr>
<td>3.5.5 Data Collection</td>
<td>108</td>
</tr>
<tr>
<td>3.5.6 Interviews</td>
<td>109</td>
</tr>
<tr>
<td>3.5.6.1 Interview Schedule</td>
<td>109</td>
</tr>
<tr>
<td>3.5.6.2 Model Assessment Schedule</td>
<td>109</td>
</tr>
<tr>
<td>3.5.6.3 Best Practices Schedule</td>
<td>110</td>
</tr>
<tr>
<td>3.5.6.4 Variable identification Schedule</td>
<td>110</td>
</tr>
<tr>
<td>3.5.7 Documentation</td>
<td>110</td>
</tr>
<tr>
<td>3.6 Data Analysis</td>
<td>111</td>
</tr>
<tr>
<td>3.6.1 Reliability tests</td>
<td>111</td>
</tr>
<tr>
<td>3.6.2 Correlation analysis</td>
<td>112</td>
</tr>
<tr>
<td>3.6.3 Regression Analysis</td>
<td>113</td>
</tr>
<tr>
<td>3.6.4 Data Visualisation</td>
<td>114</td>
</tr>
<tr>
<td>3.6.5 Interpretive analysis (case studies)</td>
<td>114</td>
</tr>
<tr>
<td>3.7 Conclusion</td>
<td>115</td>
</tr>
</tbody>
</table>
# CHAPTER 4

## ANALYSIS OF SURVEY DATA

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 Introduction</td>
<td>116</td>
</tr>
<tr>
<td>4.1 Descriptive Analysis</td>
<td>117</td>
</tr>
<tr>
<td>4.1.1 Project Type</td>
<td>117</td>
</tr>
<tr>
<td>4.1.2 Project duration</td>
<td>118</td>
</tr>
<tr>
<td>4.1.3 Project Region</td>
<td>118</td>
</tr>
<tr>
<td>4.1.4 Analysis of response to Model variables</td>
<td>119</td>
</tr>
<tr>
<td>4.1.4.1 Interpretation</td>
<td>120</td>
</tr>
<tr>
<td>4.1.4.2 Assimilation</td>
<td>126</td>
</tr>
<tr>
<td>4.1.4.3 Reproduction</td>
<td>130</td>
</tr>
<tr>
<td>4.1.4.4 Codification</td>
<td>134</td>
</tr>
<tr>
<td>4.1.4.5 Project Variables</td>
<td>137</td>
</tr>
<tr>
<td>4.2 Reliability of constructs</td>
<td>140</td>
</tr>
<tr>
<td>4.3 Correlation Analysis</td>
<td>142</td>
</tr>
<tr>
<td>4.3.1 The model</td>
<td>142</td>
</tr>
<tr>
<td>4.3.2 The model and innovation</td>
<td>145</td>
</tr>
<tr>
<td>4.3.3 The model and efficiency</td>
<td>145</td>
</tr>
<tr>
<td>4.3.4 The model and completion time</td>
<td>145</td>
</tr>
<tr>
<td>4.3.5 The model and knowledge creation</td>
<td>145</td>
</tr>
<tr>
<td>4.3.6 The model and project success</td>
<td>146</td>
</tr>
<tr>
<td>4.4 Analysing the hypothesis using regression analysis</td>
<td>147</td>
</tr>
<tr>
<td>4.4.1 Multiple regression</td>
<td>147</td>
</tr>
<tr>
<td>4.4.2 Stepwise multiple regression: project success</td>
<td>149</td>
</tr>
<tr>
<td>4.4.3 Stepwise multiple regression: innovation</td>
<td>150</td>
</tr>
<tr>
<td>4.4.4 Stepwise multiple regression: completion times</td>
<td>151</td>
</tr>
<tr>
<td>4.4.5 Stepwise multiple regression: operational efficiency</td>
<td>153</td>
</tr>
<tr>
<td>4.4.6 Stepwise multiple regression: generation of new knowledge</td>
<td>154</td>
</tr>
<tr>
<td>4.4.7 Conclusion</td>
<td>155</td>
</tr>
<tr>
<td>4.5 Plots and charts</td>
<td>156</td>
</tr>
<tr>
<td>4.6 Analysis of research objectives</td>
<td>160</td>
</tr>
<tr>
<td>4.6.1 Objective 1</td>
<td>160</td>
</tr>
<tr>
<td>4.6.2 Objective 2</td>
<td>162</td>
</tr>
<tr>
<td>4.6.3 Objective 3</td>
<td>162</td>
</tr>
<tr>
<td>4.6.4 Objective 4</td>
<td>163</td>
</tr>
<tr>
<td>4.7 Technology use in development projects</td>
<td>163</td>
</tr>
<tr>
<td>4.7.1 Analysis of KM tools and background of respondents</td>
<td>165</td>
</tr>
<tr>
<td>4.7.1.1 Web portals</td>
<td>165</td>
</tr>
<tr>
<td>4.7.1.2 Email groups</td>
<td>166</td>
</tr>
<tr>
<td>4.7.1.3 Content Management Systems</td>
<td>166</td>
</tr>
<tr>
<td>4.7.1.4 Groupware</td>
<td>167</td>
</tr>
<tr>
<td>4.7.1.5 Internet and Intranets</td>
<td>167</td>
</tr>
<tr>
<td>4.7.1.6 Databases</td>
<td>167</td>
</tr>
<tr>
<td>4.7.1.7 Agent technologies</td>
<td>168</td>
</tr>
<tr>
<td>4.7.1.8 Other KM tools</td>
<td>169</td>
</tr>
<tr>
<td>4.7.2 Classification of KM technologies</td>
<td>169</td>
</tr>
<tr>
<td>4.7.2.1 Collaborative Systems</td>
<td>170</td>
</tr>
<tr>
<td>4.7.2.2 Integrative Systems</td>
<td>170</td>
</tr>
<tr>
<td>4.7.2.3 Search Systems</td>
<td>170</td>
</tr>
<tr>
<td>4.8 Implication of results and conclusions</td>
<td>171</td>
</tr>
<tr>
<td>4.8.1 Implication of results</td>
<td>171</td>
</tr>
<tr>
<td>4.8.2 Conclusions</td>
<td>172</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>2.1</td>
<td>The concept of tacit and explicit knowledge (Jashapara, 2003)</td>
</tr>
<tr>
<td>2.2</td>
<td>Source: Nonaka and Takeuchi (1995)</td>
</tr>
<tr>
<td>2.3</td>
<td>Source: Boisot (1987)</td>
</tr>
<tr>
<td>2.4</td>
<td>Intellectual Capital Model (Chase, 1997)</td>
</tr>
<tr>
<td>2.5</td>
<td>Demerests (1997) Model</td>
</tr>
<tr>
<td>2.6</td>
<td>Typical project cycles</td>
</tr>
<tr>
<td>2.7</td>
<td>Adopted Project Sequence of activities</td>
</tr>
<tr>
<td>2.8</td>
<td>PRINCE2 Model</td>
</tr>
<tr>
<td>3.1</td>
<td>Lewin's Action Research Cycle</td>
</tr>
<tr>
<td>3.2</td>
<td>Research Process</td>
</tr>
<tr>
<td>3.3</td>
<td>Achievement of research objectives</td>
</tr>
<tr>
<td>3.4</td>
<td>Expected Outcomes</td>
</tr>
<tr>
<td>3.5</td>
<td>Analysis of PM as a knowledge generating process</td>
</tr>
<tr>
<td>3.6</td>
<td>The CRAI Model</td>
</tr>
<tr>
<td>3.7</td>
<td>The model constructs</td>
</tr>
<tr>
<td>3.8</td>
<td>Representation of Interpretative Knowledge</td>
</tr>
<tr>
<td>3.9</td>
<td>Representation of assimilative knowledge</td>
</tr>
<tr>
<td>3.10</td>
<td>Representation of reproductive knowledge</td>
</tr>
<tr>
<td>3.11</td>
<td>Representation of codified knowledge</td>
</tr>
<tr>
<td>4.1</td>
<td>Analysis of Question 1</td>
</tr>
<tr>
<td>4.2</td>
<td>Analysis of Question 2</td>
</tr>
<tr>
<td>4.3</td>
<td>Analysis of Q3</td>
</tr>
<tr>
<td>4.4</td>
<td>Analysis of Q11</td>
</tr>
<tr>
<td>4.5</td>
<td>Analysis of Q12</td>
</tr>
<tr>
<td>4.6</td>
<td>Interpretation and Assimilation</td>
</tr>
<tr>
<td>4.7</td>
<td>Codification and reproduction</td>
</tr>
<tr>
<td>4.8</td>
<td>KM tools classification</td>
</tr>
<tr>
<td>4.9</td>
<td>KM technology usage in DP</td>
</tr>
<tr>
<td>5.1</td>
<td>Jewel Project</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 2.1: Knowledge Management definitions ............................................. 20
Table 2.2: Philosophical perspectives of knowledge ..................................... 22
Table 2.3: Tan's Knowledge Processes ......................................................... 28
Table 2.4: Differences between IM and KM ................................................... 35
Table 2.5: Philosophies of KM ....................................................................... 37
Table 2.6: Life-cycle phases .......................................................................... 44
Table 2.7: The RIBA Plan of Work ................................................................. 48
Table 3.1: Project types ................................................................................. 97
Table 3.2: Project regions .............................................................................. 97
Table 3.3: World Internet usage statistics ...................................................... 98
Table 3.4: Stratified random sampling of projects ........................................ 100
Table 3.5: Questionnaire variables .............................................................. 101
Table 3.6: No. of people interviewed in organisations .................................... 107
Table 4.1: Project type ................................................................................. 117
Table 4.2: Project duration .......................................................................... 118
Table 4.3: Project region ............................................................................. 118
Table 4.4: Model variables and No. of questions ......................................... 119
Table 4.5: Interpretation .............................................................................. 120
Table 4.6: Assimilation ................................................................................ 126
Table 4.7: Reproduction .............................................................................. 130
Table 4.8: Codification ................................................................................. 134
Table 4.9: Project variables ......................................................................... 137
Table 4.10: Reliability statistics .................................................................... 141
Table 4.11: Correlations .............................................................................. 142
Table 4.12: Correlation of the model and project outcomes ......................... 144
Table 4.13: Regression analysis of model and variables ............................... 147
Table 4.14: Multiple regression: project success ........................................ 149
Table 4.15: Multiple regression: Innovation ............................................... 150
Table 4.16: Multiple regression: Completion times ....................................... 151
Table 4.17: Multiple regression: Operational efficiency ............................... 153
Table 4.18: Multiple regression: Generation of new knowledge .................. 154
Table 4.19: Analysis of KM practices: People ............................................. 160
Table 4.20: Analysis of KM practices: Culture ........................................... 161
Table 4.21: Analysis of KM practices: Strategy ........................................... 162
Table 4.22: Other KM tools .......................................................................... 169
Table 5.1: LAPO staff interview table .......................................................... 181
Table 5.2: Definition of knowledge areas of JEWEL project ...................... 200
Table 6.1: Ranking of the model in case study and survey ......................... 245
Table 6.2: Perception analysis of cases and survey ..................................... 247
### LIST OF ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPM</td>
<td>Business Process Management</td>
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<tr>
<td>BPR</td>
<td>Business Process Re-engineering</td>
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<tr>
<td>CAPRIKON</td>
<td>Capture and Re-use of Project Knowledge in Construction</td>
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<tr>
<td>CBDD</td>
<td>Capacity Building for Decentralised Development</td>
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<td>CBO</td>
<td>Community Based Organisations</td>
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<tr>
<td>CKSP</td>
<td>Collaborative Knowledge Sharing Platforms</td>
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<tr>
<td>CMS</td>
<td>Content Management System</td>
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<tr>
<td>COP</td>
<td>Communities of Practice</td>
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<td>COT</td>
<td>Community of Tasks</td>
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<td>COE</td>
<td>Community of Expertise</td>
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<td>CPM</td>
<td>Critical Path Method</td>
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<tr>
<td>CPR</td>
<td>Common Property Resource</td>
</tr>
<tr>
<td>CRAI</td>
<td>Coding, Reproduction, Assimilation and Interpretation</td>
</tr>
<tr>
<td>CREPA</td>
<td>Centre for the Training, Research and Networking for Development</td>
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<tr>
<td>CSO</td>
<td>Civil Society Organisation</td>
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<tr>
<td>D &amp; G</td>
<td>Democracy and Governance</td>
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<tr>
<td>DFID</td>
<td>Department For International Development</td>
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<tr>
<td>DP</td>
<td>Development Projects</td>
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<td>ERPS</td>
<td>Enterprise Resource Planning Systems</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>EVA</td>
<td>Earned Value Management</td>
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<tr>
<td>FAO</td>
<td>Food and Agricultural Organisation</td>
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<tr>
<td>FTP</td>
<td>File Transfer Protocol</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GELT</td>
<td>Gender, Environment, Leadership and Training</td>
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<tr>
<td>GoN</td>
<td>Government of Nigeria</td>
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<tr>
<td>HDI</td>
<td>Human Development Index</td>
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<tr>
<td>HNWCP</td>
<td>Hadejia Nguru Wetlands Conservation Project</td>
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<tr>
<td>IC</td>
<td>Intellectual Capital</td>
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<tr>
<td>IM</td>
<td>Information Management</td>
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<tr>
<td>IPMA</td>
<td>International Project Management Association</td>
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<tr>
<td>JEWEL</td>
<td>Jigawa Wetlands Enhancement Livelihood Project</td>
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<tr>
<td>KM</td>
<td>Knowledge Management</td>
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<tr>
<td>LAPO</td>
<td>Lift Above Poverty Organisation</td>
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<td>MBO</td>
<td>Management By Objectives</td>
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<td>MFI</td>
<td>Microfinance Institution</td>
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<td>MSP</td>
<td>Managing Successful Programmes method</td>
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<td>NBWRP</td>
<td>Nile Basin Water Resources Project</td>
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<td>NFS</td>
<td>Network File System</td>
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<td>NGO</td>
<td>Non Governmental Organisation</td>
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<tr>
<td>Nile DST</td>
<td>Nile Decision Support Tool</td>
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<tr>
<td>NPD</td>
<td>New Product Development</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>OPM3</td>
<td>The Organisational Project Management Maturity Model</td>
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<tr>
<td>PDSA</td>
<td>Plan, Do it, Study, Act</td>
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<tr>
<td>PERT</td>
<td>Project Evaluation and Review Technique</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>PM</td>
<td>Project Management</td>
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<td>PMI</td>
<td>Project Management Institute</td>
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<td>PPR</td>
<td>Post Project Reviews</td>
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<td>PRA</td>
<td>Participatory Rural Appraisal</td>
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<td>PRINCE2</td>
<td>Projects In Controlled Environments</td>
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<td>SAP</td>
<td>Structural Adjustment Programme</td>
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<td>SEM</td>
<td>Search Engine Matchpoint</td>
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<tr>
<td>SIDA</td>
<td>Swedish International Development Cooperation Agency</td>
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<tr>
<td>SLGP</td>
<td>State and Local Government Project</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities and Threats</td>
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<tr>
<td>TQM</td>
<td>Total Quality Management</td>
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<tr>
<td>TREND</td>
<td>Training, Research and Networking for Development</td>
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<tr>
<td>TSP</td>
<td>Target Strategy Paper</td>
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<tr>
<td>UAWS</td>
<td>Union of African Water Suppliers</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Social and Cultural Organisation</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>WBS</td>
<td>Work Breakdown Structure</td>
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<tr>
<td>WEDC</td>
<td>Water, Engineering and Development Centre</td>
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<tr>
<td>WHO</td>
<td>World Health Organisation</td>
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<td>WUP</td>
<td>Water Utility Partnership</td>
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CHAPTER 1
INTRODUCTION

This chapter introduces the research topic and presents the aims and objectives of the research, the research question, hypothesis, statement of the problem, the audience and expected outcome of the research. It also includes a thesis layout and a glossary of terms.

1.1 Background
Knowledge Management (KM) has been linked successfully to business performance (Carrillo, 2003) therefore making a case for its adoption in organisational strategy. What KM seeks to do is to capture and leverage intellectual capabilities and deploy these to help projects in the course of their activities. This helps in the overall project performance and enables projects to function optimally. KM is not a one stop solution for projects, rather the idea behind managing knowledge is to learn from experience, to communicate, to leverage capacity and to transfer competencies among others. The benefits this brings to organisations are well documented in literature. Little wonder, KM has caught on as a front burner in organisational management circles leading to a wide range of theories and practical applications. As a result, there has been a paradigm shift from early project management (PM) techniques such as Management By Objectives (MBO) which concentrated on process and measurement techniques to a knowledge driven organisation point of view (Levy, 2006; Loosemore, 2006). Because projects are used to change, it is also natural that new tools and approaches to managing projects may be considered in the course of project activity. The move to a knowledge age is also suggestive of a shift in project approach. The relevance of KM to PM is linked to the increased volume and complexity of information and knowledge required during the project process (Milton, 2005). KM has provided the opportunity to drive business results in a complex project environment. Project complexity sometimes defies natural business thinking. As a result, project managers are forced to rethink the way of doing project work, this means exploring options of new management approaches and practices to improve project activities (Anumba, 2005).
Five important areas where knowledge management could contribute to the PM context are innovation, timely completion, project success, operational efficiency and the generation of new knowledge. These variables are discussed below:

1.1.1 Innovation
The literature of innovation is very extensive necessitating a very selective treatment of the subject. Second, there is a great deal of ambiguity associated with the concept of innovation. The academic literature contains a number of definitions of innovation, each with an important aspect of it. A number of authors relate innovation with newness. This includes anything regarded as new by the people doing it (Rogers and Kim, 1985) or as something different for each organisation to which it is introduced (Downs and Mohr, 1976) or the generation, acceptance and implementation of new ideas, processes, products, activities or services (Thompson, 1965) in an applied setting (Mohr, 1969). Some see it as early adoption of a new idea (Rogers and Kim, 1985), others as synonymous with creativity (Jacques and Ryan, 1978), still others as the same thing as improvements (Ellwein, 1985), and a final group as substantive but not revolutionary changes (Merritt, 1985; Deutsch, 1985). Amidon (1998) compiled about 40 definitions of the concept “innovation” and suggested that there are those who think that creativity (invention) and innovation are distinct since the former has to do with inspiration and the latter deals with application. On the other hand, there are those who think innovation and creativity are inseparable since innovation is a process that requires creativity. There are also those who distinguish between “innovation as a process” and “innovation as a product” (Brodtrick, 1999).

Given the variety of definitions and debates centred around the concept of innovation, it is important to state early here a working definition of innovation in the context of this research. Innovation is a concept that relates to a subject (service, project, product, activity) involving the generation of new ideas which must be exploited and applied to cause significant and positive change which must go beyond minor incremental tinkering and yet must not be a revolutionary departure.
A number of literature have classified innovation as either radical or incremental. Radical innovation deals with complete breakthroughs while incremental innovation has to do with improvements on already existing products or services. If innovation is only seen as breakthrough changes, the potential gains of improving on already existing products will be missed. If innovation is only about strategically targeted objectives, a project may miss out on lucky accidents that happen during the process. Similarly, if innovation is only about key individuals in a project, the project runs the risk of failure to utilise the capabilities of other team members. And if innovation is only internally generated, key capabilities from outside the project will be missed. Incremental and radical innovation are complementary and not exclusive of each other. The emphasis of this research is on innovation that arises as a result of dynamic interaction enabled by knowledge management activities.

1.1.2 Completion times
Completion time is a major index for accessing project success. It is likely that a project will be deemed as successful if completed on time, and met cost and quality standards. Realistic project completion time is becoming increasingly important because it is now a major benchmark for assessing the performance of a project and measuring the efficiency of the project organisation. Poor performance of projects in terms of time overrun is commonplace in recent times. Literature reviewed established that there was about 50-80% delays on 1627 World Bank projects between 1974 and 1988 with an average of 23.2% time overruns on UK government projects between 1993 and 1994. Project completion time can be measured as the extent to which the project is finished on schedule (Ancona and Caldwell, 1992). One of the ways to measure completion time is to group projects according to some similarity measure and then take a project's deviation from the mean completion time of the group (Eisenhardt and Tabrizi, 1995). In recent decades, completion times have become a major constraint for projects. It is mostly against this index that clients determine whom to give contracts and whom not to give. Projects which promise to deliver on time stand better chances of winning contract bids. Project members interact and cooperate in
order to accomplish the work and complete the project on time. Cooperation and interaction among team members promote the sharing of project knowledge leading to shared understanding, collective vision, a sense of time, effectiveness, job satisfaction and completion of the project on schedule.

1.1.3 Project success
Success is measured as a project that was on-time, on-budget, and that met product specification. A project failure, this researcher believes, can only occur if there is customer discontent. If cancelled, the project may not be a failure. Cancelled projects could generate a lot of knowledge that could be directly transferred to the next project. A project being in time, on cost and meeting specifications does not mean it is successful. From a KM perspective, the measure of success is the amount of knowledge that could be carried on to future projects (Dalgleish, 2003). A lot of project success criteria are centred on cost, time and quality but de Witt (1998) argues that measuring project success solely based on these criteria is an illusion. There needs to be a consideration of the stakeholders' objectives agreed at the commencement of the project and this reflects a true measure of the project's success.

1.1.4 Operational efficiency
Operational efficiency may be defined as the optimal use and management of project inputs and processes in order to achieve the project's goals and objectives. Operational efficiency involves finding the best ways to deliver a project, eliminating repetitive and low-value tasks, reducing risk and improving quality and eliminating errors associated with certain manual or automated tasks. From the KM perspective, operational efficiency is maximised when knowledge is shared and utilised. Organizations must examine baseline operational processes that support the project, and then plan, implement, and support the right procedures using KM processes. Being process-driven means the operations that support business activities become highly efficient. Only with well thought-out project processes in place at the beginning and a leveraging through KM can an organization achieve operational efficiency. Operational Efficiency is what occurs when the right combination of people, process, and technology come together to enhance the productivity and value
of any project, while driving down the cost of routine operations to a desired level. The end result is that resources previously needed to manage operational tasks can be redirected to new, high value initiatives that bring additional capabilities to the project organization.

1.1.5 Generation of new knowledge
Knowledge creation is the process of realising new knowledge from the whole project process. The combination of knowledge creation, sharing and utilisation features of a project are factors which help yield new knowledge for a project. Knowledge realised in a project are utilised for reproducing project specifications and meeting clients needs. Project success is seen to anchor on the creation and realisation of new knowledge during the project process. Innovation is often linked to the realisation and utilisation of new knowledge leading to cutting edge delivery of products and services. PM strategies are focusing on ways of stimulating innovative practices using collaborative knowledge activity.

1.2 Research Context
The following are areas where the context of this research is situated:

1. The context of this research lies within international development. The motivation behind this lies in the researcher’s understanding of development projects (DPs) as initiatives aimed at developing countries or their citizens with the objective of improving national or individual quality of life. Selection of projects for this research would consider this element as crucial.

2. In addition, this research will be situated within the scope of development organisations working in developing countries. The types of DPs and organisations was determined in the course of the research.

1.3 Development projects
A development project (DP) is a project intended to increase a developing country's ability to produce in the future. Such projects are most commonly additions to the country's capital stock, but they may involve improvements in infrastructure, educational facilities, discovery or development of natural
resources, capacity building, human development, and economic empowerment (Deardorff, 2000). Development projects in this sense could encapsulate several disciplines or thematic areas as long as the endeavour is aimed at increasing a developing country's capacity to sustain itself. As in the foregoing, the inexistence of boundaries in discipline or thematic areas makes DPs a very wide area of activity (McMichael, 2004; Bennet, 2000). This may serve to confuse the recognition of projects as development oriented but the basic yardstick is the concern in dealing with the complex web of underlying causes of backwardness in developing countries to enable these countries to scale up capacity (Addison, Mavrotas and McGilivary, 2005).

Development projects are tied to the conditions that created them. As a result, there are various challenges that are unique to them:

1.3.1 Challenges of development projects
A number of challenges face development projects as outlined below:

**Accountability:** Development projects have been criticised for being unaccountable to clients and beneficiaries (Burger and Owens, 2006). In the past, development interventions have tended towards coming from external sources with beneficiaries having little input in how the project is designed. This makes the project vulnerable and susceptible to failure, suspicion and hostility from the host communities and misunderstanding of the real motives of the project. Current project best practice recommends the involvement of beneficiaries in designing and implementing projects from the beginning to the end (World Bank, 2007).

*The challenge of knowledge reuse:* Literature reviewed in the process of this research identifies the challenge of reusing knowledge from previous projects. Due to the temporary nature of projects, staff are forced to disband at the end of the project and reviews are hastily done, not often with the intention of reusing the knowledge in future projects but the most important factor in carrying out reviews is to comply with project monitoring stipulations.
Literature reviewed is suggesting that projects do not often reuse the lessons learned from previous projects (von Zedtwitz, 2003).

Turbulence, change and complexity: Development projects sometimes operate in highly volatile environments where conflict-political, religious and tribal, and natural disasters occur. They also operate in atmospheres of economic uncertainty especially in developing countries where politics and economic dynamics change very often. These situations necessitate constant adaptation, learning and knowledge sharing to survive and meet project objectives. Sometimes the lives of project staff depend on the quick and efficient sharing of information and knowledge. At other times, the life of the project is threatened by these unforeseen events and survival depends on the ability to manage and cope with change and complexity.

Ignorance: Development projects also operate in regions of the world where education and enlightenment is very minimal. The level of awareness of benefits that projects could bring may be very low and this may stir resistance to the project. A case in point is the resistance to the planned polio vaccination of indigenes of Northern Nigeria in 2004/2005 (Yahya, 2007). This was met with stiff resistance due to the level of ignorance, illiteracy and religion. The project failed as a result of local conditions and sentiments which the project planners probably failed to anticipate and address.

Low national infrastructure: In developing countries, especially in Sub-Saharan Africa, the rate of technological and infrastructural development is low and does not meet acceptable minimum standards of development. As a result, it is difficult for projects operating in these areas to have access to good roads, fast Internet access, good transport, established markets and even raw materials for projects. These are constraints for development projects working in these areas.
1.4 Development Organisations
The type of organisations involved in development include multilateral and bilateral organisations, international organisations like the United Nations (UN), and its specialised agencies such as United Nations Educational, Social and Cultural Organisation (UNESCO), the World Health Organisation (WHO), and United Nations Environmental Programme (UNEP). Regional bodies like the European Union (EU) are also involved in development efforts outside their region. Certain countries like the UK and the United States have development agencies like the Department for International Development (DFID) and United States Agency for International Development (USAID) respectively charged with the responsibility of identifying development needs overseas and working either alone or in partnership with local or other international organisations to provide effective interventions. Voluntary organisations, academic institutions and businesses do get involved in development efforts either directly or indirectly (Doney, 2005). Local Non-Governmental Organisations (NGOs) in developing countries also take the initiative to advocate and work towards developing their respective countries. Whatever the case, delivering of DPs involves the PM process and the PM process is often designed with specific learning outcomes in mind. This research is looking into ways KM practices could help DPs deliver their project outcomes.

1.5 Aim of the research and statement of the problem
The aim of the research and statement of the problem are stated in sections 1.5.1 and 1.5.2

1.5.1 Aim of the Research
The aim of this research is to investigate the KM practices of development projects to discover if they contribute to identified variables which are:

- Innovation
- Timely completion
- Operational efficiency
- Project success; and
- Generation of new knowledge
1.5.2 Statement of the Problem

Development projects like any other business activity, have a difficulty with managing what they know and this affects projected outcomes. Poor management of knowledge critical to a project can result in not achieving project outcomes such as, project success, innovation, efficiency, faster completion time, and the ability to create and utilise new knowledge. Understanding current project practices and identifying areas where support is needed and the development of procedures and tools for facilitating and improving decision-making is important for DPs if expected project outcomes are to be realised. For projects to realise projected outcomes, they need to: focus on the project process; capture knowledge at each stage of the project; enable learning; and ensure completed projects feedback into new projects (Cusworth and Franks, 1993). Some of the problems encountered by projects during the life of a project may include:

1. The inability to utilise lessons learnt from completed projects in the design and execution of subsequent projects.

2. The non-capture of the experience of staff who worked on the projects which affects the planning of similar projects forcing the project team to reinvent the wheel thereby wasting resources: energy; time; and money; for example.

3. Each stage of the project presents an opportunity to learn and the failure to translate the knowledge in these stages into learning opportunities would create problems for the immediate project and also lead to failure to learn for the benefit of subsequent projects.
1.6 Research Questions and Objectives

This section discusses the research questions and the objectives.

1.6.1 Research Question

This research would address the following question: Does knowledge management in development projects influence the following:

1. Innovation;
2. Timely completion;
3. Operational efficiency;
4. Project success; and
5. Generation of new knowledge.

1.6.2 Research Objectives

The objectives of this research are:

- To investigate the KM practices of development projects;
- To determine if development projects adopt KM based strategies;
- To determine whether these KM practices in development projects contribute to innovation; timely completion; project success; operational efficiency; and generation of new knowledge; and
- To recommend ways in which the KM practices of development projects could be improved if they are inadequate.

1.7 Hypothesis

The hypothesis of this research is: “Knowledge management in development projects is positively related to Innovation, project completion times, project success, operational efficiency and the rate of new knowledge generated for future projects.”
1.8 Expected Outcome/Research Audience:
This section discusses the expected outcome and research audience.

1.8.1 Expected outcome
This research is expected to contribute to the theory of KM and PM. Other contributions will probably lie in the area of improving development project practices and KM practices if projects adopt the recommendations of this research. It is also expected to contribute to PM through the investigation of ways in which KM could help deliver innovation, project success, efficiency, faster completion times and new knowledge. The research will also lead to the development of a theoretical model for managing knowledge in DPs.

1.8.2 Research audience
The audience for this research are project managers, organisations implementing projects, academics, and anyone interested in PM, KM users and managers, KM consultants and researchers, KM software providers and systems developers involved in the design and development of tools to support knowledge sharing.
1.9 Thesis Layout and Contents
This thesis will be organised as follows:

*Chapter 1: Introduction:* This chapter introduces the background, research context, development projects and organisations, aims and statement of the problem, research question and objectives. It draws out a hypothesis, and the audience of the research and the expected benefits. It also gives a brief thesis layout and contents.

*Chapter 2: Literature Review:* This chapter is a review of past and current literature in the field of KM and PM. It also examines the management of DPs from a KM perspective. This chapter traces the development of KM concepts and their current day application in research and industry. The job of this chapter is enormous giving that it seeks to integrate literature from two prominent knowledge areas-KM and PM as they relate to DPs. It brings PM and DPs into a melting pot of KM. Finally, it identifies some knowledge gaps in literature which need addressing.

*Chapter 3: Research Methodology:* This chapter proposes a conceptual framework for KM in DPs to address the gaps identified in chapter 2. It also provides a theoretical framework for the research and goes further to outline the research methods used, and the survey design and administration, case study design, and proposed data analysis framework.

*Chapter 4: Analysis of Survey data:* The survey data gathered during the research is analysed in this chapter using SPSS. The data is provided as generated from SPSS and followed with explanations, interpretation and analysis. The relationship to the model, aims, objectives and hypothesis are also highlighted. Using regression, correlation, hypothesis testing, plots and charts the research explores concepts and the results of the survey. General themes of the study are also outlined and explained.
Chapter 5: Case studies: This chapter analyses the case study data. It also brings this into context with the research objectives and the conceptual framework. It uses the descriptive approach to analysing the interviews, observations, documentation and other data collected.

Chapter 6: Discussions on survey and case studies: This chapter discusses the survey and case studies with the aim of integrating issues which emerged from both research approaches. The chapter highlights similarities and differences arising from the results of the survey and case studies.

Chapter 7: Conclusions and recommendations: This chapter concludes the research and makes recommendations on areas for further research. It summarises the research in general and discusses how the research met its objectives. It also highlights the contributions to knowledge and gives an overview of the findings of the research.
1.10 Operational Definition of Terms
The following terms are defined in the context of this research.

Communities of Practice: These are formal or informal project groupings which exist to share and exchange project-related knowledge and information. Members of communities of practice offer mutual support to one another and also serve as an informal apprenticeship network for the induction and training of new project staff.

Completion time: Completion time for a project is the point at which project objectives are delivered to the client and the project has formally ended. Various variables are involved here. There are estimated completion times and actual completion times. At the beginning of a project, the completion time given is most often estimated. Projects can overrun. Actual completion time is the time it takes from inception to conclusion.

Development: Development in the context of this research is the whole concept of active intervention in the form of project activity in developing countries to improve infrastructure, economy, social and cultural amenities, educational infrastructure and other areas which affect the lives of citizens of developing countries. The objective is to improve the standard of living, increase the capacity of those countries to tackle their domestic development needs and enable the leadership of those countries to take initiative.

Development projects: Projects which operate in developing countries with the purpose of helping the countries achieve capacity building, develop infrastructure, public services and improve the general condition of citizens.

Development Organisations: These are organisations which design and implement DPs to achieve certain stated objectives which are usually in line with improving infrastructure, social amenities, access to services, poverty reduction or any other activity whose purpose is aimed at improving individual or community conditions.
**Innovation:** Innovation is the condition that enables radical or incremental improvement within a project. Radical innovation deals with a departure from the norm and the discovery of entirely new ways of project work leading to success and incremental innovation deals with building on already known ideas and processes with occasional improvements.

**Knowledge management:** The creation, sharing, utilisation and codification of knowledge within and without a project with the aim of helping a project achieve desired outcomes.

**Knowledge Sharing:** Knowledge sharing involves the exchange of ideas and information, consciously or unconsciously in the course of project activity.

**Organisational (Project) Culture:** This refers to the whole atmosphere, norms, perceptions, traditions, idiosyncrasies, styles, written and unwritten regulations, conditions or laws which govern actions within an organisation (project).

**Organisational (Project) Learning:** Organisational learning is the sum total of the new knowledge embodied in the staff of the organisation as a result of the experiential process and outcomes of a project. However, it is not reducible to individual learning. The whole project process is a knowledge producing process and knowledge is a vehicle for learning. Organisations therefore learn through the knowledge produced during a project.

**Operational efficiency:** This involves optimum performance of a project due to the efficient utilisation of project resources. It deals with saving costs, staff time, scheduling time, and reducing the time-line of the project efficiently.

**Project Cycle:** The project cycle is an instrument which embodies a sequence of activities in a time-line constituting a pattern for the delivery of the project. A project cycle includes a schedule of activities. Often these activities are explained in detail in a project schedule usually outlined with a Gantt chart.
**Project management:** This refers to a range of activities involved in strategic management and delivery of a project. PM involves human resources management, selection and design of a project cycle, technology choice, negotiating with clients, and other activities geared towards effective delivery of a project.

**Project Success:** Project success is the achievement of project objectives. The outcomes or results must be in line with the client expectation. These objectives are often spelt out at the beginning of the project.

**Social Capital:** Social capital is a product of interaction of people working in projects. The goodwill, expectations, obligations, recommendations and networks of resources available to an individual actor in this network constitutes social capital. It often leads to knowledge discovery and new ways of doing things within a project.
CHAPTER 2
LITERATURE REVIEW

2.0 Introduction
This chapter reviews literature on knowledge management, project management and development projects. First it sets out to define KM, and classifies KM practices and perspectives into three broad areas. Second, it outlines the PM process with a focus on the PM cycle in order to provide the appropriate context. Third, it provides a background on DPs, putting this in the context of PM and KM. Finally, it outlines the knowledge gaps identified in literature and the relevance of this research in filling these gaps.

2.1 Knowledge Management (KM): An Introduction
This section introduces knowledge management and highlights the multidisciplinary nature of the subject and its definitions. Knowledge management is a relatively new discipline. Due to its similarities with information management in some areas and business management in other aspects, it can become confused as information systems by some and human resource management (HRM) by others. In reality, it has roots in a wide variety of disciplines such as philosophy, economics, cognitive science, management, organisational science, knowledge engineering, artificial intelligence, information science, sociology and politics. As a result, there are as many definitions of the concept as there are disciplines. Peter Drucker (1993) used the term “knowledge economy” to describe the current period in history where knowledge is a key asset. The popularity of knowledge management in the past five years among academics and practitioners is due to the argument that it is no longer industrial technologies or craft skills that drive competitive advantage but rather knowledge is key to survival and success.

The uniqueness of knowledge management comes from its interdisciplinary nature, although conventional academic divisions in traditional subject areas do not help. If KM was human resources management, current HR strategies
such as Business Process Re-engineering (BPR) would have been enough. Similarly, if KM was information systems, current information management tools and processes would have been sufficient. The reality though, is that different information systems and business strategies have been found wanting. Numerous examples of investments made in business strategies and information management strategies, in a number of sectors have yielded little or no results. Knowledge management rather than being HRM or IM instead, is synergistic in that it facilitates boundary crossing and enables individuals to see beyond the narrow margins of their own areas and recognise the value of debate and dialogue in problem solving. To understand the nature of KM, it is important that the definitions of KM in different contexts are explored. The sub-section that follows discusses the various definitions of KM from different perspectives.

2.1.1 Definitions of KM
Given the multidisciplinarity of KM, it comes as no surprise that various definitions come from different angles and perspectives as shown in Table 2.1. Some come from strategic management perspective (Wiig, 1997, 2000; Alavi and Leidner, 2001), others come from a human resources perspective (Skyrme and Amidon, 1997; Liebowitz, 2001) while others come from information systems angle recognising that KM is a tool for making meaning out of information (Kakabadse, 2003; Lave, 1988; Blacker, 1995). However, none of these definitions are clear on their positions on the highly turbulent environments of project management which require continuous innovation, efficiency and faster delivery (completion) times and this needs to be questioned (Newell, 2002). Egbu (2006) is among the few researchers who carried out empirical studies on the benefits of knowledge production and the impact this can have on organisational innovation. The majority of writings on KM have been theoretical with little or no empirical studies to support assumptions. The fact is that we live in uncertain times and any assumptions about competitive advantage and approaches to management need to be considered carefully.
From the definitions in Table 2.1 it is clear that any progress that could be made in the field of KM needs to adopt an interdisciplinary perspective. The purpose of KM is to increase intellectual capital and organisational performance and efficiency. It also aims to facilitate innovation, earlier delivery of products and services (completion times) through knowledge creation, sharing and utilisation. Knowledge creation in itself is not the end objective. With knowledge creation comes the challenge of sharing knowledge. The goal of KM is to leverage individual and collective knowledge and in doing this, a wide range of tools, technologies and systems are used to support the processes of creating, capturing, organising, evaluating, storing and sharing knowledge.

Table 2.1: Knowledge Management definitions

<table>
<thead>
<tr>
<th>Author/s</th>
<th>Definition</th>
<th>Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Wiig, 2000)</td>
<td>&quot;Knowledge management is the systematic and explicit management of knowledge related activities, practices, programs and policies within the enterprise&quot;</td>
<td>Strategic Management</td>
</tr>
<tr>
<td>(Liebowitz, 2001)</td>
<td>&quot;the process of creating value from an organisation's intangible assets&quot;</td>
<td>Human resources perspective</td>
</tr>
<tr>
<td>(Skyrme and Amidon, 1997)</td>
<td>&quot;the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organising, diffusion, use and exploitation, in pursuit of organisational objectives&quot;</td>
<td>Human resources process</td>
</tr>
<tr>
<td>(Davenport and Prusak, 1998)</td>
<td>&quot;Knowledge management draws from existing resources that your organisation may already have in place-good information systems management, organisational change management and human resources management practices&quot;</td>
<td>(Information systems and human resources)</td>
</tr>
<tr>
<td>(Blacker, 1995)</td>
<td>&quot;Knowledge is valid through meaningful and organised accumulation of information through experience, communication or inference&quot;</td>
<td>Information Systems</td>
</tr>
<tr>
<td>(Kakabadse et al., 2003)</td>
<td>&quot;Knowledge can be conceived of as information put to productive use&quot;</td>
<td>Information systems</td>
</tr>
<tr>
<td>(Newell et al., 2002)</td>
<td>&quot;...improving the ways in which firms facing highly turbulent environments can mobilise their knowledge base (or leverage their knowledge assets) in order to ensure continuous innovation&quot;</td>
<td>Strategic Management</td>
</tr>
</tbody>
</table>
A knowledge management definition that integrates the different perspectives seen in Table 2.1 above is offered here by the researcher. Knowledge management can be defined as: the systematic process of creating, exploiting and sharing individual and corporate knowledge (tacit and explicit) utilising technology, culture, strategy and people in enhancing innovation, efficiency, completion times and organisational performance.

This definition recognises and embraces the need to manage knowledge efficiently in highly turbulent development project environments as would be articulated in this research in subsequent sections. It also takes into account variables identified by the research hypothesis in chapter one as important to this research (innovation, completion times, operational efficiency, project success, and generation of new knowledge). The following section will discuss a few concepts that underlie knowledge management.

2.2 KM-the underlying concepts

A variety of concepts have contributed to the evolution of KM to an organisational strategy and as a discipline worthy of scholarly investigation.

2.2.1 The concept of knowledge

One of the concepts that underlie KM is the concept of "knowledge". The search for a definition of knowledge dates back to Plato (427-347 BC). Plato as a pupil of Socrates grappled with a variety of questions in the form of dialogue. He provided three answers to the question "What is knowledge"

- Knowledge is perception.
- Knowledge is true judgement.
- Knowledge is true judgement together with an account.

Aristotle (384-322 BC), a pupil of Plato, saw philosophy as an attempt to make meaning of human experience. He synthesised natural and rational perspectives of knowledge in his book Metaphysics (Burns, 1984). He also took exception to Plato's perspectives on knowledge. Subsequent philosophers who explored the concept of knowledge were divided between Plato's and Aristotle's viewpoints. Consequently, two philosophical perspectives of knowledge emerged namely the idealist and empiricist
perspectives. The idealist perspective is based on Plato’s viewpoints that knowledge is a state of being, while the empiricist perspective is based on Aristotle’s viewpoint that knowledge is doing (Jashapara, 2003). The idealist perspective starts with perception and then true judgement develops and this translates into true judgement together with an account. On the other hand, the empiricist perspective starts with appearance, works through puzzles and then comes back to appearance. The two philosophical perspectives of knowledge and the authors that take these viewpoints are represented in Table 2.2.

Table 2.2: Philosophical perspectives of knowledge

<table>
<thead>
<tr>
<th>IDEALIST (BEING)</th>
<th>YEAR</th>
<th>EMPIRICIST (DOING)</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLATO</td>
<td>427-347 BC</td>
<td>ARISTOTLE</td>
<td>384-322 BC</td>
</tr>
<tr>
<td>DESCARTES</td>
<td>1596-1650</td>
<td>LOCKE</td>
<td>1632-1704</td>
</tr>
<tr>
<td>KANT</td>
<td>1724-1804</td>
<td>HUME</td>
<td>1711-76</td>
</tr>
<tr>
<td>HEGEL</td>
<td>1770-1831</td>
<td>PEIRCE</td>
<td>1839-1914</td>
</tr>
<tr>
<td>HUSSERL</td>
<td>1859-1938</td>
<td>JAMES</td>
<td>1990-</td>
</tr>
<tr>
<td>HEIDEGGER</td>
<td>1889-1976</td>
<td>DEWEY</td>
<td>1859-1952</td>
</tr>
<tr>
<td>SARTRE</td>
<td>1905-80</td>
<td>WITTGENSTEIN</td>
<td>1889-1951</td>
</tr>
</tbody>
</table>

(Source: Hegel and Gray, 1997)

The two philosophical viewpoints on knowledge affected the ideas and writings that followed after. Even today, our notions of tacit knowledge is based on the empiricist perspective of “doing” while the notion of explicit knowledge is based on the idealist perspective of “being”. In section 2.2.3, the researcher will be discussing the concepts of tacit and explicit knowledge. Idealistic postulations of knowledge are existentialist while empiricist postulations are pragmatic. There is yet no universally accepted definition of knowledge. Definitions have tended to follow one of the two perspectives described above. Styhre (2003) explained that the reason why there would be no final coherent definition of knowledge, is because mainstream knowledge management theorists are not that interested in knowledge per se but rather care more about management. This section is not enough to treat the philosophical concept of knowledge but it suffices that mention is made of the two dominant viewpoints which pervade philosophical discussion on knowledge. The next section discusses the concept of management.
2.2.2 The concept of management

The use of knowledge and intellectual resources in an organisation is generally said to be knowledge management. Paradoxically, organisations ignore fundamental and detailed analyses of the notions and definitions of management. Management is inextricably linked with the notions of organisation and administration. The processes of controlling, governing or steering a process towards achieving objectives are part of management. The majority of definitions of management are aligned towards the viewpoint of controlling, organising, administering, steering, utilising and maximising the resources of an organisation (Gephartd, 1996; Jacques, 1996; O'Connor, 2001). Management has become a tool for controlling employees and for organising resources. On one hand managers are in charge and on the other hand they are not fully in control of workers. Von Krogh, Ichijo and Nonaka (2000) observed that the term management implies control of processes that may be inherently incontrollable. The irony of the term “management” has led to an interest in practices which enhance workers self-motivation and empowerment. In the old days, the manager was the boss and made decisions and was held accountable for success or failures. In the new regime, the manager has been changed to a team member or first among equals, supporting and motivating co-workers to achieve objectives.

Going from the above, the KM angle of the concept of management relates to organisational management being responsible for motivating and empowering workers to share skills, knowledge, experiences and insights about a project and devising a system to capture and manage what is shared to improve organisational practices. Having looked at the concept of management in this section, the next section will discuss tacit and explicit knowledge as a KM concept.

2.2.3 The concept of tacit and explicit knowledge

Knowledge management discourse in the current dispensation has been dominated by the two types of knowledge-tacit and explicit knowledge. Nonaka’s (1995) seminal work on knowledge management served to
popularise these concepts. The notions of tacit and explicit knowledge could be traced back to Gilbert Ryle (1900-1976) and Michael Polanyi. Their viewpoints and philosophies are represented in Figure 2.1 below.

Ryle contributed mostly towards the understanding of “knowing how” (tacit) and “knowing that” (explicit). Polanyi comes from a similar background as Ryle and his contribution towards the concept of tacit and explicit knowledge borders on the idea that “we know more than we can tell”. Tacit knowledge is the basis of actions-knowing how to do a thing while explicit knowledge is action that is dormant. Nonaka’s (1995) work on tacit and explicit knowledge elaborated on the relationships between the two kinds of knowledge and the fact that one can be converted into the other. Both kinds of knowledge can exist side by side in a process. There is a lot of debate in literature as to whether tacit knowledge can be converted to explicit knowledge and vice versa. Some writings also question the classification of knowledge into tacit and explicit. However, what has been discovered from literature review both in definitions, theories and applications of knowledge management is that authors and practitioners viewpoints border on one or the other (tacit or explicit). Some are balanced in their view about KM relating to the two
viewpoints. Section 2.4, will discuss the philosophies of knowledge management. This will draw out the applications of KM based on the underlying philosophies.

2.2.3.1 Can knowledge be managed?
The idea of managing knowledge is subject to debate. The foregoing section 2.2.3 dealt with the notion of tacit and explicit knowledge. Explicit knowledge deals with documented knowledge represented in all kinds of formats while tacit knowledge deals with knowledge that has not been formalised. The argument against the possibility of managing knowledge only appears credible with reference to tacit knowledge—that resides in peoples heads. There is a semblance of difficulty in managing the ideas, nuances, traits and other forms of knowledge which have not been captured in a concrete format. However, the emphasis of KM is to enable people to share, capture and contextualise knowledge regardless of the forms it takes—tacit or explicit. So regardless of the difficulty, people can be encouraged to share what they know. Proponents of the idea that knowledge cannot be managed are on the side of the divide which believe that knowledge is a state of being and difficult to contextualise. Those who put forward the idea that knowledge can be managed hold the viewpoint of knowledge being a state of doing.

KM is a relatively young discipline trying to find its way. Its' multidisciplinarity makes it imperative that any acceptable propositions on how to manage knowledge should integrate the two viewpoints of tacit and explicit knowledge which are the major dividing lines between authors and philosophers. Tacit and explicit knowledge constitute intellectual capital that could be leveraged through knowledge management practices. The next section will look at KM and intellectual capital.

2.2.4 KM and intellectual capital
Stewart (1997) defined intellectual capital (IC) as the “intellectual material – knowledge, information, intellectual property, experience – that can be put to create wealth”. In section 2.1 we highlighted Kakabadse ’s (2003) definition of
knowledge as “information put to productive use”. This definition positions KM and intellectual capital as related concepts. The emphasis is on creating wealth or productive use. Intellectual capital is made up of intangible assets of organisations or entities. Tangible assets are those assets which could be quantified and measured while intangible assets cannot be quantified or measured easily. In recent times, a number of researchers have concentrated on measuring intangible assets. The argument is that intangible assets contribute to the wealth of organisations. One of the flagship studies on intellectual capital is Edvinsson and Malone (1997) which reported hidden intellectual assets of Skandia AFS, a Swedish financial services firm, as a supplement to the annual report. It was the first time that the term “intellectual capital” was used rather than the accounting term “intangible assets”. Sveiby (2001) is another leading study on intellectual capital. His framework focuses more on people in the organisation and their know-how.

Knowledge management has been said to leverage intellectual capital, Wiig (1997). Leveraging intellectual capital is a major driver behind KM programmes and practices. Intellectual capital of an organisation constitutes a rich base of competitive advantage, innovation, efficiency and organisational learning. When IC is leveraged through KM, the organisation learns. The next section discusses KM as a strategy.

2.2.5 The concept of KM as strategy
Carrillo et al. (2003) successfully linked KM with business performance therefore making a strong case for organisations to adopt a KM strategy. Knowledge management has become a tool for strategic management in organisations due to the advantages it could deliver. The need for the management of knowledge in the present time cannot be over-emphasised. Managing knowledge in an organisation involves acquiring and leveraging knowledge and utilising, where possible, technologies to harvest and manage the knowledge produced during a task.
Currently, KM projects in organisations are becoming common. It is fashionable for organisations to have a project dedicated to managing their knowledge regardless of how efficient or sustainable such KM programmes could prove in leveraging the organisations resources. Examples of KM projects are the Skandia Navigator Project placing emphasis on intellectual capital (Edvinsson and Malone, 1997), the Japanese experience observed by Nonaka and Taekuchi (1995), the IBM KM project (IBM, 2006), and the British Airways KM project (Yeoman, Sparrow and McGunnigle, 2000).

These KM examples show that organisations are taking KM seriously. They also adopt it as a strategy for maximising organisational resources and achieving competitive advantage. Davenport and Prusak (1998) amplified the views of Edvinsson, Malone, Nonaka and Takeuchi by reiterating that how organisations manage what they know would be responsible for their sustainability in the increasingly competitive global market. A number of these KM initiatives use the community and social capital approach (Wenger, McDermott and Snyder, 2002). The varieties of knowledge initiatives, experiments and projects across the globe has led to a phenomenal growth in KM body of knowledge (Sharkie, 2003). Researches looking into ways KM could be utilised in the process of innovation and improving already existing processes are on the increase (Toffler, 1990). Moreover, one unique feature characterising KM is that a significant number of KM applications like the ones mentioned above have been applied in the organisational process giving a hint that the need for quality, efficiency and a faster time to market cycle may be the major drivers for KM applications (Quinn, 1992). The next section discusses knowledge management processes.

2.2.6 Knowledge Management models and Processes

Many models of KM covering a wide spectrum of viewpoints exist in the literature. In this section, a number of KM models are critiqued and a tentative representative model for development projects is suggested as useful for further work and for structuring research and project applications of KM. The models must be treated with caution as they are useful in understanding the
underlying assumptions in representations rather than accepting them as objective representations of reality.

**Tan's Knowledge processes:**

Perhaps, one of the most explicit knowledge processes in literature is the Capture and Reuse of Project Knowledge in Construction (CAPRIKON) expostulated by Tan et al (2006). This process was developed for knowledge management in construction and is mostly representative of what a typical KM adventure within a project should look like. Table 2.3 below depicts the CAPRIKON and compares it with other typical knowledge processes. Most of the processes in the table below are similar but differ in nomenclature, robustness and application.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Capture</td>
<td>Discovering</td>
<td>Acquiring</td>
<td>Creation</td>
<td>Planning</td>
</tr>
<tr>
<td>Identifying</td>
<td>Locating</td>
<td>Creating</td>
<td>Creating</td>
<td></td>
</tr>
<tr>
<td>Locating</td>
<td>Capturing</td>
<td></td>
<td>Assessing</td>
<td></td>
</tr>
<tr>
<td>Representing</td>
<td>Organising</td>
<td>Storing</td>
<td>Presentation</td>
<td>Integrating</td>
</tr>
<tr>
<td>Storing</td>
<td>Storing</td>
<td></td>
<td>Organising</td>
<td></td>
</tr>
<tr>
<td>Validating</td>
<td></td>
<td>Validation</td>
<td>Transferring</td>
<td></td>
</tr>
<tr>
<td>Sharing</td>
<td>Sharing</td>
<td>Sharing</td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td>Reuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapted</td>
<td>Modifying</td>
<td>Utilising</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>Applying</td>
<td>Applying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain</td>
<td>Archiving</td>
<td></td>
<td></td>
<td>Maintaining</td>
</tr>
<tr>
<td>Retirement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 2.3 above, knowledge capture encapsulates identifying and locating knowledge. Knowledge representation involves storing knowledge and validating knowledge. Knowledge sharing deals with the transfer of knowledge to the right people at the right time (Robinson, 2002). Knowledge can be
transferred between people and computers. People can also interact with computer systems thereby eliciting knowledge transfer. The next step in the knowledge process is knowledge reuse. This process involves adapting and applying knowledge gained for problem solving. Ideas could be reused and applied for innovative ends through developing such ideas fully and reconceptualising the problems they are meant to solve. In this way, there is a continual flow of knowledge in a cycle leading to use and reuse and in each scenario, the knowledge adapted and used emerges in a different and improved form. Knowledge reuse leads to its maintenance which relates to archiving and retiring such knowledge for subsequent use. It also involves updating what is obsolete and refining it to keep abreast of developments in the area.

**Nonaka and Takeuchi’s knowledge creation model**

<table>
<thead>
<tr>
<th>Tacit</th>
<th>Explicit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socialisation</td>
<td>Externalisation</td>
</tr>
<tr>
<td>Internalisation</td>
<td>Combination</td>
</tr>
</tbody>
</table>

*Figure 2.2: Knowledge creation processes (Nonaka and Takeuchi, 1995)*

Nonaka and Takeuchi’s (1995) model represents a knowledge creation process. As seen from Figure 2.2, knowledge is considered as consisting of tacit and explicit elements. There is a question of the appropriateness of this kind of categorisation. From the model above, it is not clear where knowledge is actually created and shared. Is it at the point of socialisation, internalisation,
combination or externalisation? Although later representations of the knowledge creation process as would be seen later have argued that knowledge processes could run concurrently, Nonaka and Takeuchi's model make assumptions on knowledge creation during socialisation. Perhaps, the usefulness and relevance of this model could be much more attributable to its categorisation of the kinds of knowledge (tacit and explicit) and the identification of four levels of interaction of knowledge in a process but falls short of elucidating the knowledge creation process itself. Therefore from a critical standpoint, Nonaka's categorisation of knowledge is perhaps limited.

The model makes the assumption that tacit knowledge can be transferred through a socialisation process into tacit knowledge in others and that tacit knowledge can become explicit knowledge through a process of externalisation (top 2 squares of the model in Figure 2.2). The model also assumes (bottom 2 squares) that explicit knowledge can be transferred into tacit knowledge in others through a process of internalisation, and that explicit knowledge can be transferred to explicit knowledge in others through a process of combination. Therefore, the transforming processes are assumed to be socialisation (everyday friendship), externalisation (formalising knowledge), internalisation (converting insight into practice) and combination (combining what is known). However, perhaps knowledge creation in development projects is much more complicated than this simple matrix suggests.

**Boisots knowledge management model**

<table>
<thead>
<tr>
<th>Codified</th>
<th>Uncodified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proprietary Knowledge</strong></td>
<td><strong>Public Knowledge</strong></td>
</tr>
<tr>
<td><strong>Personal Knowledge</strong></td>
<td><strong>Common Sense</strong></td>
</tr>
</tbody>
</table>

*Figure 2.3: Boisots' Model (1987)*
Boisots' (1987) model considers knowledge as either codified or uncodified. It also considers it as diffused or undiffused within an organisation. The term codified in this context refers to knowledge that can be easily prepared for transmission and the term uncodified refers to knowledge that cannot be easily prepared for transmission. The term diffused refers to knowledge that can be readily shared while undiffused refers to knowledge that is not readily shared. There are a number of similarities between Nonaka's and Boisots' models. Nonaka's categorisation of tacit and explicit knowledge bear some resemblance to Boisots' classification of uncodified and codified knowledge. In both models also, the horizontal aspects of the model relate to the diffusion or spread of knowledge across the organisation. Both models have the same limitations in that codified and uncodified knowledge are two discrete categories of knowledge. Also the idea of diffused and undiffused knowledge is rather general and is less clear on whether it includes incorporating knowledge within the organisation and spreading it.

The intellectual capital model of KM

![Diagram of Intellectual Capital Model](image)

*Figure.2.4: Intellectual Capital Model (Chase, 1997)*
A number of models in literature represent KM as intellectual capital. These models are process oriented and emphasise the leveraging of knowledge within organisational processes. A typical Intellectual Capital model is the Skandia intellectual capital model from Chase (1997). The model assumes that IC or KM can be broken down into human, customer, process and growth dimensions contained in two main categories of human capital and organisational capital. The model assumes that knowledge can be commodified hence the link to organisational capital. Skandia was the first company in the world to publish a supplement to its annual report on the company’s intellectual capital philosophy and activities (Chase, 1997). However, this intellectual capital view of KM ignores the political and social aspects of KM. Also, like Nonaka’s model, it assumes KM can be broken down into objective elements rather than being a socio-political phenomenon. This mechanistic approach can result in more simplistic mechanised approaches to complex social-related issues. The Skandia example tries to bring a measurement approach to KM elements assuming it can be tightly controlled just like tangible assets. This approach may result in placing objective measures on issues which are subjective.

Socially constructed model

Figure 2.5: Demerest Model (1997)
Demerests (1997) model highlights the construction of knowledge within the organisation and does not limit the process to scientific approach but also involves the social construction of knowledge. Knowledge is embodied not just through explicit programmes but also through a process of social interchange. This model is more balanced in view than the previous models in that it is not mechanistic but is inclusive of social interchange.

In Chapter 3, a conceptual model was developed and compared with the models reviewed here.

2.3 Differences between KM and Information Management

Information management sometimes is mistakenly referred to as KM. This is understandable given that the differences between information management and KM are often difficult to explain or grasp. There is a thin line between managing information and managing knowledge. KM operates at a more abstract level than IM. This often makes the causal links with benefits and tangible assets difficult to grasp and explain, but that does not render them less real or reduce the strategic importance of KM. To understand the similarities and differences between information and knowledge, it is important to explore these from the following angles:

- Interplay between information and knowledge
- IM and KM projects: different scopes, approaches and measurement systems
- Protecting intellectual capital: IM and KM perspectives.

2.3.1 Interplay between information and knowledge

The management perspective of information recognises that information is much more easily identified, organised and distributed. Knowledge on the other hand is not easily identified, organised and distributed. Identifying, organising and distributing knowledge is not as simplistic a notion as doing the same with information. Thus, KM is limited to creating the right conditions for individuals to learn using information and experience and then apply these to organisational benefit. One of the subtle distinctions that could be drawn between knowledge and information is that as knowledge is turned into information (documents, databases etc) a transformation occurs. During the
process of speaking, dialogue and writing (in review meetings), individuals are not just offering what they know, but they are also learning and transforming what they know and providing a context.

2.3.2 IM and KM projects: different approaches, measurements and scopes.
Knowledge management is more closely associated with the art of managing than IM. KM is defined by the identification of people's expertise and the interplay of people with people and between people and information systems (Carter and Scarbrough, 2001). KM is highly dependent on people's previous experience, motivation and willingness to create, share and codify their own individual knowledge, KM processes are far more complex than IM processes. KM may be dependent on a solid IT infrastructure. This is evident in large dispersed project work where knowledge workers need to collaborate with each other to accomplish tasks although they are not in the same geographical location, but information is constantly created, shared and stored for reuse by people who may never meet personally. KM projects need to be a lot more value driven than traditional IM projects. Whereas the success of IM projects are normally judged on technical achievements, the success of KM has less to do with technical achievements and more to do with changes in behaviour and actions on learning opportunities that the project provided.

2.3.3 Intellectual capital: IM and KM perspectives
When it comes to strategies for protecting intellectual capital, there are differences between IM and KM approaches. An IM approach will lead organisations to protect physical documentation, IT equipment with valuable information, floppy disks, CD-ROMs and other information embodied in explicit format. A KM perspective will take the approach of devising ways to utilise and leverage the information embodied in these electronic media, transform and share these for organisational advantage.

In conclusion, knowledge as an asset or resource unlike information is not easily understood, classified, shared or measured. Expanding the knowledge base within an organisation is not the same as expanding the information
base. Most importantly, KM represents a shift from a focus on information to a focus on the individuals that create and use knowledge.

The researcher has categorised the differences between information management and KM in table 2.3. below. This is not an exhaustive categorisation, but these are gleaned from current literature. It is possible that additional differences between the two concepts could be drawn.

<table>
<thead>
<tr>
<th>Information Management</th>
<th>Knowledge Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM is a preliminary stage to knowledge management</td>
<td>KM is the ultimate product of information management</td>
</tr>
<tr>
<td>Working with objects (data and information)</td>
<td>Working with people, creation, use, learning, meaning</td>
</tr>
<tr>
<td>Focus on documents, spreadsheets, CAD drawings, programme codes</td>
<td>Recognises value in originality, innovation, agility, adaptability, intelligence and learning</td>
</tr>
<tr>
<td>Access, security, delivery and storage</td>
<td>Concerned with critical thinking, innovation, relationships, exposure to ideas, patterns, competencies and collaboration</td>
</tr>
<tr>
<td>Efficiency, veracity, timeliness, speed, accuracy, cost</td>
<td>Strengthens alignment among members of a group</td>
</tr>
<tr>
<td>IM deals with objects-orders, routing, addresses</td>
<td>Encourages sharing of experiences, failures and best practices</td>
</tr>
<tr>
<td>Encourages capturing of explicit documentation</td>
<td>Uses technology to foster dialogue</td>
</tr>
<tr>
<td>Uses technology to capture information</td>
<td>Increase communication, shared context and negotiate meaning</td>
</tr>
<tr>
<td>Increases data gathering, storage and analysis</td>
<td>People focused, extends to recruitment, rewards, retention, recognition and reification</td>
</tr>
<tr>
<td>Technology and object focused</td>
<td>Intangibles, intellectual capital, competitive advantage and innovation</td>
</tr>
<tr>
<td>Tangibles like documents, facts, figures, and information flows</td>
<td>Holistic with benchmarking processes for best practices and solutions</td>
</tr>
<tr>
<td>Compartmental and based on technology processes</td>
<td>Intuition-an outcome of Knowledge Management</td>
</tr>
<tr>
<td>Inference-an outcome of information management</td>
<td>Knowledge is the product of learning personal to an individual</td>
</tr>
<tr>
<td>Expression of knowledge capable of storage and access</td>
<td>Dependent on information for commercial applications</td>
</tr>
</tbody>
</table>


From Table 2.3 above it is obvious that IM is not KM and KM is not IM either. Both concepts are related but differ at the levels of theory and practice. Both depend on each other in a variety of ways as highlighted in the table. Information could be considered as systematically organised data while
knowledge could be considered as actionable information. Information is endowed with meaning, relevance and purpose but however, knowledge is much more complex than this simplistic notion. Knowledge allows us to act more effectively than information or data and has a greater ability to predict future outcomes.

The perspective from which individual researchers and organisations view KM depends on the philosophy behind it. The pragmatic and empirical viewpoints which relate to the notion of tacit and explicit knowledge has been discussed in section 2.2.1. This section has documented the differences between information management and knowledge management. In the next section, the philosophies behind the adoption and practice of KM will be discussed.

2.4 Philosophies of KM

The researcher has considered some representative literature of KM and tried to understand the philosophies behind these writings. A basic assumption of the researcher here is that researchers and practitioners views found in literature on KM could help understand the philosophy and practice of KM within an organisation. Therefore understanding and categorising the literature could shed light on reasons why an organisation or project adopted a KM style. The literature of KM have tended towards three philosophies. These philosophies have been responsible for the way KM is articulated in organisations. The researcher has categorised these dominant philosophies into three major areas as highlighted in Table 2.4 below.
2.4.1 The Custodian Philosophy

The custodian philosophy of KM is handed down from information management disciplines. At present, almost every discipline or area of knowledge is laying claim to KM and this is giving the concept a variety of meanings, applications, theories, and practical implications. Information scientists, librarians, information technologists, data managers, software developers and a broad spectrum of technology disciplines are prone to viewing KM as a system for managing information effectively. Here much of what is represented as KM is in reality information or data management.

There are two broad approaches to KM when considering the custodian perspective. One focuses on the "hard" aspects, the use of appropriate technology, and the other focuses on the "soft" aspect, the capture and transformation of knowledge into a corporate asset. This second approach includes the management of people and processes.

Sveiby's (2001) two categorizations of KM reflect this hard and soft perspective. His first categorization is the management of information. This
approach views knowledge as objects that can be handled by information management systems. The key goal of this approach is to increase access to information through enhanced methods of access and reuse of documents through, for example, hypertext linking, databases, and full-text search, (Mason and Pauleen, 2003). Networking technology in general (especially intranets), and groupware in particular, are key solutions. This approach is based on the idea that technology harnessed to a great volume of information will make KM work. The inadequacies of this philosophy are very glaring:

1. An attachment to information management without the human dimension will stifle the incentive to share knowledge;
2. there is bound to be an erroneous attribution of effective KM to technology and information management processes which when put into proper perspective are indeed sub-elements of a KM system; and
3. technology cannot equate to KM and KM is not technology either. The failure of the custodian perspective of KM to take into consideration, people aspects is in direct contrast to the social philosophy which is discussed in the next section.

2.4.2 The Social Philosophy

Intellectual discourse on knowledge started with philosophy and later sociology. These fields of study shaped the theory of knowledge and its practical implications. The foremost sociologists on the exposition of knowledge and KM are Brown and Duguid (1991), and Wenger (2000). The social perspective of knowledge places more emphasis on people over technology, (Lang, 2004). Here, Socratic dialogue and engagement is given prominence in knowledge producing activities, (Lin, 2004; Mclean, 2003).

Organisations that apply the social perspective of knowledge leverage what they know through dialogue, questioning, engagement, community, and networking. Interaction is given more premium than technology. The social
philosophy of knowledge is much older than any other philosophy of knowledge. Engagement and networking, mutuality, interaction, obligation, reciprocity, sanctions, expectations, and boundaries are all functional elements of a social perspective of knowledge (McMichael, 2004). Most authors who hold this view argue that all kinds of knowing is social in context. This social philosophy gave birth to the concept of social capital as having functional capability to leverage knowledge and this has given rise to the communities of practice and social networks concept. Social processes are the development of relationships, reflective conversations, probing questions, and in-depth interactions that are the backbone of knowledge sharing (Abom, 2004).

The social perspective of knowledge is growing in prominence due to the works of Wenger (2000), Brown and Duguid (1991) and Lave and Wenger (1991). As a result, a number of organisations have implemented the communities of practice model of learning which is based on the social learning perspective.

2.4.3 The Corporate philosophy
The corporate sector is among the latest group to see knowledge as having practical implications. It is also ironical that the corporate sector has served to popularise the concept of KM even though sociology and philosophy really initiated the concept. Among the corporate theorists who defined KM in relation to achieving corporate objectives, specifically competitive advantage are (Nonaka and Takeuchi, 1995; Edvinsson and Malone, 1997; Davenport and Prusak, 1998)

The business definition of knowledge as the "collection of processes that govern the creation, dissemination and utilization of knowledge to fulfil organizational objectives" was provided by Murray and Myers (1997). KM is seen as a tool for optimising resources in the firm. One of the benefits of KM in the corporate sector is that it has enabled knowledge to be shared within organisations along local, national, and international boundaries. However, there is a negative trend in the reinforcement of knowledge as a competitive
repository. Knowledge becomes sticky within the organisation and does not get out.

The corporate perspective of knowledge vacillates between the custodian and social perspectives. It is in fact a melting pot of the custodian and social dimensions of knowledge. Corporate organisations today emphasise the use of technology and people in leveraging knowledge. However, the main feature of a corporate dimension is the emphasis on strategic and competitive advantage which gives rise to withholding information from the public domain thus enforcing stickiness.

The authors in the table above are chosen because their views are easily identifiable and could be classified into one or more areas of the philosophies of KM. This does not imply that other authors reviewed do not have certain perspectives relevant to be classified here. However for brevity and distinctiveness, the researcher has chosen the authors in the table. The literature of KM is very wide and more authors and researchers are emerging, but one consideration has been to explore the earlier and current authors whose works have served to popularise and further the frontiers of KM. Good examples are Wenger's (2000) seminal work on communities of practice, Nonaka and Takeuchi's (1995) work on KM and Brown and Duguid's (1991) work on social capital.

These three philosophies are relevant to current KM thinking. The success of KM in an organisation depends on the underlying philosophy of KM adopted. The predominance of the custodian philosophy in an organisation portends an emphasis on technology and information management over people. Here, the acquisition and deployment of content management tools, email, groupware, databases, web technology, agent technologies, knowledge aggregators and other support tools for KM would become the emphasis.

The prevalence of these tools hold a promise for amassing a huge silo of information but whether these are deployed appropriately for KM purposes is open to question. Researches have shown that a combination of the three philosophies in articulating a KM strategy works better for KM (Newell, 2001; Jashapara, 2003). The competitive, profit and reward motivation behind the
corporate philosophy helps drive a KM strategy. However, it also reinforces the stickiness of knowledge thus creating knowledge silos within the organisation.

2.4.4 Perspective and philosophy adopted by this research
This research is assuming that the social perspective of KM works best in leveraging knowledge within DPs. The rationale behind this comes from the literature reviewed which emphasises that most knowledge is socially constructed and some authors believe that all knowledge is indeed socially constructed. Secondly, the development project scenario is different from the corporate sector setting. The researcher's estimation and experience is that the social philosophy would serve better within DPs. Current PM thinking has adopted KM as one of the best practices requisite for project processes. A wide variety of researches have adopted KM as a critical project success factor. The importance of KM in development PM cannot be overemphasised. The process of social construction of knowledge is rooted in the learning perspective of knowledge.

The processes generating learning and knowing can be described by integrating the equal dimensions of philosophies mentioned above. The next section discusses Project Management in order to provide a context for the relevance of KM in PM context.

2.5 Project Management
The Project Management Institute (1996) defines PM as “the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project”. The PM paradigm is rapidly shifting due to business globalisation and information technology. Currently, PM has become more focused on tracking project work processes and effective and efficient sharing of information and knowledge among project actors. Task interdependence and member distribution across time, space and technology make high degrees of collaboration necessary to accomplish project work. Prompt and sufficient sharing of knowledge in every
dimension of the project, proactive change management and procedural
monitoring are crucial factors involved in nurturing a project to success
(Carmichael, 2006; Hodgson and Cicmil, 2006).

One criticism of traditional PM is that it focuses on scheduling as a tool for
control and quality assessment and neglects collaborative aspects which is
necessary for achieving success especially in distributed PM. Distributed PM
imposes three challenges on the project (1) Collaboration—which is aimed at
supporting effective interaction, communication and coordination (2) KM—
capturing tacit knowledge and converting this into explicit knowledge and
sharing explicit knowledge (3) Work process—analyzing task interrelationship,
documenting lessons learned and reasons behind decisions and
concentrating on the work process itself (Lester, 2006; Levy, 2006; Clements,
2005). Various project management models exist. The following subsection
reviews a number of these models.

2.5.1 The project cycle

PM practices in relation to the project cycle have changed since the 1960s.
Organisations have tended not to adopt any tailor-made PM frameworks but
do adapt an organisational in-house project process or cycle with clearly
defined deliverables. This is done on a far more informal basis with less paper
work by relying on techniques such as “checklists for end of phase reviews”,
(Kerzner, 2001). A benchmarking study concluded that organisations which
are successful in PM use frameworks specific to their organisational context
which defines a staged approach for all projects under all circumstances
(Buttrick, 2000). Various project cycles exist in the literature such as the
Control-oriented model, quality oriented model, a fractal approach to the
project life-cycle as well as numerous organisation specific cycles. The
number of phases within each of these project cycles differ depending on
what type of activity is being carried out (Bonnal, Gourc and Lacoste, 2002).
The Project activities adopted for the purposes of this research is Problem Identification, Preparation, Development, Implementation and Evaluation.

Figure 2.7: Adopted Project Sequence of activities
The life-cycle phases are elaborated and explained in table 2.6 below. The first column itemises the phase, while the second column lists different terms used for the phase in order to foster understanding. The third column describes the phase.

Table 2.6: Life-cycle phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Alternative Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>Proposal, Concept, Initiation, Ideation</td>
<td>During this phase, ideas are generated and put on paper in the form of proposals or business plans.</td>
</tr>
<tr>
<td>Preparation</td>
<td>Feasibility, Assessment, Research, Preliminary investigation</td>
<td>The project is given detailed thought. An initial evaluation is carried out in terms of financial, operational and technical capacity and viability.</td>
</tr>
<tr>
<td>Development</td>
<td>Design, Testing</td>
<td>This period of the project deals with designing the details and testing these designs, depending on what kind of project.</td>
</tr>
<tr>
<td>Implementation</td>
<td>Realisation, Production, Construction, Build, Develop and test</td>
<td>Depending on the type of project, this phase deals with actual production of the service or product of the project.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Product Audit, Appraisal, Review</td>
<td>After the project delivery, the PM begins a winding down process and this involves reviewing the process and product so far and determining if the project is successful, on time, and cost efficient.</td>
</tr>
</tbody>
</table>

Sections 2.5.1.1 to 2.5.1.5 below describe and explain the life cycle phases represented in table 2.6 above.

2.5.1.1 Identification: Project identification is the period of initiation when the idea is given birth to. This idea stage might translate to planning and formulation of objectives. A project team might or might not have been commissioned by a sponsor to undertake the project. The activities that take place at this stage vary and depend on projects and organisations. However, a general consensus about this stage is that it marks the beginning of the project. What happens thereafter at this stage depends on the internal processes of the project organisation (Thiry, 2001).
2.5.1.2 **Preparation:** Project preparation is formulating or conducting a strategic analysis. Programme benefits are determined here and feasibility studies carried out to determine the financial, technical and operational implications of embarking on the project. The project deliverable, costs in relation to staff, time and money are evaluated and put down on paper. This again depends on the organisation and the type of project being speculated or planned. Some researchers call this the planning stage. At this stage, the process for selecting and prioritising the projects and other actions required to deliver the benefits and setting up the programme team and structures are put into place (Meredith and Mantel, 2005; Lock, 2004).

2.5.1.3 **Development:** During this phase, the project deliverables are designed. For development projects, at this stage the team builds on the technical and implementation features of the product. It could be called the pre-implementation stage. What separates this from implementation stage is the level of activity being carried out. Development deals with technical details and insight, laying out the architecture of the project, experimenting with some pilots to demonstrate the product's viability and applying and experimenting on the different scenarios for possible execution of the project. The various shades of opinion on how the project could be implemented are taken into consideration (Bennet, 2003; Loo, 2003; Sandhu and Helo, 2006).

2.5.1.4 **Implementation:** Project implementation as its name denotes, deals with building, constructing, producing, or reproducing a developed product. It is an extension of the foregoing phase. Implementation takes into consideration the design details, the agreed benefits, time, and cost considerations. It is difficult to always determine the most important phase of a project, but the implementation stage is about the most important given that here the client begins to see the physical product developed. There must of necessity, be an interaction between the product process and the stakeholders definitions at the beginning of the project. Project managers must work within the framework of the stakeholders needs and expectations,
manage communication within and outside the team, create a synergy between the project and senior management's control and direct influence on the project (Lu, 2006; Srivannaboon, 2006; Biggs, 2003; Jaafari, 2002).

2.5.1.5 Evaluation: After implementation, the project is expected to begin a winding down process. This process embraces the review and appraisal of actions so far. A project is viewed as one whole system with a body of constraints and the key to PM is to concentrate on one constraint at a time. The evaluation process details and reviews the progress so far against predetermined milestones and objectives. Project appraisal determines whether the team has met the expected benefits of the project, if the programme and business circumstance has changed in relation to the stakeholders needs and expectations. It is often advisable to dissolve a programme if the rationale for the project ceases to exist. Most projects which go on to completion do have a period of evaluation where documentation, lessons learnt, design details, benefits accrued, stakeholders expectations, business circumstances, sustainability of the project beyond completion and various other issues are reviewed and documented. Depending on the type of project, the final product is handed over to the stakeholders and the project is disbanded and staff reassigned (Grant, 2006; Sohail, 1996).

2.5.2 Project Management Processes and techniques

Various definitions of a project management process abound in literature. Davenport (1993) defined a process as a "structured, measured set of activities designed to produce a specified output for a particular customer or market" and that they are "the structure by which an organisation follows that which is necessary to produce value for its customers". Oakland (1995) defines process as "the transformation of a set of inputs, which can include actions, methods, and operations, into outputs that can satisfy customer needs and expectations in the form of products, information, services or generally-results". Zairi (1997) defines it as "an approach for converting inputs and outputs. It is the way in which all the resources of an organisation are used in a reliable, repeatable and consistent way to achieve its goals".
Bulletpoint (1996) suggests that regardless of the definition of the term "process", there are certain characteristics that this process should have:

- Predictable and definable inputs
- A linear, logical sequence of flow
- A set of clearly definable tasks or activities; and
- A predictable and desired outcome or result.

A number of project management processes and techniques exist in literature. A few of these are reviewed here.

2.5.2.1 Prince2 PM method: This is a de facto standard used extensively by the British government and was originally developed for technology processes. According to the PRINCE2 website at www.prince2.com: 'It is a process-based approach for project management, providing an easily tailored and scalable method for the management of all types of projects. Each process is defined with its key inputs and outputs, together with the specific objectives to be achieved and activities to be carried out.' The model is represented in Figure 2.8 below.

![Figure 2.8: PRINCE2 Model](image)

The process approach of Prince2 may also be its major limitation. The model has been criticised for being too process centred and neglecting the people aspect of project management. It comes with a whole set of documentation.
such as pre-set pro-formas for project implementation. It has been criticised for being overly bureaucratic for a lot of people's project management needs (Holmes, 2005). Some of the limitations of Prince2 is the emphasis on time and cost control rather than on quality and end product of the process.

2.5.2.2 The RIBA plan of work: The RIBA plan of work was developed by the Royal Institute of British Architects. The RIBA plan of work organises the plan of designing and managing building contracts into a number of key work stages. The work stages are divided in alphabetical order from A-L.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Appraisal</td>
<td>Feasibility studies, review alternative approaches and provide information on cost.</td>
</tr>
<tr>
<td>B Strategic brief</td>
<td>Client prepares strategic brief</td>
</tr>
<tr>
<td>C Outline proposals</td>
<td>Develop strategic brief into project brief</td>
</tr>
<tr>
<td>D Detailed proposals</td>
<td>Develop detailed proposals from the outline brief</td>
</tr>
<tr>
<td>E Final proposals</td>
<td>Develop final proposals from the approved detailed proposals</td>
</tr>
<tr>
<td>F Production information</td>
<td>Prepare production information for tender purposes</td>
</tr>
<tr>
<td>G Tender documents</td>
<td>Prepare and collate tender documents in sufficient to enable a tender or tenders to be obtained</td>
</tr>
<tr>
<td>H Tender action</td>
<td>Contribute to appraisal and report on tender negotiations</td>
</tr>
<tr>
<td>J Mobilisation</td>
<td>Provide production information as requested for the building contract and construction information</td>
</tr>
<tr>
<td>K Construction to practical completion</td>
<td>Project delivery period</td>
</tr>
<tr>
<td>L After completion</td>
<td>Identify and correct defects, settle final accounts and handover to client.</td>
</tr>
</tbody>
</table>

The RIBA plan of work was developed in 1964 and has remained largely unchanged since then. A review of the plan of work was published in 2000. Although the RIBA plan of work is widely known and has formed the basis for organising and managing construction work for 36 years a critical evaluation of the RIBA plan of work and review of related literature warns that the plan of work is no longer appropriate for current day construction work (Hughes, 2003). The RIBA plan of work was developed from an architectural point of
view and this has in some way restricted its applications to some forms of project management work (Morris and Pinto, 2004).

2.5.2.3 The Process Protocol: The Process Protocol (Appendix 7) was developed by the University of Salford and Loughborough University with seven industrial partners during 1995-98. Using manufacturing principles as a reference point, a framework of common definitions, documents and procedures were developed to help construction project participants work together seamlessly. The design and construction process was mapped into eight sub-processes (Activity Zones); Development, Project, Resource, Design, Production, Facilities, Health & Safety, Statutory and Legal, and Process Management; four broad stages, as in Pre-Project, Pre-Construction, Construction and Post-Construction; and ten phases. The protocol maps the entire project process from the clients recognition of a new or emerging need through to operations and maintenance (Cooper et al., 1998; Kagioglou et al., 1998). The process is based on six principles (Sheath et al., 1996; Aouad et al., 1998):

- **Whole project review**: The process has to cover the whole life of the project from the recognition of the need to the delivery of the finished product.
- **Progressive design fixity**: The protocol adapts a phase review process that applies consistent planning and review procedure throughout the project.
- **A consistent process**: The generic properties of the Process Protocol will allow a consistent application of the phase review process. This together with the adoption of standard approach to performance measurement, evaluation and control will help facilitate the process of continual improvement in design and construction.
- **Stakeholder involvement/teamwork**: Project success relies on the right people having the right information at the right time. The proactive resourcing of phases through the adoption of a stakeholder view will help to ensure that appropriate participants from each of the functions are consulted earlier in the process than is traditionally the case.
• **Coordination:** The process map emphasises the need to coordinate across activities the key actors in the process.

• **Feedback:** The Process Protocol recommends the use of a legacy archive; a central repository that can take the form of an electronic management system. Real benefits in cost, schedule, quality and safety for future projects an only emerge if construction knowledge can be effectively harnessed in planning and executing future work.

One of the main issues with existing models is that people aspects of project management are overlooked and process is emphasised. Secondly, a lot of these process-based models do not take into account the complex and fluid nature of development projects and the environments where they operate, so they are limited in the ability to cater for sudden change. Third, these models are not designed with knowledge management perspectives in mind, so they are limited in their ability to enhance knowledge sharing in projects. The solution is to take into consideration the process, people and knowledge management aspects of project management in a model that would recognise the complexities of development projects and the need to adapt to changing situations. The next section discusses development projects.

### 2.5.3 Development projects

This section discusses development projects, the issues that make management of knowledge critical and positions DPs in the context of KM.

#### 2.5.3.1 Development projects: a theoretical understanding

To develop a theoretical understanding of development projects, one would need to start with project management definitions. Project organisations are saddled with responsibility to design and execute projects. Turner, (1993) defines a project as “a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavour managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change”. Turner (1993) defines a project as “an endeavour in which human, material and financial resources are organised in a novel way,
to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives". Disterer (2002) defines projects as “temporary organisations with specific objectives, detailed tasks, and restricted time and budget”. Integrating the three definitions above in the context of DPs leaves us with this definition:

Development projects are temporary organisations to which resources are assigned to undertake a unique scope of work within constraints of cost and time as to achieve beneficial change defined by quantitative and qualitative objectives.

The uniqueness of DPs rests in their field of activity in developing countries to improve human conditions, scale up capacity, provide enabling social and economic conditions for developing countries to have self sustainability.

2.5.3.2 Background to development project activities.

DPs operating in developing countries often have a number of reasons and objectives of operation. Some of the conditions that give rise to development intervention and the initiation of projects in developing countries are outlined below:

Low Growth of Income: According to a World Bank Report (1999) the Gross Domestic Product (GDP) of Sub-Saharan Africa during recent decades has been very low. While regions which had similar growth rates with Africa in the 1970’s witnessed appreciable growth, Sub-Saharan Africa’s economy is on the decline. Ill-conceived policies which had negative impact on employment opportunities were responsible for the low per capita GDP. In recent times, policies in these countries are changing and there is increased growth, yet efforts need to be intensified.

High Population Growth: Population growth in relation to the limited and fragile resource base is often problematic for economies in Africa and other developing countries. Africa’s population is expected to more than double to 1.2 billion in less than 25 years from now by the year 2025 (World Bank,
2002). With such high levels of population come attendant problems. Governments are often ill-prepared to tackle the outbreak of epidemics like the HIV/AIDS pandemic. This often leads to international development assistance and projects being initiated to mitigate the consequences.

**Inadequate Social Services:** The huge population explosion mentioned in the preceding paragraph places a strain on African governments’ abilities to provide basic social services to their citizens. Two examples suffice: Odaga and Heneveld (1995) highlight the inadequate social services available in African countries especially for the education of girls, and 74% of people in rural Sub-Saharan Africa are dependent on unsafe supply of drinking water (World Bank, 1995).

**Economic Inefficiency:** The poor in developing countries lack the necessary resources to contribute to production and economic development. Such resources as land, access to credit and high levels of education are generally lacking and militate against economic efficiency.

**Social and Political Instability:** The inability of governments to address economic issues and reduce poverty could compound ethnic tension, political instability and often lead to crises like wars, military coups, and insurgency.

As a result of the prevailing environments under which they operate, the contexts of DPs are continually shifting (Lewis, 1998; Edwards-Jones, 1994). There is an increasing need to learn from what project teams are doing in the field. The two central questions of DPs are:

1. How can the benefits estimated by project planners be delivered to the potential beneficiaries or clients; and
2. How can the knowledge generated during projects be managed?
2.5.4 Issues in development project KM

A number of issues constitute a challenge for managing knowledge in development projects:

Traditional development PM has in the past been criticised for being unaccountable to clients, lacking a sense of ownership among targeted communities and individuals and sometimes wasting resources in planning and implementation. The way forward is to understand the complexity of the project environment and seek ways to enhance project impact (OECD, 2003). Maximising intellectual capital in projects is a part of this process of understanding and enhancing project work (Murdoch, 2001). However, understanding and enhancing project work through intellectual capital considerations have to be in the context of individual and organisational learning as espoused by Wood (2003). KM is a vehicle for individual and organisational learning.

Sections 2.5.4.1 to 2.5.4.4 discuss a number of issues and areas where managing knowledge in development projects need support and leverage.

2.5.4.1 Leadership

Disterer (2002) discussed the challenge of coordinating the intangible capabilities of each project worker to come to bear on the project at hand and also tapping past experience and using it to shape a direction for a current project. Why this is a challenge for development projects is the distributed nature of most projects. Sometimes project workers are in remote areas and are expected to coordinate efficiently with other colleagues working on the same project in a different geographical location. The dispersed nature of current day project work makes this issue a challenging one. As well as the need for coordinating knowledge resources in distributed project work, leadership and encouragement for knowledge sharing is required to make management of knowledge in development projects work.

Development project teams are often charged with providing necessary flexibility to react quickly to changes. Project team members are often from
different functional areas and require leadership to synergize the various capabilities and focus them to achieve objectives. The proliferation of team-based projects have profound implications for leadership in DPs. Whereas in the past, leader-follower relationships have been vertical and authority relations a common feature of management, the emergence of project-teams and groups places different kinds of constraints on leadership (Weinkauf and Hoegl, 2002). Leaders are now required to be flexible, adaptive, approachable, innovative, visionary, inspirational, situational (Lee-Kelley, 2001), creative and motivational (Barber and Warn, 2005). Leadership is widely considered an important determinant in project effectiveness (Gladstein, 1984; Hackman, 1987). Leadership is the influencing of attitude and behaviour of individuals and the interaction within and between groups for the purpose of achieving goals (Bass, 1990). According to Mackenzie (1969) leadership functions are categorised into three types: Conceiving, organising and accomplishing. Conceiving takes place at the beginning of a project and involves formulation of ideas, design of a detailed programme for achieving the objectives and drafting a roadmap for the project. Organising deals with providing a context—human, material, financial and social for implementing the project. Accomplishing is the whole lot of activities geared towards achieving the desired goals of the project. KM needs project leadership support to thrive. Leaders must be seen to support the KM process and in this way provide an enabling environment for knowledge sharing and active participation.

2.5.4.2 Social space for knowledge sharing.

Bourdieu (1985) defined social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance or recognition”. Social capital is the wealth or benefits that exist as a result of an individual’s social relationships. Lesser (2000) identified three dimensions of social capital to include: The “structure of relationships”, “interpersonal dynamics in the structure” and “common context and language”. Social capital has the quality of being appropriable and convertible to a certain degree. It
requires maintenance to be productive and it does not have a predictable rate of depreciation. Social capital is "a processual system for allocating resources across a social network according to the pattern of relations among the individual egos that comprise the network" (Brown and Duguid, 1991).

The generation of social capital among teams working in a development project would help create, share and utilise knowledge which is vital for executing the project. Oluikpe (2003) studied the effect of social capital in innovating in a work community. This research found that social capital is vital to innovation and that communities or teams rely mostly on the network of relationships and mutual obligations arising from a loose or compact network of work relationship. The individual project member derives strength and power from the acquisition of durable social contacts and in projects the network of social relationships supplements formal induction. The power and success of individuals in service and knowledge of projects will be partially due to the breadth and depth of their social capital. Social capital cannot be transferred from one individual to another but knowledge arising from an individuals wealth of social connections can be shared within a group, thereby contributing to project success and effectiveness. Developing an extensive and diverse network of relationships is key to project members ability to contribute to the project organisation.

2.5.4.3 Project Knowledge Concept: Core and Ephemeral knowledge.
Leseure and Brookes (2004) identified two types of project knowledge: Core and Ephemeral knowledge. Core knowledge is the type of knowledge that is regarded as kernel knowledge, often sitting at the core of the project organisation. This type of knowledge is responsible for the independent execution of projects and qualifies to be tagged as an intangible asset. It is the type of knowledge that should remain and be nurtured within a project in order to achieve and sustain high project performance. On the other hand, the other type of knowledge is called ephemeral knowledge deriving from its nature to help achieve project completion though there is no guarantee that this type of knowledge would ever be used in future projects. In effect,
ephemeral knowledge is useful and specific to certain projects. These two types of knowledge are crucial to a project and need to be leveraged through a KM strategy. Disterer (2002) highlighted the challenges projects face in capturing knowledge of staff who have dispersed at the completion of the project. He sees this as a major challenge citing that unless staff knowledge is captured before they leave the project, some aspects of the project knowledge would need to be reinvented whenever it is needed.

2.5.4.4 Knowledge sharing and re-use

Re-invention of the wheel is abundant in project execution. Most projects begin to learn over again what could have been learnt from a similar project somewhere because there is no avenue to share and transfer knowledge. Knowledge sharing is an essential part of PM. Development project staff should be seen to embrace the exchange of ideas, sharing of know-how, learning through interaction, cooperation, collaboration and commitment. Social interaction leverages knowledge sharing and impacts positively on projects. Researches sometimes fail to explain why in some organisations that discourage knowledge sharing, employees are very keen and actively sharing knowledge while in some that encourage knowledge sharing, there is an obvious hoarding of knowledge and reluctance to share (Chua, 2003). Since knowledge is enriched with insights and is socially embedded in organisational practices, it is not easily imitated, traded or substituted. Hence knowledge sharing is very crucial for developing competitive advantage for any project. This is the reason why an important agenda of KM initiatives within a project is to foster knowledge sharing among project members (Trussler, 1998). Knowledge sharing is too important to be left at the sole discretion of organisational members. A major impediment to knowledge sharing is a lack of top down management support for knowledge sharing activities. PM should be seen to encourage visibly, the sharing of knowledge through establishing strategies for supporting sharing of knowledge among staff. Some of these strategies include using technology, introducing incentive schemes, cultivating communities of practice, providing role models, and creating centres of excellence across functional divisions. The next
section will discuss the enablers of knowledge management in development projects.

2.6 KM enablers in Development Projects
This section discusses the four known enablers of knowledge management within the context of development projects. These enablers are people, technology, culture and strategy. They are the four dimensions of KM identified in literature as the dominant focus of KM programmes and practices.

2.6.1 People
The people dimension of KM is discussed in this section as an enabler of KM in development projects. It looks at people centred delivery, capacity building, shared space, communities of practice and networks of practice.

2.6.1.1 People Centred delivery
A good KM strategy for a development project would be people centred. Swan and Newell (2000) documented case studies of projects which failed due to the failure to take into consideration the people dimension of KM. The people in a project are more important than any other factor. For a development project to learn and deliver its objectives successfully, its people must be put first. This involves building the project process around the project staff and ensuring that a conducive knowledge creation and sharing atmosphere exists. The realisation of the people factor of KM has made organisations begin to find ways of building around their people. Development projects can benefit more by designing projects which take into consideration the careers and lives of its people, their welfare, information and knowledge sharing needs and any other needs they may encounter in the course of the project (Lu, 2006; Matthews, 1999)

2.6.1.2 Capacity building
Capacity building is about empowering the project staff to take control of the project and provide a direction. Secondly, it is the process of utilising the qualifications, experience and personal qualities of project workers to the benefit of the project. Development projects should explore opportunities for
increasing the capacity of their team. Such opportunities may come in the form of conferences, seminars, apprenticeship programs, field visits, training, induction, partnerships with other projects and other activities.

2.6.1.3 Shared space
The creation of a shared space for knowledge exchange is vital and critical to KM. KM can deliver this important facet of communication to projects thus creating opportunity for staff to learn from each other and collaborate on key aspects of the project. The informality that face to face meetings, groupware, email lists, message boards, text, discussion groups, communities and networks of practice could bring to a project would drive innovation and leverage know-how.

2.6.1.4 Communities of Practice
The concept of communities of practice has been around in KM practice for some time. Jean Lave is credited to have coined the word “communities of practice” (Lave and Wenger, 1991). Communities of practice is a closely knit system involving people who engage in interaction in a project team for mutual benefit. Interaction could be formal or informal, facilitated or spontaneous, rewarded or based on individual initiative. Overall, the notion of communities of practice presumes the sharing of ideas, work practices, norms, obligations, sanctions, expectations, story telling, dissemination of information and knowledge, reciprocity and initiation and induction of new comers. Communities are of necessity, organisational units within an organisation, finding their life and sustenance on the individual interests of project members. They provide a platform for shared understanding. Within a development project, a community of practice is highly visible due to the consultative nature of projects. Project groups are forced to find direction through reiteration, reification, sharing, dialogue, documenting and dissemination of knowledge present in a project. The first and foremost objective is to achieve project success, but underneath this objective are individual objectives of career advancement, reward, motivation, job satisfaction, social advancement and the desire to network. Project Managers
must find ways of linking project staff career advancement and individual aspirations to the sharing of knowledge in communities. Communities of practice have been advocated to be a potent KM tool (Jashapara, 2003).

The various definitions of communities of practice are centred around three broad perspectives: Learning, goals, interest and practice.

**Learning**: Learning is the process of acquiring and utilizing knowledge for meaningful activity. Stewart (1996) define communities of practice as "groups that learn...". His definition focuses on social capital generated by communities of practice as the basis for learning. Wenger, McDermott and Snyder (2002) toe a similar line in categorizing COPs as part of the learning loop. The debates centred around how people learn have tended to situate learning in social contexts. Learning cannot be divorced from social affiliations. Communities facilitate the learning process because they are in themselves ideally suited for participative learning. Brown and Duguid (1991) are among the leading theorists situating COPs within the learning loop.

**Goal and Interest Orientation**: Theorists who have defined communities as goal and interest oriented include Johnson-Lenz (1997), COVIS (2003) and Brown and Duguid, (2000). The existence of communities is tied to the achieving of common goals and interests. This often benefits the host organisation directly and indirectly. Hildreth, Kimble and Wright (2000) attributed the reasons for the change of organisational attitude towards workplace groupings as the understanding that they add value to the organisation and help manage tacit knowledge. Organisations realised that when employees leave their employ, they leave with valuable knowledge and if this knowledge is not shared probably through apprenticeship which communities foster, the knowledge is as good as lost and might be bought over by competitors and utilised.

**Practice**: Nonaka and Takeuchi (1995) have opinions converging on COPs being communities aimed at practice. Practice here is used to denote the aggregation of people around similar professional interests. The word in its
sense is close to the meaning of goal and interest orientation but the researcher is using 'practice' to delineate the tendency of communities to gravitate around similar professional fields.

2.6.1.5 Networks of Practice
Networks of Practice are loosely knit units of professional practice which thrive on the desire of members to connect to peers in a similar area of interest. Networks of practice could be virtual, collocated, or span geographical boundaries. Whatever the case, they constitute a reliable channel for disseminating best practice, fostering innovation, spreading results of recent research, incubating ideas, making reference to existing research and development. Project delivery stands to benefit from networks of practice due to the high level of communication that could exist between peers in a related field of project activity. Jashapara, (2003) has documented the differences between COPs, networks of practice, project teams and work groups.

2.6.2 Technology
This section deals with technology, the second enabler of KM in the context of development projects. It discusses three broad groupings of technology tools used in managing knowledge in development projects as identified from the literature reviewed. These are storage, search and retrieval technology, collaborative technology and integrative technology.

2.6.2.1 Storage, search and retrieval technology
A central knowledge repository is often one of the strategic KM targets. Current day knowledge repositories could exist in the form of a portal with lessons learned, best practices, forms, schedules, history of the project, staff contacts even after the project had been completed, project status, benefits accruable from the project, innovative features of the project and future areas for research. A central knowledge repository makes the project last beyond completion. Search/retrieval features are often built into these forms of storage technology to enable project staff to identify, search and retrieve needed information.
2.6.2.2 Collaborative Technology

Technology is a great enabler of project processes. A variety of technologies exist which could drive KM within projects. Tirwana and Bush (2001) documented KM tools and technologies that could come in useful for PM. Collaborative technologies are often used in DPs to facilitate multi-project scheduling, tracking, and implementation. Examples of collaborative technologies are; groupware; workflow; email groups; chat; blackboard; and certain features of intranets. These could be used to provide issue logs, database of risks and lessons learned.

2.6.2.3 Integrative Technology

Integrative technologies are those technologies that act as interfaces for other underlying technology. The Internet, portals, databases and intranets act as integrative technologies. Certain databases like Metalib are integrative in nature. They act as interfaces for pulling together project resources from different and diverse sources and presenting them in one single access gateway for the user.

2.6.3 Culture

This section discusses culture as an enabler of KM in development projects. The major aspect discussed here is organisational culture. The organisational culture of a development project would be responsible for the success or failure of a KM initiative.

2.6.3.1 Organisational culture

Organisational culture is the whole climate upon which organisational knowledge rests. It involves the ways of doing things, history and legacies, processes, etiquettes, norms and obligations, interpretations, perceptions and perspectives, diction and the whole body of knowledge that constitute the organisation (Alavi, 2005). As simple as this may sound, yet it is a nebulous concept. Organisational culture includes the chain of internal and external relationships that have shaped the life of the organisation over the years.
Organisational culture relates to organisational climate. Climate is static but culture is dynamic and individual values, beliefs, assumptions and attitudes are shaped by organisational culture. The success or failure of KM is hinged on the organisational culture and to some extent on the climate. The receptivity to knowledge sharing and management differs across different organisations, depending on the type of structure in place. Within organisations, role cultures, power cultures, person cultures, and task cultures exist. These all relate to the type of responsibility relationship adopted by the organisation to meet objectives.

According to Handy (1985) the following are types of cultures and authority relationships existing in organisations:

- **Power culture** is characterised as a web with a person or small group of people at the centre. There are few rules and people tend to act politically and are more concerned about ends rather than means. Such organisations can react quickly to environmental changes but may suffer from high turnover rates if suitable people are not recruited.

- **Role cultures** are characterised by bureaucracies where rules, procedures and job descriptions tend to predominate. They are successful in stable environments but may have difficulties adapting to more turbulent environments.

- **Task cultures** are characterised by project or matrix organisations that bring together the appropriate resources and competence required for effective team functioning. Mutual respect is based on ability rather than status or age. These cultures can be highly effective for innovative projects but are less successful where there is an emphasis on cost rationalisation and economies of scale.

- **Person cultures** are characterised by individual autonomy and collective action based on fulfilling individual self interests. Individuals decide on their work allocations rather than a central body. Examples of person cultures may be found in academia, among architects or barristers.
2.6.4 Strategy

This section discusses the strategy dimension of KM in development projects. In section 2.1 which dealt with the introduction and definitions of KM, it was pointed out that some authors definitions border on strategic management as relating to achieving competitive advantage in the organisation. In this section, the strategy dimension of KM relating to development projects will discuss process, innovation (a major driver of the strategy perspective), risk analysis, time management, competency and efficiency, and generation of new knowledge in development projects.

2.6.4.1 Process

Winter et al. (2006) highlight the importance of strategic process as a learning system. They argue that project learning has to be strategic to make sense. The literature of organisational learning is replete with recommendations for a strategic thrust in providing enabling environments for organisations and projects to learn. This research is treating the PM cycle as a learning process and system.

2.6.4.2 Innovation

Crawford, Pollack and England (2006) researched the prevailing research emphasis of journal articles for the past 10 years using keyword analysis. This seminal work found innovation as ranking very high in PM emphasis along with other factors such as project success, completion on time, meeting clients objectives, quality, efficiency and competency and human factors (learning, sharing, communities). This thesis considers innovation as one of the variables and outcomes of a KM strategy in DPs. Innovation is the result of a process which success rests upon the interactions and exchanges of knowledge involving a large diversity of actors in situations of interdependence.

Innovation can be classified into two; radical and incremental innovation. Radical innovation deals with a total departure from the norm, and charting an unknown or remote territory in developing new ideas, tools, products and...
services while incremental innovation builds on existing products, services, ideas and tools. It seeks to improve what has been existing. Critics of incremental innovation argue that its impact on the society is minimal as little ventured, little gained. Incremental innovation is evolutionary, as opposed to the revolutionary features of radical innovation. High level uncertainty, unpredictability, sporadic starts and stops, dead ends, non-linearity, and context dependency all characterise radical innovation. Uncertainties influence the course of radical project development that require flexibility and creativity in resource and competency acquisition while incremental projects follow more formal and predictable routes. Long term organisational success has been linked to the ability to innovate.

2.6.4.3 Risk analysis

One of the success factors of projects is the ability to identify risks before they occur. Risk management is one of the areas most written about in the past ten years according to Crawford, Pollack and England (2006). A project's ability to reduce significant risks to the success of the project would help ensure that objectives are met and delivered to beneficiaries and clients. In essence, this research considered project success as an important variable of KM in DPs.

2.6.4.4 Time Management

A delay in project schedule could cause an increase in scope and cost. More and more projects are laying emphasis on the need to complete on time to avoid these problems. Competent PM would be able to manage the scope of the project, schedule, resources, quality, interpersonal aspects, knowledge, information, and other aspects combining to make the project complete on time. This thesis will treat completion times as an important variable of KM in DPs.
2.6.4.5 Competency and Efficiency
Projects need to operate at an optimum level. This need is also highlighted in the research of Crawford, Pollack and England (2006). Parker and Skitmore (2005) outlined the influence of high staff turnover rate in undermining project performance. Lack of teamwork, communication, motivation, and realistic goals and objectives contribute to undermining project efficiency. A good strategy to motivate staff to work competently and efficiently influences project outcomes. This research treats operational efficiency as a variable of KM in DPs.

2.6.4.6 Generation of new knowledge
Projects need to devise a strategy to generate new knowledge from current project activities. Good KM and IM strategies and systems are required to create, capture, codify, store, retrieve, and disseminate new knowledge in a project. This research considers KM systems as the whole and integral part of KM dimensions such as technology, culture, people, and strategy. These and the PM process (identification, preparation and development, implementation and evaluation) will be considered in a model (framework) depicting KM in development projects. The next section discusses the knowledge gap in the literature of KM in development projects.
2.7 Knowledge Gap

The researcher recognises that there are significant knowledge gaps in the literature dealing with management of knowledge in development projects. Most KM literature reviewed in this thesis have come from business, technology, engineering, information science and management disciplines. This is as a result of the dearth of materials dealing with KM in development projects. This is a significant gap and this research contributes to fill this gap.

2.7.1 Lack of a framework for KM in development projects

Consequent to the lack of literature on KM in development projects, there is no framework addressing KM in this area. This means that no studies have attempted to map the knowledge needed in development projects and to develop a model or framework to help development projects manage their knowledge. While there are many knowledge management models in literature which could be easily adapted to different scenarios, one cannot safely assume that these will work in development project scenarios, especially in developing countries where this research focuses on. This research is therefore attempting to fill this gap by developing a framework or model for managing knowledge in development projects. This will in turn contribute to literature and also form a basis for future discussion, debate and research in the area.

2.7.2 Absence of empirical studies on KM in development projects

In research, each emerging area requires empirical studies to lay the foundation for further studies. A lot of empirical studies carried out in the field of KM have concentrated on business, technology, aerospace, construction or other established areas where profit is the motivation and competitive advantage is a major driver. This research is one of the few empirical researches being carried out in the field of knowledge management in development projects.

2.7.3 Failure to link KM to development project performance

From the hypothesis, “KM in DPs is positively related to innovation, project completion times, project success, operational efficiency and the rate of new
knowledge generated for future projects”. From the literature review there are no known studies in development projects which relates to or addresses these important variables. While the literature review established that these variables have dominated project management literature in the past ten years (Crawford, Pollack and England, 2006) there are no known studies which have measured the variables independently or together. Carrillo (2003) established a business case for the adoption of KM in business process. Bringing this to the management of development projects, there is the need to measure the variables identified by this research as the dominant focus of development project management over the past ten years to investigate the impact KM could have on these. One of the major goals of KM is to help organisations realise their most important objectives. Innovation, project completion times, project success, operational efficiency and generation of new knowledge have been at the front bench of PM. This research will measure the relationship and impact KM could have on these variables.

2.8 Conclusion

This chapter has reviewed the literature of KM, definitions and perspectives and has identified three philosophies of KM. It also addressed the underlying concepts of KM and further differentiated between KM and IM thus providing a proper context for the use of the term “KM”. Furthermore, the chapter reviewed PM with an emphasis on the PM cycle as a useful tool for project control. It goes further to consider the PM cycle as a knowledge process and also reviewed a number of project management processes. It then reviewed development projects and the conditions that make them necessary, bringing the management of DPs in the context of KM. It does this using the KM dimensions of people, technology, culture and strategy. The literature review concludes by highlighting the knowledge gap in literature and the researchers interest in five project outcomes—innovation, project success, operational efficiency, completion times and generation of new knowledge. These variables were identified using a seminal work which studied the prevailing emphasis of PM in the past ten years.
CHAPTER 3

Research Method

3.0 Introduction.
This chapter discusses research methods and identifies and describes the method chosen for this research. It also discusses the conceptual framework of the research and proposes and develops a conceptual model for KM in development projects. The proposed model meshes together the project cycle, and the four KM enablers with four identifiable KM stages unique to DPs. The chapter goes further to discuss research methods, design, and strategies, how the population of the study was chosen, sampling, survey administration, response, case study design and the data analysis techniques chosen and employed by the research.

3.1 Research methods, design and strategies.
Research Methodology means the entire process of the study (Creswell, 1994). The process involves a systematic investigation to establish facts or principles or to collect information on a subject using defined methods or series of actions. The purpose of describing the research methodology is to raise an understanding of the methods employed for this research. Research in development project management is believed to be at the intersection of natural science and social science. Natural science studies events consisting of a sequence of facts which are independent from what anybody says or thinks about them. It relates to testing or experimenting scientific works. In contrast, social science involves thinking and perception (Love, 2004). This research seeks to understand the situation in which project management operates in relation to the consideration of knowledge management as an enabling tool. This understanding serves as a basis of decision-making that influences the next course of action.
3.1.1 Research Methods

Research methods are categorised into two: pure and applied research methods. A comprehensive research programme will encompass both applied and pure research to some extent.

3.1.1.1 Pure Research

Pure research tends to address more theoretical issues in an attempt to advance knowledge and might be perceived as being more academic than applied research. Pure research is research that broadens knowledge, sources of new ideas and ways of thinking and focuses on refuting or supporting theories. An exploratory approach is the most common in pure research (Robson, 2002).

3.1.1.2 Applied Research

Applied research attempts to solve specific problems or help researchers accomplish a task. A descriptive approach is frequently adopted in applied research (Neuman, 1997). Theory is less central in this type of research. It is usually focused on specific situations or answers particular questions.

3.1.2 Research Approaches

There are three types of approaches to research: exploratory, descriptive and explanatory research. These approaches can be adopted in both pure and applied research methods.

3.1.2.1 Exploratory Approach: The exploratory research approach is used when a new topic or issue is explored and more information is required to learn about it. It is less structured to allow the researcher to seek out new insight, ask questions and assess phenomena in a different perspective (Adams and Schvanevelt, 1991). A researcher may conduct an exploratory study in order to know enough to design and execute a second, more systematic or extensive study (Neuman, 1994).
3.1.2.2 Descriptive Approach: This approach is largely used within applied research methods. It begins with a well-defined subject and conducts research to describe it more accurately and portray an adequate profile of persons, events or situations. It is suitable for further description of a situation or problem after an extensive previous knowledge of it (Robson, 2002).

3.1.2.3 Explanatory Approach: This approach provides the reasons for something to occur and builds on exploratory and descriptive research. It reaches beyond giving focus to a topic or providing a picture of it and moves to examining the reasons it exists or operates in the way it does (Neuman, 1994; Robson, 2002).

3.1.3 Research Techniques
Research techniques could be broadly categorised as either qualitative, quantitative or a combination of both, known as triangulation method.

3.1.3.1 Qualitative Technique: The qualitative technique is the best approach to understand a concept or phenomenon which has little research done on it (Creswell, 2003). It is used optimally for situations which will increase understanding, expand knowledge, clarify the real issues, explain and explore attitudes and behaviour and provide an input for a future stage of research or development (Gordon and Langmaid, 1988). There are many methods which fall under the category of qualitative research such as case study, politics and ethics, participatory inquiry, interviewing, participant observation, visual methods and interpretative analysis. According to Denzin and Lincoln (2005) qualitative research operated in eight historical moments: the traditional (1900-1950), the modernist or golden age (1950-1970), blurred genres (1970-1986), the crisis of representation (1986-1990), the post-modern period (1990-1995), post experimental enquiry (1995-2000), methodologically contested present (2000-2004), and the fractured future (2005-). The researcher describes the various types of qualitative research below:
Ethnography. This is the genre of qualitative research that presents varying degrees of qualitative descriptions of human social phenomena based on fieldwork. Ethnography presents the results of a holistic research method founded on the idea that a system’s properties cannot necessarily be accurately understood independently of each other. The genre has both formal and historical connections to travel writing and colonial office reports. Several academic traditions, in particular the constructivist and relativist paradigms, employ ethnographic research as a crucial research method. Many cultural anthropologists consider ethnography the essence of the discipline. Within ethnographic research, there are other categories, the most prominent of which is performance ethnography. This type of qualitative research often deals with the re-enactment of culture and past events. It is often a stage re-enactment of ethnographically derived notes. Practitioners of performance ethnography acknowledge that culture travels in the stories, practices and desires of those who engage in it. By utilising an experiential method such as performance ethnography, those who seek understanding of other cultures and lived experiences are offered a body-centred method of knowing (Conquergood, 1986). Denzin (2003) defined this type of qualitative enquiry as a method of “putting the critical sociological and socio-political imagination to work in understanding the politics and practices that shape human experience”.

Action research: Kurt Lewin (1945) is credited to have coined the word “action research”. Action research is an iterative inquiry process that balances problem solving actions implemented in a collaborative context with data-driven collaborative analysis or research to understand underlying causes enabling future predictions about personal and organizational change (Reason & Bradbury, 2001). Action research challenges traditional social science, by moving beyond reflective knowledge created by outside experts sampling variables to an active moment-to-moment theorizing, data collecting, and inquiring occurring in the midst of emergent structure. “Knowledge is always gained through action and for action. From this starting point, to question the validity of social knowledge is to question, not how to develop a reflective science about action, but how to develop genuinely well-informed
action—how to conduct an action science” (Torbert 2001). Kurt Lewin described the process of action research as in Figure 3.1 below.

Lewin’s approach as represented above does take a fairly sequential form—and it is open to literal interpretation. Following it can lead to practice that is ‘correct’ rather than ‘good’. It can also be argued that the model itself places insufficient emphasis on analysis at key points. Elliott (1991), for example, believed that the basic model allows those who use it to assume that the ‘general idea’ can be fixed in advance, ‘that “reconnaissance” is merely fact-finding, and that “implementation” is a fairly straightforward process’. As might be expected there was some questioning as to whether this was ‘real’ research. There were questions around action research’s partisan nature—the fact that it served particular causes. There were also questions concerning its rigour, and the training of those undertaking it. However, as Bogdan and Biklen (1992) point out, research is a frame of mind—‘a perspective that
people take toward objects and activities'. Once we have satisfied ourselves that the collection of information is systematic, and that any interpretations made have a proper regard for satisfying truth claims, then much of the critique aimed at action research disappears.

Participant observation: Participant observation is a qualitative strategy which aims to gain a close and intimate familiarity with a given group of individuals (such as a religious, occupational, or subcultural group, or a particular community) and their practices through involvement with people in their natural environment, over an extended period of time. Such research usually involves a range of methods: informal interviews, direct observation, participation in the life of the group, collective discussions, analyses of personal documents produced within the group, self-analysis, and life-histories. Although the method is generally characterized as qualitative research, it can include quantitative dimensions. Participant observation is usually undertaken over an extended period of time, ranging from several months to many years. An extended research time period means that the researcher will be able to obtain more detailed and accurate information about the people he/she is studying. Observable details (like daily time allotment) and more hidden details (like taboo behaviour) are more easily observed and understandable over a longer period of time. A strength of observation and interaction over long periods of time is that researchers can discover discrepancies between what participants say -- and often believe -- should happen (the formal system) and what actually does happen, or between different aspects of the formal system; in contrast, a one-time survey of people's answers to a set of questions might be quite consistent, but is less likely to show conflicts between different aspects of the social system or between conscious representations and behavior (DeWalt, DeWalt, and Wayland, 1998).

3.1.3.2 The Quantitative Technique: The quantitative method seeks to gather factual data in order to study relationships between facts and how these relationships accord with findings and theories of previous studies and
research. It conveys a sense of solid and objective research due to the use of numbers and the ability to present findings in the form of graphs and tables. Scientific techniques are used to obtain quantified data which are evaluated in the light of existing knowledge. Quantitative research is generally approached using scientific methods which include:

- The generation of models, theories and hypotheses
- The development of instruments and methods for measurement
- Experimental control and manipulation of variables
- Collection of empirical data
- Modeling and analysis of data
- Evaluation of results

Quantitative research is often an iterative process whereby evidence is evaluated, theories and hypotheses are refined, technical advances are made, and so on. Virtually all research in physics is quantitative whereas research in other scientific disciplines, such as taxonomy and anatomy, may involve a combination of quantitative and other analytic approaches and methods. In the social sciences particularly, quantitative research is often contrasted with qualitative research which is the examination, analysis and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships, including classifications of types of phenomena and entities, in a manner that does not involve mathematical models.

Statistics is the most widely used branch of mathematics in quantitative research outside of the physical sciences, and also finds applications within the physical sciences, such as in statistical mechanics. Statistical methods are used extensively within fields such as economics, social sciences and biology. Quantitative research using statistical methods typically begins with the collection of data based on a theory or hypothesis, followed by the application of descriptive or inferential statistical methods. Causal relationships are studied by manipulating factors thought to influence the phenomena of interest while controlling other variables relevant to the experimental
outcomes. In the field of health, for example, researchers might measure and study the relationship between dietary intake and measurable physiological effects such as weight loss, controlling for other key variables such as exercise. Quantitatively based opinion surveys are widely used in the media, with statistics such as the proportion of respondents in favor of a position commonly reported. In opinion surveys, respondents are asked a set of structured questions and their responses are tabulated. In the field of climate science, researchers compile and compare statistics such as temperature or atmospheric concentrations of carbon dioxide.

Empirical relationships and associations are also frequently studied by using some form of General linear model, non-linear model, or by using factor analysis. A fundamental principle in quantitative research is that correlation does not imply causation. This principle follows from the fact that it is always possible a spurious relationship exists for variables between which covariance is found in some degree. Associations may be examined between any combination of continuous and categorical variables using methods of statistics.

3.1.3.3 Triangulation Technique (Mixed Research Method): A combination of the qualitative and quantitative methods is termed as the triangulation method. It allows the researchers to gain insights and results to assist in making inferences and in drawing conclusions (Denzin, 1978). Love (2002) suggest that triangulation is an appropriate research approach for extending the scope of theory in construction management research. Construction management mostly uses project management processes to execute projects. Development project management also uses project management processes similar to construction management.

There are various types of mixed research:

**Sequential studies:** In this type, the researcher first conducts a quantitative phase of a study and the follows it up with a qualitative phase or vice versa. The two phases are separate aspects of the study.
Parallel/simultaneous studies: The researcher conducts the quantitative and qualitative aspects of the study at the same time.

Equivalent status designs: The researcher conducts the study using both the quantitative and the qualitative approaches equally to understand the phenomenon under study.

Dominant-less dominant studies: The researcher conducts the study within a single dominant paradigm with a small component of the overall study drawn from an alternative design.

3.1.4 Methodology adopted

The research methodology adopted combines the element of pure and applied research. The pure research method was adopted to: (1) review the background of the research, shape the research scope and build up theoretical concepts governing the research agenda; and (2) overview the perception of project management practitioners on the ideas and concepts introduced from this research. Creswell (1994) states that researchers should make the most efficient use of both paradigms (qualitative and quantitative techniques) or simultaneously (triangulation) in understanding social phenomena. As the research intends to explore an area which has little research done on it and to provide input to instigate further work in this area, qualitative techniques would be combined with quantitative methods for this research. The quantitative technique aspect involves the generation of a model based on literature reviewed which identified existing knowledge management and project management models as inadequately suited for development project activity. It will also take into account, the hypothesis generated at the beginning of the research, generation of variables for the research, development of instruments for data collection and measurement, collection of empirical data and analysis of data and the evaluation of results.

Justifying the quantitative aspect: The quantitative aspect of this research is employed to gain a broad understanding of knowledge management in
development projects. The model and hypothesis developed in this research is tested using quantitative data. The aim is to gain a broader understanding of the phenomenon. There has been a lot of studies in knowledge management in other areas but very few KM research in development activity. Adopting the empirical paradigm in this research is therefore exploratory in nature.

Justifying the qualitative aspect: The qualitative aspect of this research is adopted to confirm or reject the quantitative dimension of the study. It is therefore sequential. The qualitative aspect follows the quantitative study. The initial results of the quantitative study gave rise to the selection of case studies for the qualitative study. Both paradigms are linked and follow after each other. The qualitative aspect of this study is complementing the quantitative. Although they were conducted separately (sequentially), they were designed to explore similar areas to increase understanding of the phenomenon. It was felt that there are issues about the phenomenon which the quantitative aspect could not explore in reasonable depth, so the qualitative aspect helped to explain these areas.

3.1.5 Research Strategy and process
The choice to use mixed research methods should not be mistaken with the choice of a research strategy. Yin (1994) describes three research strategies that could be utilized in any research. These are experiments, surveys and case studies. Each of these strategies can use either quantitative or qualitative methods or their combination. According to Yin (1994), the choice of an appropriate research strategy depends on the question that the research seeks to answer, the control over the phenomenon studied and whether the phenomenon is historical or contemporary.

According to Yin (1994) the survey and case study research strategy has a particular advantage when “a ‘how’ or ‘why’ question is being asked about a contemporary set of events over which the investigator has little or no control.” This might be the case in this research. This is because the research is
seeking to find out what KM practices exist in DPs and how these practices could lead to project outcomes such as innovation, project success, faster completion times, operational efficiency and generation of new knowledge. As a result, it was felt that surveys and case studies were the most appropriate research strategy.

Survey research has been criticized for forcing researchers to develop general questions which are minimally appropriate for all respondents, possibly missing what is most appropriate to many respondents. They are also thought to be inflexible, and also force researchers to ensure that large numbers of the selected sample will reply. It may be hard for respondents to tell the truth or reply to controversial questions, and some authors argue that surveys seldom go in to as much detail as case studies could (Allan and Skinner, 1991; Bourque, Linda and Fiedler, 1995). However, the advantages of survey research are numerous;

1. Surveys are useful in describing the characteristics of a large population. No other method of observation can provide this general capability;

2. they can be administered from remote locations using, mail, email, websites or telephone;

3. very large samples are feasible thereby making the results statistically significant even when using multiple variables;

4. standardized questions make measurement more precise by enforcing uniform definitions upon the participants. Standardization ensures that similar data can be collected from groups then interpreted comparatively (between-group study); and

5. high reliability is easy to obtain-by presenting all subjects with a standardized feature and observer subjectivity is greatly eliminated (Schwartz & Seymour, 1996)
Case study research has also been subject to considerable criticism. Yin (1994) has identified three sources for this criticism. First, it arises from the potential lack of rigour. The researcher is solely in control of the systematic application of the research methods. Thus, the research quality is a function of the researcher. Second, the value of case studies for generalization tends to be modest. Third, case studies can be massive documents that are laborious to compile. As a result, it is difficult to know what is important and what data needs to be collected.

Carroll and Johnson (1990) characterise case study strategy by stating that "the primary goal is to understand the case itself; only later might there be efforts to generalise from the case to broader principles." This quote underlines that the strength of case study research is in understanding, not in generalisation. This research sought to harness this strength of the case study strategy as it was used to increase understanding of KM in DPs. The criticism that relates to the potential lack of rigour and filtering vast amounts of information on each case study was acknowledged and taken into account in the development of the case study design.
3.1.5.1 Research process

The process this research has taken is represented in Figure 3.2 below.

In chapter one, the research began with giving a background, problem identification, identification of aims and objectives and justification for the research. In chapter two it then reviewed current and past literature on knowledge management, development projects and project management to identify the state of the practice and how the identified problems had been addressed in the literature. The literature review led to the identification of some knowledge gaps which this research is seeking to fill. In chapter 3 a conceptual model was developed for this research and this led to the adoption of a mixed (triangulation) research technique in order to test the model through a survey and case study strategy (Chapters 4 and 5) and these led to a discussion on findings based on the results of both research strategies adopted. The next section will discuss the survey research strategy.
3.1.5.2 How objectives are to be achieved

Figure 3.3 shows the objectives of the research and how they are to be achieved.

The four objectives of this research are to be achieved using a literature review, development of a conceptual model, survey questionnaires, case study and documentation review and interviews. The chapters of the thesis which contribute towards achieving the objectives of the research have been shown in Figure 3.9 above. The next sub-section discusses the input, activities and expected outcomes of the research process.
3.1.5.3 Expected outcomes

The outcomes expected by this research are presented in Figure 3.4 below.

In order to achieve the expected outcomes of this research, a literature review was used to enable understanding of the KM, PM and development project literature and to identify and articulate a knowledge gap. This led to the development of a conceptual model and the utilisation of surveys and case studies and interviews to test the conceptual model. This phase is termed “industry input” because the conceptual model is being tested in real life scenarios within development projects. At the end, findings and discussions validate the applicability of the conceptual model to development project scenarios as articulated in the literature review, surveys and case studies. The next section discusses the model development.
3.2 Model Development

In the research methodology, the quantitative technique is normally approached using the generation of models, developing hypotheses and theories. When combined with the qualitative technique (triangulation); this could also be the case. The triangulation method adopted for this research is sequential, thereby requiring the conduct of a quantitative study first and then complementing this with a qualitative study. Following from the literature reviewed and the perceived inadequacy of current PM and KM methods in addressing development project needs for managing knowledge, the researcher is proposing a model which is expected to enhance knowledge management capabilities of development projects. This model will be tested using the quantitative technique and confirmed with the qualitative technique. Utilising the project management process, this research tried to identify knowledge processes within the PM stages. A basic assumption is that the project process is also a knowledge generating process. Therefore the PM cycle which is a basic instrument of managing projects represents a knowledge cycle. What this research has done is to examine the processes and typical activities that go from identification to evaluation stages of a project in the light of a knowledge generation process. It also treated the four KM enablers of technology, culture, people and strategy as the inner crust of a KM programme within the PM process. This research proposes the CRAI model as a theoretical model for KM in DPs.

In proposing the model, the thesis in sections of the literature review, examined the PM cycle, the KM process and dimensions, and the possible deliverables of a KM driven PM. The model is explained in section 3.2.1 below. A combination of KM and PM ontology resulted in the development of four elements of a KM process which the researcher considers suitable for formulating a KM model for development projects. These terms might mean different things in other contexts, but for the purposes of this project, the context in which these constructs are used would be explained in the next section.
Analysis of PM as a Knowledge generating process

Figure 3.5: Analysis of PM as a knowledge generating process

Figure 3.5 above presents the PM cycle as a knowledge generating cycle, providing a basis for formulating the conceptual model.
Figures 3.6 depicts the conceptual model and is discussed in section 3.2.1.

<table>
<thead>
<tr>
<th>Four Stages of Project Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Codified Knowledge</strong></td>
</tr>
<tr>
<td>Knowledge output of the whole project needing to be captured, codified and stored.</td>
</tr>
<tr>
<td>- Evaluation</td>
</tr>
<tr>
<td>- Analyse results</td>
</tr>
<tr>
<td>- Lessons learnt</td>
</tr>
<tr>
<td>- Impact assessment</td>
</tr>
<tr>
<td><strong>Reproductive Knowledge</strong></td>
</tr>
<tr>
<td>Knowledge assimilated needs to be reproduced on implementation. Project results are direct reproductions of project knowledge assimilated.</td>
</tr>
<tr>
<td>- Refine knowledge</td>
</tr>
<tr>
<td>- Utilise Knowledge</td>
</tr>
<tr>
<td>- Finished product</td>
</tr>
<tr>
<td>- Progress review</td>
</tr>
</tbody>
</table>

Figures 3.7 depicts the model constructs and defines the process. This is further discussed in section 3.2.1.
3.2.1 The model constructs
This section explains the four constructs of the model and their meanings in
the context of this research.

3.2.1.1 Interpretation (Interpretative knowledge)

Each project begins with an interpretation, analysis, and detailed
consideration of project information, requirements and specifications. To
deliver a project well, one must understand why it is needed and what it is for
at the start of the planning process. At this stage documentation,
organisational knowledge, staff experience, decision support tools and
technologies are used to enable project managers to make decisions. The
client explains their requirements, stakeholders are able to get across their
views about the project and what they require. This stage is the preliminary
stage of interpretation and planning, (Muriithi and Crawford, 2002) where
things are made clear. Figure 3.8 above represents the interpretative

Figure 3.8: Representation of Interpretative Knowledge
knowledge of projects divided into four aspects: people; culture; technology; and strategy.

People: The people aspect of interpretative knowledge comprises of best practices, qualifications of project staff, experience carried over from other projects and the constitution of project staff. This aspect is among the first things project management considers in the course of designing and implementing a project. The assumption is that people are part of the KM process of project management. Their experience is vital for smooth project take-off. Equally, their knowledge of best practices relevant to the project will enhance the process and their training, either academically or vocationally adds value to the project, Farr-Wharton (2003). Furthermore, a good project staffing practice will help projects select the best people for the project and thus enable smooth working relationships and thereby increase the potential for the creation and sharing of quality knowledge, (Kotnouor, 2000; Peters and Homer, 1996).

Technology: At the commencement of a project, technology tools support the sense making process as the staff try to make meaning of documentation and what they are supposed to do, (Odhiambo, Harrison and Hepworth, 2003). Technology enables the search and retrieval of information that relates to similar projects of the past. Project databases and intranets offer a lot of information on related resources such as post project reviews which might contain lessons learned and mistakes made and this constitutes important knowledge for current projects.

Strategy: The strategy perspective of interpretative knowledge relates to the projects ability to schedule project times, manage sudden and unexpected change, plan for risk management and manage the project process effectively.

Culture: The culture dimension relates to the knowledge available in the form of project leadership, resource base, project capacity and organisational memory. The knowledge available to a development project in this respect
enhances the progression of the project from the identification stage to the other stages.

3.2.1.2 Assimilation (Assimilative Knowledge)

This is considered the level of intense interaction between project team members. At this stage, the various day to day interactions taking place between new team members and experienced team members begin to yield a measure of knowledge hitherto unavailable to individual members of the team on their own. Even new members of a team in their inexperience, bring views that make experienced managers learn. The various tools that foster assimilation of knowledge about a project include emails, face to face interaction, mentorship, groupware, telephone conversations and chat. But the most important vehicle of assimilation is a community.

Team members form communities of tasks (COT) and expertise (COE) which facilitate knowledge generation and integration. At this stage of the project, the information presented in documentation at the interpretation stage is
assimilated through everyday interaction, questioning, dialogue, explanations from team managers, group discussions and stakeholders meetings. The researcher considers this the most crucial stage of project delivery. A project is essentially a new product development since individual projects are unique in themselves, and therefore require a high level of innovation and efficiency. In the process of assimilation, information is converted into knowledge and tacit knowledge is shared among team members. A mutual understanding about the project develops. The knowledge acquired and shared in this process is a potent tool for achieving the project objectives.

Research has linked a projects information utilisation capacity to the existence of group mechanisms (Galbraith, 1973; Gupta and Govindarajan, 2000). Innovation flows more efficiently through relationships in and outside a project (Tushman and Scanlan, 1977; Ghoshal and Bartlett, 1988; Nobel and Birkinshaw, 1998; Hansen, 1999), and best practices are transferred more easily when there is a relationship between two parties to knowledge transfer (Szulanski, 1996). Hansen (2002) researched on knowledge sharing between project teams and linked project completion time to the rate of knowledge sharing among teams.
3.2.1.3 Reproduction (Reproductive knowledge)

The reproduction process is the implementation stage. At this stage, knowledge residing in design details and in the heads of team members is made tangible. The project outcome (infrastructure) is the product of tacit and explicit knowledge. Tacit knowledge which is in a state of doing (empirical) and explicit knowledge which is in a state of being (idealist) are combined and reproduced into project outputs. Knowledge creation in itself is not profitable if it’s not translated into project outcomes. The reproductive stage in the model is enabled by knowledge creation, sharing and utilisation. At this stage the core competencies (entrepreneurial competencies, technical competencies, evaluative competencies, and relational competencies) of PM as identified by Lampel (2001) are brought to the fore. Some of the elements that constitute the various processes and ingredients for successful reproduction of project design into project outcomes are: knowledge creation; refining and use and reuse (culture dimension); quality management; work breakdown structure (WBS); communication (strategy dimension); leadership; team work; reviews (people dimension); integrative technology; search and retrieval; databases and collaborative technology (technology dimension).
3.2.1.4 Codification(Codified knowledge)

The codification stage of the KM (conceptual) model is the evaluation stage of the PM process. Towards the conclusion of a project, relevant knowledge and information are documented and passed on as evaluation reports, summaries of project activity, appraisals, project brief and debriefings (Schindler and Eppler, 2003). These documentation attempt to capture the knowledge of staff who worked on these projects. Post project reviews (PPR) have been recognised as strategies for capturing and codifying project knowledge (Carrillo, 2005). Although documentation may contain project knowledge, they are often not in readily usable format to enable decision making. Research has been carried out in the area of learning from post project reviews (Terry, 2004; Carrillo, 2005). Post project review meetings, evaluation reports, and lessons learned databases offer a rich source of knowledge for projects if they have the time to analyse them. In theory, organisations have PPR and review meetings but in practice they are frequently not in place (von Zedtwitz, 2003). This makes organisations miss the opportunity to learn from important
mistakes or successes of a project. Capturing and codifying project knowledge throughout the project process will lead to the generation of new knowledge if the captured knowledge is subsequently analysed and utilised (Argyris, 1999; Disterer; 2002; Bowen et al., 1994). The next section discusses the justification for developing the CRAI model.

3.3 Justifying the CRAI model

It is necessary to state that the CRAI model is not a PM process and does not seek to replace any PM process. The CRAI model is much more a KM process embedded in a project management life-cycle. It therefore can be implemented within any PM process.

One of the main issues with existing models is that people aspects of project management are overlooked and process is emphasised. Secondly, a lot of these process-based models do not take into account the complex and fluid nature of development projects and the environments where they operate, so they are limited in the ability to cater for sudden change. Third, these models are more process oriented than knowledge-based, so they are limited in their ability to enhance knowledge sharing in projects. The solution is to take into consideration the process, people and knowledge management aspects of project management in a KM model that would recognise the complexities of development projects and the need to adapt to changing situations. The design of the CRAI model is justified by the following:

1. The RIBA plan of work was developed with perspectives from architectural management and the Process Protocol for construction management process, and the Prince2 for technology processes. It is not clear how these PM processes take into consideration a knowledge-based approach to PM. The CRAI model is developed specifically to provide a knowledge-based approach to PM.

2. There is a gap in the concentration on knowledge management perspectives in the reviewed models which the CRAI model is designed to fill. Although the Process Protocol identifies that lessons learnt
should be captured using a repository, there is no coherently articulated KM plan within the protocol.

3. The CRAI model is a mixture of knowledge management process and project management life-cycle. None of the other models have tried to develop this perspective. The Process Protocol stops short at mentioning and incorporating the need to capture knowledge produced during the construction process. However, from the beginning of the Protocol, it is not clear how knowledge would be managed.

4. The CRAI model was designed to improve and not replace other PM processes. A project management process like the RIBA plan of work for example, could be implemented with the CRAI model.

3.3.1 The CRAI model and other KM processes
The KM models reviewed in Chapter 2 have not taken into account the complexities of the development project area. As highlighted in Chapter 1, the challenges facing development projects are numerous. Secondly, these models were not designed within the context of development project processes and we cannot assume that they work when applied in this area. The following arguments are put forward by the researcher for developing a novel KM process.

1. The KM models reviewed have not taken into consideration the development project management process.

2. Perhaps, the core differences between the KM process of Tan et al. (2006) and the CRAI model are: (1) The Caprikon process spells out the processes of knowledge creation of a typical KM system but does not go into details in mapping what should be captured, shared, stored, reused and maintained. Caprikon is generic, but the CRAI model is specific given it's orientation to the development project management process. (2) The CRAI model identifies and maps the development project management cycle with the aim of leveraging knowledge at each stage of the cycle whereas Caprikon bears the semblance of a knowledge creation process which takes place generically in every knowledge producing activity irrespective of the project stage. For example, within the Interpretation aspect of the CRAI model, we could
have a knowledge creation process which embraces all the elements of CAPRIKON. It is therefore more appropriate to look at the CRAI model as a KM process meant to leverage knowledge within the project lifecycle.

3. In similar ways as the foregoing argument, the CRAI model also differs from Nonaka and Takeuchi's (1995) process in that this process is more concerned with categorising knowledge (tacit and explicit) and identifying the interrelationships between these two types of knowledge and their metamorphosis from one stage of interaction to the other (socialisation, externalisation, combination and internalisation) in a matrix. What is lacking is a contextual application. The CRAI model therefore goes further from where this model stops and applies four knowledge processes within the context of development projects with distinct terms suitable for the development project. The CRAI model is similar to Nonaka and Takeuchi's (1995) process in some respects. It utilises stages in the process. The term "assimilation" is similar to "socialisation". This is where people to people interaction yields knowledge that could help implement projects.

3.3.2 Conclusion
The CRAI model is complementary and improves on existing KM processes. It seeks to test out well known KM principles in the area of development projects utilising a four-staged approach and terminology for the life-cycle management of development projects.

3.4 Survey Design
A survey was carried out during this research. The potential study population was 10,000 but the sample size was narrowed to 1,000 using various criteria as described below:
3.4.1 Project Selection

Project management classifies the status of projects as ongoing, completed and abandoned (Baker, 2000; World Bank, 2002). The researcher decided to use ongoing and completed projects for this study.

**Ongoing projects:** The reason for this decision is because ongoing projects have the potential for answering some questions this research find important in regard to knowledge management. Such questions as the usefulness of knowledge from previous projects is important to this research. Secondly, ongoing projects provide the opportunity to meet with staff who due to their involvement with the project may be interested in answering questions related to the project. Accessibility to staff is a major decision in the selection of ongoing projects. Due to the fact that project staff more often than not, are reassigned to other projects and may be difficult to locate, it was viewed as important to gather information about the research with ongoing projects in a number of areas common and relevant to both ongoing and completed projects. Moreover, ongoing projects are more likely to be adopting new and current practices which completed projects might not have utilised.

**Completed projects:** Lessons learnt from completed projects give the benefit of hindsight. This is a major reason for selecting completed projects for the survey. Some aspects of the model developed, require the gathering of data from projects which have already been completed. Such aspects as codification of knowledge is considered by the researcher as more applicable to projects which have completed or near completion. This is due to a practice prevalent in the development project field where projects are most often evaluated at the end of the project rather than in-between phases. Project success is also much more measurable with a completed project than with an ongoing project. This research recognises the difficulty in reaching staff of completed projects with a survey and the fact that they may be busy with other projects and find the survey an added constraint since it may not be relevant to their current tasks. However, to overcome this constraint, efforts
were made to reach staff of selected completed projects well on time to enable them have more time to respond to the survey.

Regions of activity: The researcher decided to survey only projects which implement development projects in Sub-Saharan Africa. The sources used to select projects often indicate regions of interest for each project and areas where projects are implemented. Where this is not indicated in their profile, the researcher sent emails to verify the region projects are operating in. It is important to clarify that some projects do not have a direct presence in Africa but do commission projects in Africa through funding. They may contract out projects to secondary organisations or go into partnership where the other organisation has technical competence and the project organisation is providing the funding. The criteria though is that this organisation would have a level of administrative control and oversight.

3.4.2 Project Type
The researcher selected project areas of activity based on a random review of databases such as development gateway, directory of development organisations and the WEDC directory of development organisations. The criteria for selection are:

1. frequent reoccurrence of a development field in the directories and databases;
2. predominance of such areas of development activity in Sub-Saharan Africa; and
3. utilisation of project management processes for design and implementation of projects.
Table 3.1 shows the selected project types for the survey.

<table>
<thead>
<tr>
<th>Table 3.1: Project types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Construction</td>
</tr>
<tr>
<td>2. Water and Sanitation</td>
</tr>
<tr>
<td>3. Education</td>
</tr>
<tr>
<td>4. Technology</td>
</tr>
<tr>
<td>5. Social services</td>
</tr>
<tr>
<td>(health, etc)</td>
</tr>
<tr>
<td>6. Sustainability</td>
</tr>
<tr>
<td>7. Information</td>
</tr>
<tr>
<td>8. Women Welfare</td>
</tr>
<tr>
<td>9. Children and Youth</td>
</tr>
<tr>
<td>10. New Product Development</td>
</tr>
<tr>
<td>11. Design</td>
</tr>
</tbody>
</table>

The next section discusses the regional classification of projects selected for this research.

3.4.3 Project Region

The World Bank (2005) regional classification of projects was used as a standard for this project. The survey was designed to be executed in 12 regional divisions of the world. This decision was made for ease of classification of data and also for clarity and detail in analysis. Development organisations have a more elaborate classification.

For the purposes of this project, development organisations were classified into 12 regions as listed below. The questionnaire thus made provision for these 12 regions for the purposes of data collection for this study:

<table>
<thead>
<tr>
<th>Table 3.2: Project regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
</tr>
<tr>
<td>North America</td>
</tr>
<tr>
<td>Latin America</td>
</tr>
<tr>
<td>The Caribbean</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>North Africa</td>
</tr>
<tr>
<td>East Asia</td>
</tr>
<tr>
<td>The Pacific</td>
</tr>
<tr>
<td>Central Asia</td>
</tr>
<tr>
<td>South Asia</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td>Middle East</td>
</tr>
</tbody>
</table>
From the survey, it appears most development project organisations that implement major projects in Africa have their headquarters based in Europe and North America. The functions of the majority of the staff in these organisations are directly connected to field activities in developing countries. The predominance of respondents from Europe and North America indicate the active participation in international development, of organisations from these regions. The primary target region for this study however was Africa. The criterion for selecting a project for inclusion in the survey was the active participation in or execution of DPs in Africa.

3.4.4 Questionnaire Design

A web questionnaire was developed to enable the researcher to gather information faster and more effectively. Web surveys are becoming increasingly popular as a method for scientific and social inquiry. A United Nations Conference on Trade and Development Study (2004) reported a rising rate of Internet connectivity among businesses and development organisations in developing countries of the world. This report represented in table 3.3 below, among other studies, informed the decision to carry out this survey through the Internet. Response rates from developing countries was considerable and encouraging.

Table 3.3: World Internet usage statistics

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>900,465,411</td>
<td>14.0 %</td>
<td>13,468,600</td>
<td>198.3 %</td>
<td>1.5 %</td>
<td>1.5 %</td>
</tr>
<tr>
<td>Asia</td>
<td>3,612,363,165</td>
<td>56.3 %</td>
<td>302,257,003</td>
<td>164.4 %</td>
<td>8.4 %</td>
<td>34.0 %</td>
</tr>
<tr>
<td>Europe</td>
<td>730,991,138</td>
<td>11.4 %</td>
<td>259,653,144</td>
<td>151.9 %</td>
<td>35.5 %</td>
<td>29.2 %</td>
</tr>
<tr>
<td>Middle East</td>
<td>259,499,772</td>
<td>4.0 %</td>
<td>19,370,700</td>
<td>266.5 %</td>
<td>7.5 %</td>
<td>2.2 %</td>
</tr>
<tr>
<td>North America</td>
<td>328,387,059</td>
<td>5.1 %</td>
<td>221,437,647</td>
<td>104.9 %</td>
<td>67.4 %</td>
<td>24.9 %</td>
</tr>
<tr>
<td>Latin America/Caribbean</td>
<td>546,917,192</td>
<td>8.5 %</td>
<td>56,224,957</td>
<td>211.2 %</td>
<td>10.3 %</td>
<td>6.3 %</td>
</tr>
<tr>
<td>Oceania/Australia</td>
<td>33,443,448</td>
<td>0.5 %</td>
<td>16,269,080</td>
<td>113.5 %</td>
<td>48.6 %</td>
<td>1.8 %</td>
</tr>
<tr>
<td>WORLD TOTAL</td>
<td>6,412,067,185</td>
<td>100.0 %</td>
<td>888,681,131</td>
<td>146.2 %</td>
<td>13.9 %</td>
<td>100.0 %</td>
</tr>
</tbody>
</table>

NOTES: (1) Internet Usage and World Population Statistics were updated on March 31, 2005.


98
The questionnaire was structured on a six-point likert scale ranging from strongly disagree to strongly agree. Respondents were required to show their degree of agreement or disagreement with the statements made under each construct of the model. Questions were placed randomly in the questionnaire to avoid response bias.

The questionnaire was coded with options to add to the fields of development through a free text tool, as long as respondents were working in these unlisted areas. It is necessary to note that some respondents did add areas which they felt were not included in our list. On a general note, these areas listed above were very representative of the development practice.

3.4.5 Population
About 10,000 DPs were selected for this study. From this population, a sample size of 1000 was drawn. The following sources were used for selecting the email addresses of respondents:

- KnowledgeBoard (www.knowledgeboard.com)
- WEDC List of Development Workers (www.lboro.ac.uk/wedc)
- Directory of Development Organisations (www.devdir.org)

These three sources are very large databases of information about development workers and organisations. They also organised the information according to country, region and project areas.

3.4.5.1 Sampling
The stratified random sampling was used to select projects to be surveyed. The results of the random sampling is given in table 3.4 below.
Table 3.4: Stratified random sampling of projects

<table>
<thead>
<tr>
<th>Regions</th>
<th>No. selected</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>North America</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>Latin America</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>The Caribbean</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>North Africa</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>East Asia</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>The Pacific</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Central Asia</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Australia</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Middle East</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>South Asia</td>
<td>70</td>
<td>7</td>
</tr>
</tbody>
</table>

The number of projects selected from each region represented in table 3.4 above was arrived at based on the total number of projects from a region represented in the total population. There were more projects from Europe and North America than other regions and using the stratified random sampling technique, it was decided that fifteen percent (15%) of projects each should come from Europe and North America. The response rate as discussed in Chapter 4, section 4.1.3 also justifies this decision. The next sub-section discusses the coding of individual items on the questionnaire.

3.4.5.2 Question coding

The questionnaire was coded as follows: Section A of the questionnaire has 11 background questions which dealt with the general features of the project. The questions in this section include the project region, size, number of staff, duration of project, communication tools, project roles of respondent, KM tools used, email contacts for feedback, and project type. This section was meant to gather as much information as possible about the project to enable the researcher to make objective assessments about the project. It was also important that the researcher knows if the project is ongoing or completed as
important areas of comparison might be discovered between responding projects.

### Table 3.5: Questionnaire variables

<table>
<thead>
<tr>
<th>SECTION A: GENERAL</th>
<th>SECTION B: PROJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Region</td>
<td>Interpretation</td>
</tr>
<tr>
<td>Project Size</td>
<td>Assimilation</td>
</tr>
<tr>
<td>Project Type</td>
<td>Reproduction</td>
</tr>
<tr>
<td>Project Duration</td>
<td>Codification</td>
</tr>
<tr>
<td>No. of staff on Project</td>
<td>Project Completion Time</td>
</tr>
<tr>
<td>Project Role of Staff</td>
<td>Project Success</td>
</tr>
<tr>
<td>Project Communication tools</td>
<td>Best Practices</td>
</tr>
<tr>
<td>Knowledge sharing tools</td>
<td>Innovation</td>
</tr>
<tr>
<td>operational Efficiency</td>
<td>Generation of New Knowledge</td>
</tr>
</tbody>
</table>

Section B was designed to gather information regarding KM in DP. Specifically it was structured using the analysis of PM as a knowledge generating process in figure 3.5 which is the ontology and basic concept behind the CRAI model. Thirty six (36) questions were used to gather information on selected projects in the areas presented in table 3.5. For a detailed presentation of the survey questionnaire see Appendix 1.

### 3.4.5.3 Pilot studies

An initial pilot was conducted with eleven respondents representing eleven areas of development project activity to be studied in the main survey. The reasons for the pilot study are:

- Developing and testing adequacy of the research instrument
- Assessing the feasibility of the main survey
- Assessing whether the research design is realistic and workable
- Establishing whether the sampling frame and technique are effective
- Identifying logistical problems which might occur using proposed methods
- Estimating variability in outcomes to help determining sample size
- Collecting preliminary data
- Assessing the proposed data analysis techniques to uncover potential problems
- Training the researcher in as many elements of the research process as possible

Response and feedback from the eleven respondents were considered in the following areas with results:

(a) Feedback from the respondents indicated a number of areas and wordings in the questionnaire which needed adjusting. This mostly related to the concept of knowledge management and how to convey the meaning to respondents. This was taken into consideration and adjusted as recommended.

(b) Respondents also indicated difficulty accessing and submitting the online questionnaire. With the feedback, the researcher was able to rebuild the coding system of the online design. This enabled interoperability between various types of computer systems to enable respondents to complete and submit the questionnaire successfully.

(c) As a result of the pilot studies, changes were made to the structure of the questionnaire and the questions asked. These changes are now reflected in the research design here in the sections that follow.

(d) The nature of the response also enabled the researcher to determine what types of data analysis techniques to be utilised in analysing the results of the main survey.

(e) The pilot response helped the researcher explore further some aspects using free text tools, where they were previously inexistent. Some aspects of the questionnaire needed respondents to write in their perceptions using free text tools. This was decided after the pilot studies, because some respondents gave feedback by email suggesting that such free text areas will enable them give more feedback.

(f) The pilot also helped the researcher understand a perceived notion of knowledge management as relating to the areas of development activity being studied. Some of the managers who responded to the pilot survey were later contacted in order to understand their notion of knowledge management.
Their response was taken into consideration in redesigning the main questionnaire.

### 3.4.6 Survey Administration

As mentioned in subsection 3.3.4, a web questionnaire was designed for the purposes of this survey. It was then loaded on a website and administered to each project contact using email. A link to the questionnaire was provided on the email after introducing the research. After responding to the questions, the respondent is provided a button through which their response is sent back to the researcher by a single click. The response is then harvested and sent back to the researcher by an email client.

#### 3.4.6.1 Response

Over a period of five months responses were received from different project contacts. The response rate is 303 which represents 30.3% of the sample size. This response rate is high considering that some studies are of the view that a good response rate is in the region of 20% and above (Kardas and Milford, 1996). Various reasons account for the high response rate obtained for this research:

(a) Most development organisations surveyed have their administrative and control offices based in the USA, Europe and other developed nations, although field activities were ongoing directly in developing regions of the world. This makes it possible for managers to respond to questionnaires because of the high rate of Internet connectivity.

(b) Over the first two months after administering the survey questionnaire, the researcher followed up contacts who had not responded using telephone and email. This helped in boosting response rates as individuals involved were contacted directly. The researcher does not have any personal relationship with these managers, so the issue of response bias is minimised here, however contacting the potential respondents directly by telephone greatly increased the response rate.
3.4.6.2 Non response
On some occasions, reminders were sent out to respondents and this helped generate more responses. Follow up calls were also made to projects which had not responded and personal communication helped in getting some projects to respond. The researcher made telephone calls to organisations which had not responded and some were able to respond after being contacted. Some very late responses were also received after the data was fed into SPSS and these were also included. Some of the reasons given by project contacts for not responding include: Being too busy with projects, not interested in the research, and confidentiality. There were projects also which never responded despite the number of emails sent. Some projects which had received a few reminders requested not to be reminded again either because they were too busy to respond, the information needed was not available or confidentiality issues did not permit them to respond.

3.4.6.3 Invalid responses
A number of invalid responses were also received. As these were not useful for the research, the researcher sought to identify the contacts which sent them through email addresses. On some occasions they were not identifiable because they had not provided email addresses while on some other occasions where emails were provided, contact was made and a valid response secured.

3.4.6.4 Results of the survey—a caveat
From the high level of response and also some preliminary consideration of the survey responses, it is important to issue a caveat about the results of the survey. These results should not in anyway be overestimated and care should be taken in adopting these results for any practical implementation. At the moment, these results based on the theoretical model should not in anyway be interpreted as practically applicable to every project situation as results may vary depending on the situation. The researcher calls for more studies to confirm or reject the findings of this study. This is an exploratory study and needs more in-depth studies that would throw more light on issues considered
The researcher expects the findings of this study to stimulate further intellectual debate and research.

3.5 Case Study Design
This section looks into the design of case studies to further gather information and insight into the research. The selection of case studies followed a consideration of the pattern of response to the survey, region located and the level of KM indicators detected in the project through the survey. The four organisations selected for this study exhibited KM awareness in their response to the survey. The level of awareness of KM in the projects informed their selection for the case study. There were no hard and fast rules developed by the researcher for selecting case studies, however, the researcher used his objective judgement about the responses the projects gave and their views on KM. Consideration was given to the presence of the model indicators in the responses received from the projects. Finally, the researchers level of contact with these projects during the research period also enabled him make judgements on their suitability as case studies.

3.5.1 Standardisation
The interview schedule for the case studies was applied to each project regardless of the specific features of the projects in themselves. This is meant to achieve uniformity in analysis of data. For purposes of comparison, the interview schedule was not varied nor adjusted to the type of project. However the researcher, taking into consideration the nature of the project, asked questions in a context applicable and sensible to the project being interviewed.

3.5.2 Indicators of KM
Indicators are the primary criteria for identifying what knowledge processes are in action in a project case study. During case study interviews, the researcher looked out for cases where the indicators were present. Where they have been confirmed prior to the interview, a re-confirmation was sought to ascertain that the model indicators were present and active in the project.
3.5.3 Case Study Selection

The number of case studies was a key consideration in research design. The use of four case studies was justified using the following arguments:

- It was considered that the survey might narrow the responses from projects due to its structured nature. Respondents may not be free to give views which are outside the scope of the questionnaire items.
- Secondly, the case studies provided an applied research context for this study. It gives room to see the KM concepts in practice.
- The case study interviews and visits provided first hand experience for the researcher and also enabled him to understand concepts and KM practices of development projects and test the conceptual framework in real situation.
- The case study offered an avenue to confirm or contradict the findings of the survey. It was explanatory in nature and was complementary to the survey thereby justifying or contradicting certain phenomenon which might have emerged during the survey analysis.
- The use of four case studies as opposed to five, six or seven is justified because the researcher understands that although each project is unique, given that projects selected for the case studies come from the same region, the conditions where these projects operate are generic and four case studies were considered adequate to explore the KM, PM and development project perspectives sought by this research.

For these reasons, the following apply in the case study process:

- the primary purpose of this research is to investigate KM practices in DPs and to see if these practices influence innovation, project success, completion times, operational efficiency and the generation of new knowledge;
- the methodology used was to be extremely rigorous, which would make the nature of the research revelatory;
- the selected cases were ongoing and completed projects and the cases selected were: Lift Above Poverty Organisation (LAPO), Nigeria; Jigawa Wetlands Enhancement and Livelihood Project (JEWEL),
Nigeria; Water Utility Partnerships (WUP), Dakar, Senegal; and Nile Basin Water Resources Project (NBWRP), Kampala, Uganda;

- the use of four cases as opposed to just one was to allow the possibility of misinterpretation of the research findings to be reduced;

The number of people interviewed in each organisation is presented in table 3.6:

<table>
<thead>
<tr>
<th>Organisation</th>
<th>No of people interviewed</th>
<th>Position of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAPO</td>
<td>6</td>
<td>LAPO Development Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AGM Coordination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LAPO Health Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information Systems Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finance Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Programme Director</td>
</tr>
<tr>
<td>JEWEL</td>
<td>3</td>
<td>Project Coordinator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 other anonymous staff</td>
</tr>
<tr>
<td>WUP</td>
<td>1</td>
<td>Project Director</td>
</tr>
<tr>
<td>NBWRP</td>
<td>1</td>
<td>Project Director</td>
</tr>
</tbody>
</table>

3.5.4 Approach to case studies

The researcher decided to approach the case study using some of the process below:

- **Initial contact with interviewees:** After the survey responses were collected, the researcher sifted through the responses to identify projects which were of interest and needed further exploration. Project contacts were made through email or telephone. The researcher asked the project contacts if they were willing to participate in a further exploration of the research through a case study. Consent was secured either by email or telephone.

- **In-depth interview recorded on tape:** Interviews were scheduled and conducted either by visits or through telephone. LAPO and the JEWEL project both in Nigeria were visited and staff interviewed. The two other projects' staff were interviewed over the telephone. The face to face interviews were recorded on tape. The taped recordings were transcribed and some of these were summarised and made to conform to this research's ontology as represented in Figure 3.5
• **Review of relevant documents supplied by interviewees:** Documentation from projects were supplied by interviewees either during the visits or through email. Some other documentation were collected from the websites of the participating case study projects. These documents were reviewed by the researcher for further information on the projects. Documentation requested and received from projects is outlined in section 3.6.7.

• **Further discussions to clarify unclear issues:** Where the researcher needed further clarification of points raised from documentation or the interview transcripts, he called or emailed the project contacts seeking clarification. Response was always received from the project contacts.

• **Confirming the contents of the report with interviewees:** The case study report was confirmed with interviewees. This was done sometimes by email and at other times using telephone. The researcher needed to know that he was not quoting the interviewees out of context. The relevant portions of the report was attached through an email or read out to the interviewees over the telephone seeking their confirmation that this was factual and representative of their views. Where errors were detected by interviewees, this was corrected by the researcher in consultation with the interviewee.

This approach is used to reduce the likelihood of error and inaccuracy of the information supplied by interviewees.

### 3.5.5 Data Collection

The stakes in development projects are considerable. As a result, project sensitivity was a major issue in the selection of data collection methods. Two data collection methods suitable for this type of research were considered and rejected. The first data collection method rejected was participant observation. It was unlikely that a researcher would have been able to gain any control over the process studied. In order to use participant observation to pursue the aim of this research, the researcher would have needed to be in a position to have an input in the project development before the research started. The second data collection method rejected was pure observation. The method
was rejected due to perceived project sensitivity. First, the project market is competitive. The rejection of both participant observation and pure observation led to the decision to use self-reporting as a main source of data in the case studies. The self-reports were obtained as interviews. Other data sources such as documentation supplied by interviewees were used to confirm or reject the information revealed or not revealed in the self-reports. According to Carroll and Johnson (1990), self-reports are good in generating understanding of decisions taken. This is especially the case if they are used as the one data collection method of a case study.

3.5.6 Interviews
Interviews were carried out as outlined in the case studies approach above. An interview schedule was designed to gather information on the perceptions of managers and staff on KM and PM issues relating to their projects. The interview schedule is designed to conform to the CRAI model elements.

3.5.6.1 Interview Schedule
The interview schedule was designed in 7 areas. Altogether there were 24 questions in the schedule and these were divided into seven areas: building and leveraging capacity; knowledge sharing; knowledge generation and preservation; innovative practices; performance and efficiency; project completion time and project success. These are critical areas for this research, as its objective is to find out if KM has any impact or causative effect on these variables of PM.

3.5.6.2 Model Assessment Schedule
The model assessment schedule is designed to help the researcher gather information on KM indicators within the organisation and how these relate to the conceptual model. During interviews, comments which highlighted the KM indicators found in the model were marked down and later highlighted in the model assessment schedule. The processes involved in project execution were considered in the light of the CRAI model to determine if organisations have a considerable presence of the elements making up the model. The elements of the model are interpretation, assimilation, reproduction and
coding and the sub-elements of these broad variables are listed in the Model Assessment Schedule. The model assessment took into consideration the four elements of a KM dimension and the typical PM cycle.

3.5.6.3 Best Practices Schedule

This schedule was designed to identify project best practices within the organisations under study. The elements of this schedule include information management, human resource practices, knowledge sharing, implementation, project design, information technology, funding, capacity building and innovation. The best practices schedule was used to document interview responses which identified best practices in knowledge management.

3.5.6.4 Variable identification Schedule

A variable identification schedule was also built in to gauge the perceptions of project managers on the five deliverables of this research: generation of new knowledge; innovation; project success; completion time; and operational efficiency. This schedule was used in conjunction with the interview schedule as a note taking strategy. As respondents make comments on the fly, the researcher records certain points which are relevant to the five deliverables on the schedule despite the fact that the interview was recorded on tape.

3.5.7 Documentation

The documentation collected or sought from projects included annual reports, human resources documentation, financial statements, information technology policies, networking documentation to identify relationships between the organisation and other similar organisations in a network, project design processes, capacity building, funding and donor information, client/user surveys, impact assessments, client-project partnerships, and independent surveys of the project, post project reviews, monitoring and evaluation documents.
3.6 Data Analysis

Tesch (1991) outlines three approaches to analyzing data. These are language based analysis, descriptive or interpretive analysis, inferential analysis and theory building. The language based analysis looks at how language is used in the source data. It also focuses on the meaning that is attached to the use of language. Descriptive or interpretive analysis seeks to formulate a holistic view of the process being studied. This is done from the viewpoint of the people (qualitative) or the distribution of data (quantitative) involved in the process. Theory building, as the term indicates, involves an attempt to develop a theory based on the collected data.

This research chose to use the descriptive or interpretive approach to analyze the interview data, as its main purpose was to investigate the KM practices of DP and to see ways in which KM contributes to the deliverables/project outcomes. It also chose to use descriptive and inferential approaches to analyze survey data. The purpose of the descriptive approach was to give a picture of the data collected in the process of the research. Inferential analysis would provide insight into outcomes of statistical tests, helping deductions to be made from the data collected, and to test the hypothesis of this research and finally relate the findings to the sample or population. The next subsection discusses data analysis techniques employed by this research and the rationale behind their use.

3.6.1 Reliability tests

Reliability is the degree to which a test is repeatable and yields consistent scores.

**Internal consistency:** There are various types of reliability tests namely: alternate forms; split-half reliability, inter-rater reliability; and internal consistency. Internal consistency is commonly measured as Cronbach's Alpha (based on inter-item correlations) - between 0 (low) and 1 (high). The greater the number of similar items, the greater the internal consistency. This research chose to use the Cronbach's Alpha (internal consistency) as the
measurement unit for reliability. The Cronbach’s Alpha is known to be robust in quantifying the reliability of a score to summarize the information of several items in questionnaires. Cronbach’s Alpha can also be applied when test items are scored dichotomously, and it has the advantage of being applicable when items are weighted (as in a likert scale where an item scored 0 points for agreeing and, 1 point for strongly agreeing, 2 points disagree, and 3 points for strongly disagree or whichever way the researcher wants to rank responses). In the case of this research, responses were ranked using a likert scale and Cronbach’s alpha was selected as the most useful in determining the reliability of this type of data.

Validity: Construct validity attempts to seek agreement between a theoretical concept and a specific measuring device or procedure. It can be broken down into two sub-categories: convergent and discriminant validity. Convergent validity is the general agreement among responses gathered independently of one another, where measures should be theoretically related. Discriminant validity is the lack of a relationship among measures which theoretically should not be related. Three steps are used to carry out construct validity:

1. the theoretical relationships must be specified e.g. using a hypothesis;
2. the empirical relationships between the measures of the concepts must be examined e.g. using correlations
3. the empirical evidence must be interpreted in terms of how it clarifies the construct validity of the particular measure being tested e.g. interpretation (Carmines and Zeller, 1991).

This research used construct validity to examine the relationships between the constructs of the conceptual model.

3.6.2 Correlation analysis
This research chose to use correlation analysis technique because it was seen as the most suitable in examining the relationships between the variables of this research. This research has assumed a relationship between the variables of the conceptual model and also a relationship between the
model and project outcomes. A correlation is a single number that describes the degree of relationship between two variables. Although correlation does not imply causation, another number produced by the correlation output (significance) gives an indication of the relevance of the relationship and how strong it is. The Pearson's product moment correlation was used in analyzing correlations between the variables in the survey data. The equation is expressed as:

If we have a series of $n$ measurements of $X$ and $Y$ written as $x_i$ and $y_i$ where $i = 1, 2, ..., n$, then the Pearson product-moment correlation coefficient can be used to estimate the correlation of $X$ and $Y$. The Pearson coefficient is also known as the "sample correlation coefficient". It is especially important if $X$ and $Y$ are both normally distributed. The Pearson correlation coefficient is then the best estimate of the correlation of $X$ and $Y$. The Pearson correlation coefficient is written:

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{(n-1)s_xs_y},$$

where $\bar{x}$ and $\bar{y}$ are the sample means of $X$ and $Y$, $s_x$ and $s_y$ are the sample standard deviations of $X$ and $Y$ and the sum is from $i = 1$ to $n$. As with the population correlation, we may rewrite this as:

$$r_{xy} = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n \sum x_i^2 - (\sum x_i)^2} \sqrt{n \sum y_i^2 - (\sum y_i)^2}}.$$

### 3.6.3 Regression Analysis

Regression estimates relationships between one or more response variables. These are called dependent and independent variables. Regression is used for predictions of variable responses to each other, modeling of causal relationships, and testing hypotheses about relationships between variables. This research is using regression technique because it assumes that there is
a relationship between the variables of the models and the project outcomes chosen for the research. Regression is more suitable for measuring relationships between multiple variables.

The general form of a simple linear regression is

\[ y_i = \alpha + \beta x_i + \varepsilon_i \]

where \( \alpha \) is the intercept, \( \beta \) is the slope and \( \varepsilon \) is the error term, which picks up the unpredictable part of the response variable \( y_i \). The error term is usually taken to be normally distributed. The \( x \)s and \( y \)s are the data quantities from the sample or population, and \( \alpha \) and \( \beta \) are the unknown parameters to be estimated from the data. Estimates for the values of \( \alpha \) and \( \beta \) can be derived by the method of ordinary least squares.

The goodness of fit of a regression model is usually checked using various parameters such as the ANNOVA table, the F-statistic which checks for statistical significance, an analysis of the pattern of the residuals, and t-tests of individual parameters.

3.6.4 Data Visualisation

In this research, some of the data gathered is presented using graphs, bar charts, histograms and scatter plots. These are used to visualize the data and to present it in understandable format.

3.6.5 Interpretive analysis (case studies)

The data collected through case studies was analysed using interpretive analysis. Documentation and interview results were analysed based on the conceptual model. The ontologies developed in figure 3.5 were used to match interview responses to the conceptual model. Views of respondents were sought through various questions asked using the interview schedule and these are transcribed and interpreted from the research point of view.
3.7 Conclusion

This chapter examined research methods that may be used to achieve the research purposes. It proposed and developed a conceptual model for knowledge management in development projects. It then adopted the pure and applied (mixed) research methods which utilises quantitative and qualitative techniques. Furthermore, the research identified surveys and case studies as research strategy to achieve the objectives of this research.

In addition, the research process, expected outcomes of the research and how the objectives were achieved was detailed. The design of the survey and case studies was also laid out and how data was collected was explained and finally, the data analysis techniques chosen for this research were itemised and explained.
CHAPTER 4
ANALYSIS OF SURVEY DATA

4.0 Introduction.
The quantitative data collected in the course of this study was analysed using SPSS. The analysis units being considered are; descriptives; reliability of the model; correlation analysis; plots and charts; and regression analysis. The essence of analysing the data gathered is to check if the data supports the hypothesis and the assumptions made at the beginning of this research. Secondly, the data collected is meant to fulfil the objectives of the study. The survey questionnaire was structured to reflect the elements of the CRAI model. In essence, the four variables of the model had several questions asked in order to gather information relative to these elements. In section 4.1 the researcher proceeds to outline the elements of the model and the questions asked under each element and how the survey response is representative of the general population surveyed. The detailed questionnaire containing the questions asked under each element of the CRAI model is presented in Appendix 1.

The survey questionnaire was structured using the items in figure 3.5 of Chapter 3 which is the conceptual basis of the CRAI model. The typical project cycle is embedded in a KM process with technology, culture, people and strategy as sub-elements.

The survey data and analysis was sent to a psychologist who has advanced experience in employing statistical methods in psychology research at Keele University for evaluation and to see if the variables were coded correctly and to give critical comments on the types of analysis techniques used. His comments and evaluation were taken on board especially in coding the variables in SPSS and running and interpreting reliability, and regression analysis.
4.1 Descriptive Analysis
This section presents a descriptive analysis of the survey data.

4.1.1 Project Type
Table 4.1 outlines survey responses according to project types.

<table>
<thead>
<tr>
<th>Project Types</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>58</td>
<td>19.1</td>
</tr>
<tr>
<td>Technology</td>
<td>54</td>
<td>17.8</td>
</tr>
<tr>
<td>Education</td>
<td>52</td>
<td>17.2</td>
</tr>
<tr>
<td>Construction</td>
<td>45</td>
<td>14.9</td>
</tr>
<tr>
<td>New Product Development</td>
<td>25</td>
<td>8.3</td>
</tr>
<tr>
<td>Social</td>
<td>20</td>
<td>6.6</td>
</tr>
<tr>
<td>Sustainability</td>
<td>13</td>
<td>4.3</td>
</tr>
<tr>
<td>Water</td>
<td>11</td>
<td>3.6</td>
</tr>
<tr>
<td>Design</td>
<td>10</td>
<td>3.3</td>
</tr>
<tr>
<td>Women Welfare</td>
<td>9</td>
<td>3.0</td>
</tr>
<tr>
<td>Children</td>
<td>6</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>303</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The response from the survey is shown in the table above. Information projects topped the rate of response. Technology, Education and Construction were second, third and fourth highest responding projects. It is not particularly obvious why this is so from the results of the survey. However, the level of Internet usage or access to the Internet among projects might be responsible. Technology awareness in DPs seems to be high, however what remains to be known is the level of KM practices adopted by these projects, hence this could be a factor in the response rates differing among project types. The next section presents data on project duration.
4.1.2 Project duration

Table 4.2 presents data on the number of years responding projects ran or are to run.

<table>
<thead>
<tr>
<th>Project Duration</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>74</td>
<td>24.4</td>
</tr>
<tr>
<td>1 Year</td>
<td>65</td>
<td>21.5</td>
</tr>
<tr>
<td>2 Years</td>
<td>87</td>
<td>28.7</td>
</tr>
<tr>
<td>3 Years</td>
<td>46</td>
<td>15.2</td>
</tr>
<tr>
<td>4 Years</td>
<td>17</td>
<td>5.6</td>
</tr>
<tr>
<td>5 Years</td>
<td>9</td>
<td>3.0</td>
</tr>
<tr>
<td>More than five years</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>302</td>
<td>99.7</td>
</tr>
</tbody>
</table>

About 46% of projects have between 0 and 1 year, 74.8% are running between 0 and 2 years, and 90.1% of projects run between 0 and 3 years. In effect, above 90% of projects surveyed expect to complete within 3 years. Just over 9% of projects fall within the category of 4+ years.

4.1.3 Project Region

The project regions selected for this study and the level of responses from each region are shown in Table 4.3 below

<table>
<thead>
<tr>
<th>Project Region</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>100</td>
<td>33</td>
</tr>
<tr>
<td>North America</td>
<td>66</td>
<td>22</td>
</tr>
<tr>
<td>Latin America</td>
<td>28</td>
<td>9.2</td>
</tr>
<tr>
<td>The Caribbean</td>
<td>6</td>
<td>2.0</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>10</td>
<td>3.3</td>
</tr>
<tr>
<td>North Africa</td>
<td>12</td>
<td>4.0</td>
</tr>
<tr>
<td>East Asia</td>
<td>11</td>
<td>3.6</td>
</tr>
<tr>
<td>The Pacific</td>
<td>14</td>
<td>4.6</td>
</tr>
<tr>
<td>Central Asia</td>
<td>6</td>
<td>2.0</td>
</tr>
<tr>
<td>South Asia</td>
<td>19</td>
<td>6.3</td>
</tr>
<tr>
<td>Australia</td>
<td>15</td>
<td>5.0</td>
</tr>
<tr>
<td>Middle East</td>
<td>16</td>
<td>5.3</td>
</tr>
<tr>
<td>Total</td>
<td>303</td>
<td>100.0</td>
</tr>
</tbody>
</table>

As could be seen Europe had a response of 33%, North America, 22%, and Latin America 9.2%. The Internet usage of Europe is 29.2% as compared to North America which is 24.9%. The level of response here supports the Internet usage statistics on which project selection for each region was based.
It is not surprising why response rates in the other regions apart from Europe and North America were low. Looking at the Internet usage statistics in table 3.3 one would conclude that usage in Europe and North America expectedly is higher than obtained in other regions of the world.

4.1.4 Analysis of response to Model variables

About thirty six questions in the questionnaire were based on the CRAI model. These questions were derived from Figure 3.5 (analysis of PM as a knowledge generating process) found in Chapter three. They were designed to gather information on the various indicators that constitute the basis of the CRAI model. Questions were drafted based on the four constructs – interpretation, assimilation, reproduction and codification and the project outcomes as shown in Table 4.4 below:

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>10</td>
</tr>
<tr>
<td>Assimilation</td>
<td>6</td>
</tr>
<tr>
<td>Reproduction</td>
<td>10</td>
</tr>
<tr>
<td>Codification</td>
<td>5</td>
</tr>
<tr>
<td>Project Outcomes</td>
<td>5</td>
</tr>
</tbody>
</table>

In this section, we will be presenting the constructs and the questions asked under each construct. The tables in this section generally show the means, standard deviations and standard errors of mean of the variables under each construct. The means, represent a model of how the data is distributed across the population. The mean is not particularly useful unless we take into consideration the standard deviation and the standard error of mean. Small standard deviations (relative to the value of the mean itself) indicate that data points are close to the mean. Large standard deviations (relative to the value of the mean) indicate that the data points are distant from the mean—the mean is not an accurate representation of the data.
The standard error is a measure of how representative a sample is likely to be of the population. A large standard error relative to the sample mean indicates that there is a lot of variability between the means of different samples and so the sample we have might not be representative of the population. A small standard error indicates that most sample means are similar to the population mean and so our sample is likely to be an accurate reflection of the population. I now proceed to apply this principle in the elements of the model and their constructs in the next sub-sections.

4.1.4.1 Interpretation

This section presents and discusses responses to questionnaire items on the model construct, interpretation. Table 4.5 details the number and percentages of response.

Table 4.5: Interpretation

<table>
<thead>
<tr>
<th>Questions</th>
<th>Count</th>
<th>Mean</th>
<th>%</th>
<th>S.E Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. We consider a KM process at the initial stage of the project</td>
<td>303</td>
<td>5.12</td>
<td>87.5</td>
<td>0.7</td>
<td>1.18</td>
</tr>
<tr>
<td>2. Change Management is a factor in our project planning</td>
<td>303</td>
<td>4.66</td>
<td>73.6</td>
<td>0.8</td>
<td>1.32</td>
</tr>
<tr>
<td>3. We conduct a risk analysis of our project at the planning stage</td>
<td>303</td>
<td>4.78</td>
<td>80.4</td>
<td>0.7</td>
<td>1.21</td>
</tr>
<tr>
<td>4. We estimate the time necessary for completing the various aspects of the project</td>
<td>303</td>
<td>4.74</td>
<td>80.2</td>
<td>0.8</td>
<td>1.33</td>
</tr>
<tr>
<td>5. We defined what constitutes success at the beginning of the project</td>
<td>303</td>
<td>5.10</td>
<td>86.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>6. We reviewed similar project reports of the past while planning for this project</td>
<td>303</td>
<td>4.66</td>
<td>77.6</td>
<td>0.8</td>
<td>1.32</td>
</tr>
<tr>
<td>7. We also conducted feasibility studies before project commencement</td>
<td>303</td>
<td>4.92</td>
<td>84.5</td>
<td>0.7</td>
<td>1.19</td>
</tr>
<tr>
<td>8. We consider the experiences and qualifications of staff important in recruitment</td>
<td>303</td>
<td>5.10</td>
<td>90.1</td>
<td>0.6</td>
<td>1.07</td>
</tr>
<tr>
<td>9. Best practices are important aspects of our project considerations</td>
<td>303</td>
<td>5.07</td>
<td>89.1</td>
<td>0.6</td>
<td>1.01</td>
</tr>
<tr>
<td>10. We had information management plans put into place at the beginning of the project</td>
<td>303</td>
<td>5.38</td>
<td>92.1</td>
<td>0.4</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Table 4.5 above shows that the responses were representative of the population in the following ways:

(1) The standard error of mean of each question is very low relative to the mean itself. This shows that there is not a lot of variability between the means of different samples and so the sample we have is representative of the population and can be used to make inferences,
predictions and conclusions about the population. This result gives us confidence in making further analysis of the data; and (2) the standard deviation is very useful in measuring how close the data points are to the mean. In our case here we have small standard deviations relative to the value of the mean and this indicates that the data points are close to the mean indicating that the data is an accurate reflection of the population.

With this in mind, the various questions were asked under the interpretation construct of the CRAI model.

**Question 1:** We consider a KM process at the initial stage of the project.

---

**Figure 4.1: Analysis of Question 1**

About 87% of projects have considered a knowledge sharing process at the planning stage of their project. Breaking the data further down, figure 4.1 above gives details of project region, project status, project size and project type responses regarding this questionnaire item. Europe had about 48% of...
positive response to this item, while North America had 11%. The lowest response on this was from Central Asia which had about 1% response. Around 37% of completed projects and 63% of ongoing projects had considered a knowledge sharing process at the planning stage of the project. Information projects had the highest positive response to this item (21%) while technology followed with 18%, Education 17% and Construction 16%. Small projects had a response rate of 34%, Medium projects 41% while large projects had a positive response of 25%.

**Question 2**: Change management is a factor in our project planning

Projects surveyed appear to consider change management as a significant factor of PM. The response to this questionnaire item across regions surveyed is outlined in the first bar chart. Europe had about 90 responses representing 29.7% of responses, North America had 24 (7.9%), Latin America, 21 (6.9%) Central Asia and the Caribbean had the lowest positive response on this item 3 (1%) and 4 (1.3%) respectively. About 151 (49.8%) ongoing projects had change management processes in place at the beginning of the project. On the other hand 72 (23.8%) completed projects responded in the same positive light as regarding this item. The remaining bar charts also show how
small, medium and large projects as well as project types, responded to the questionnaire item. Literature reviewed (Holmes, 2005) indicate that projects need change management plans and not bureaucratic systems that constrict the ability to respond quickly to change.

**Question 3:** We conduct a risk analysis of our project at the planning stage

![Figure 4.3: Analysis of Q3](image)

About 80% of projects conduct risk analysis. The identification of possible risks which might affect a project at the planning stage and preparation to deal with such risks is a key interpretative knowledge. The various shades of responses relating to project type, size, status and region are outlined in figure 4.3 above. As could be seen, 48% of positive responses came from Europe, and 63% of responses were from ongoing projects while 37% were from completed projects. The figures for the project type were laid out in the pie chart at the bottom right hand corner in percentages. Information projects represented the largest positive response rate (20%). Crawford, Pollack and England (2006) highlighted risk analysis as a crucial factor of project management.
**Question 4:** We estimate the time necessary for completing the various aspects of the project

About 80.2% of DPs estimate the completion times of their project. This is one of the key interpretative aspects of project knowledge. Having a good knowledge of when different project components would complete is important for managing project knowledge. About 44% of projects who responded positively to this item are from Europe and 11% are from North America. About 37% of completed projects responded positively and 63% positive response is from ongoing projects. Project completion time is important to project management (Turner, 1999; Disterer, 2002; Carmichael, 2006; Hodgson and Cicmil, 2006)

**Question 5:** We defined what constitutes success at the beginning of the project

Response on question 5 showed that 86% of projects had success definitions for their projects. Interpretative knowledge of a KM program in a project would require that these success definitions be understood by team members to enable them focus on project objectives. Information and construction projects tend to have high positive response rates and Europe and North America have majority of responses. Literature reviewed highlighted a significant use of project management methods such as the Prince2, CPM and PERT (Holmes, 2005). These models enable project management to define project objectives, milestones and what constitutes success. Response to this item is therefore supported by literature.

**Question 6:** We reviewed similar project reports of the past while planning for this project

On this question, response showed that 77.6% of projects considered it necessary to review reports of past projects. Ongoing projects constitute the bulk of responding projects to the various questionnaire items.

**Question 7:** We conduct feasibility studies before project commencement
Feasibility studies has to do with the ability of the project organisation to execute the project. It also reviews whether the resources at the disposal of the project are sufficient for execution, and whether the situation or environment is right for the project. The likelihood of project outcomes benefiting clients and also risks that might arise are part of feasibility studies. A knowledge of how feasible a project would be, constitutes interpretative knowledge. In this survey, 84.5% of respondents agreed that their projects conduct feasibility studies before project commencement.

**Question 8: We consider the experiences and qualifications of staff important in recruitment.**

In this survey, 90.1% of projects consider experience and qualification as vital to recruiting staff who would work on a project. Selection and recruitment policies of organisations have tended to emphasise this aspect of experience and qualifications. So it is not surprising that projects do emphasise this as crucial to recruiting staff who would work on a project. A key interpretative knowledge of a project is the experiences and qualifications of its staff. A project must make sure it has the right staff for the project in question.

**Question 9: Best practices are important aspects of our project considerations**

The consideration of best practices at the interpretative stage of a project is important as could be seen from the results of this survey. About 89.1% of projects regard best practices as important to their considerations at the beginning of a project. Staff must be aware of what constitutes best practices in certain scenarios that might arise during a project. Sometimes, best practices could be gleaned from an issues log or a best practices manual of a project. The interpretative stage of a project should ensure that staff are very familiar with the best practices of the project and what to do at certain times.
**Question 10:** We had information management plans put into place at the beginning of the project.

It is ideal for projects to have a plan to manage the vast information that might be generated during their lifetime. An information management plan includes how to document, store, retrieve and share project knowledge. About 92.1% of projects have IM plans put into place at the beginning of the project. What this result shows is that projects are aware of the benefits of information management. An information management plan is a key interpretative feature of a project. It provides the framework for documenting, storing, retrieving and disseminating what a project knows. It is therefore a basis for KM in a project.

### 4.1.4.2 Assimilation

This sub-section presents responses from projects on the second construct of the model-assimilation. Table 4.6 presents the responses of projects on this construct.

<table>
<thead>
<tr>
<th>ASSIMILATION</th>
<th>Count</th>
<th>Mean</th>
<th>%</th>
<th>S.E</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was a lot of team work during the project</td>
<td>303</td>
<td>5.28</td>
<td>90.4</td>
<td>0.4</td>
<td>.71</td>
</tr>
<tr>
<td>Team members helped each other learn on the project</td>
<td>303</td>
<td>5.38</td>
<td>92.1</td>
<td>0.4</td>
<td>.68</td>
</tr>
<tr>
<td>We held regular meetings to review work done, brainstorm and to correct mistakes</td>
<td>303</td>
<td>5.28</td>
<td>90.4</td>
<td>0.4</td>
<td>.71</td>
</tr>
<tr>
<td>There were informal groups and communities within the project team</td>
<td>303</td>
<td>5.38</td>
<td>90.0</td>
<td>0.4</td>
<td>.68</td>
</tr>
<tr>
<td>Team members are encouraged to communicate with outside projects to gain knowledge</td>
<td>303</td>
<td>5.10</td>
<td>86.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>Team members are encouraged to share what they know with other members</td>
<td>303</td>
<td>5.12</td>
<td>91.0</td>
<td>0.7</td>
<td>1.18</td>
</tr>
</tbody>
</table>

The standard deviations and the standard errors of mean of each question under assimilation are significantly low relative to the mean. These results show that the sample size is representative of the population and can be used to make assumptions and generalisations regarding our population in this study.
Respondents were asked to indicate their perception of team work during the project. The rate of positive response to this statement (90.4%) showed significant levels of interaction among project team members. At the assimilative stage of a project, team work and collaboration enables the generation and sharing of knowledge. A breakdown of the level of positive response to this questionnaire item relating to project type, region, status and size is given in Figure 4.4 above.
### Question 12: Team members helped each other learn on the project

![Figure 4.5: Analysis of Q12](image)

About 92.15% of respondents indicated positively that project learning was collaborative. As could be seen from figure 4.5 above, 88 small projects, 117 medium projects and 74 large projects out of a total of 303 respondents indicated positively that team members helped each other learn on the project. On this item, 34% of completed projects and about 66% of ongoing projects indicated positively that there was learning among team members on the project. Perceptions were further broken down into regions and project type responses as could be seen from the figure above.

### Question 13: We held regular meetings to review work done, brainstorm and to correct mistakes.

Progress review meetings represent an avenue to share knowledge. Response to this item of the questionnaire stands at 90.4%. Responses indicate that review meetings are important in sharing knowledge and that problem solving and correction of mistakes is a significant aspect of these meetings. Gibbons (1994) postulated that knowledge creation takes place in
problem-solving scenarios of project. Review meetings and brainstorming sessions are made to help knowledge sharing and learning.

**Question 14:** *There were informal groups and communities within the project team*

Ninety percent (90%) of responses indicated the existence of informal groupings or communities within the project team during the life of the project. Informal peer to peer interaction in project teams represent an avenue to leverage project knowledge in DPs. The high level of positive response underscores the importance of group collaboration. Literature (Jashapara, 2003; Lave and Wenger, 1991; Brown and Duguid, 1991) support this response. Communities of practice exist within project management teams and these communities are important for the successful execution of projects because the present an avenue for team members to share, collaborate and draw motivation.

**Question 15:** *Team members are encouraged to communicate with outside projects to gain knowledge*

In this survey, about 86.8% of projects indicated that team members are encouraged to communicate with outside projects. This helps cross-fertilisation of ideas and sharing of knowledge. When team members are in contact with outside projects, opportunities for the exchange of knowledge might arise and this brings benefits for the project.

**Question 16:** *Team members are encouraged to share what they know with other members*

Encouraging knowledge sharing would go a long way in making team members to communicate and share with each other. In this survey, 91% of projects surveyed indicate that team members are encouraged to share what they know with other team members. Review meetings and informal person to person interaction may be one of the ways used to share knowledge.
4.1.4.3 Reproduction.

This sub-section discusses the responses on the model construct-reproduction. Table 4.7 presents the responses on this construct.

Table 4.7: Reproduction

<table>
<thead>
<tr>
<th>REPRODUCTION</th>
<th>Count</th>
<th>Mean</th>
<th>%</th>
<th>S.E Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge gained from group collaboration and discussions were critical to project execution</td>
<td>303</td>
<td>5.10</td>
<td>90.1</td>
<td>0.6</td>
<td>1.07</td>
</tr>
<tr>
<td>2. Innovative ideas spurned during team discussions were implemented</td>
<td>303</td>
<td>5.10</td>
<td>86.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>3. In my estimation our project created new knowledge during its lifecycle</td>
<td>303</td>
<td>5.28</td>
<td>92.4</td>
<td>0.4</td>
<td>0.71</td>
</tr>
<tr>
<td>4. Project leadership was very critical to its success</td>
<td>303</td>
<td>5.14</td>
<td>87.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>5. The team work on this project was adequate in helping project delivery</td>
<td>303</td>
<td>4.94</td>
<td>85.5</td>
<td>0.7</td>
<td>1.15</td>
</tr>
<tr>
<td>6. There was an issues management process which enabled project staff raise problems with management</td>
<td>303</td>
<td>4.66</td>
<td>87.5</td>
<td>0.7</td>
<td>1.18</td>
</tr>
<tr>
<td>7. We had a quality management procedure in place to ensure the project met standards</td>
<td>303</td>
<td>5.12</td>
<td>86.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>8. There was a work breakdown structure in place to ensure duties were assigned to competent staff</td>
<td>303</td>
<td>5.10</td>
<td>85.5</td>
<td>0.7</td>
<td>1.15</td>
</tr>
<tr>
<td>9. I would consider this project a success in the light of stated objectives and stakeholders views</td>
<td>303</td>
<td>5.10</td>
<td>87.8</td>
<td>0.6</td>
<td>1.07</td>
</tr>
<tr>
<td>10. The project also met the requirements of the clients and stakeholders</td>
<td>303</td>
<td>5.14</td>
<td>88.0</td>
<td>0.6</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Under reproductive knowledge, ten questions were used to gather information on the perceptions of project managers on the utilisation of knowledge at the implementation stage of the project. The results are outlined in the table above. The same principle using the standard error of mean and the standard deviation applies here and we can say confidently that the data gathered under this construct is representative of the population of this study.

**Question 17:** Knowledge gained from group collaboration and discussions were critical to project execution

The response on this questionnaire item is 90.1%. This reflects project managers' views on the reproduction of knowledge gained from discussions, meetings, collaborations, sharing and informal discussions. This includes reviews such as post project reviews, after action reviews and progress
meetings. Projects rely on person to person contact to share knowledge and information rather than stored information. Collaborative project work is gaining more prominence in project cycles due to its popularity in leveraging what projects know. Swan and Newell (2000) lends credence to the need for project workers to work collaboratively.

**Question 18:** Innovative ideas spurned during team discussions were implemented

This questionnaire item explores the likelihood of projects implementing knowledge created and shared among team members. The rate of agreement to this item is 86.8%. Projects are likely to implement ideas generated during discussions and project team meetings. As this is the case, it therefore follows that formal and informal discussions constitute a major avenue for sharing what projects know and projects do take these knowledge generated seriously.

**Question 19:** In my estimation our project created new knowledge during its lifecycle

Project managers realise that new knowledge has been created during the project. It is not easy to measure knowledge created during a project however, various factors can give an indication that new knowledge is being created. The knowledge available to the project at the beginning and the feeling of managers that the project has got more capabilities at the end of the project than it did at the beginning. Realisation of new knowledge has a variety of indicators: staff competence at the beginning of the project and their competence at the end; the level of awareness and rate of knowledge disseminated during the project; and how successful the stages of the project were. For this questionnaire item we have a positive response rate of 92.4%. This indicates a strong perception on the part of project managers that new knowledge was realised during the project. Gibbons (1994) work on knowledge creation supports the problem-solving nature of knowledge creation found in development project management.
**Question 20:** *Project leadership was very critical to its success*

At the implementation stage, project leadership is deemed very critical to its success. This is indicated in the positive response rate of 87.8%. Leadership is important at the reproduction stage of the project process. There is often the need to motivate the team, inspire, lead and direct with the aim of achieving project objectives. When good leadership is lacking there is a negative effect on the project outcome. Even within collaborative projects, leadership is still a critical success factor. Literature review identified leadership as an important determinant of project success and effectiveness (Gladstein, 1984; Hackman, 1987).

**Question 21:** *The team work on this project was adequate in helping project delivery*

The perception of projects on the adequacy of team work during the project was sought using this questionnaire item. About 85.5% of projects surveyed were positive that team work was adequate. This response rate is also on the high side. DP by their nature more often than not are team based and sometimes project teams have been working together for a number of years with minimal changes or staff turnover. Due to the level of integration and team cohesion, managers do have a high level of satisfaction with team work on the project. At the reproduction stage of a project, team work is very critical to the achievement of project objectives.

**Question 22:** *There was an issues management process which enabled project staff raise problems with management*

An issues log is one of the tools used to get feedback from project staff on problems or issues that need attention. This enhances decision making and ensures that mistakes are corrected frequently as the project goes on. In this survey, 87.5% had a process through which project staff could raise issues with management. This enables communication and helps build confidence. It enhances the process of project execution.
**Question 23:** We had a quality management procedure in place to ensure the project met standards.

About 86.8% of projects did have a quality management procedure through which they ensured that projects were meeting standards. Meeting standards stipulated by clients and the industry is part of project success. Quality cannot be compromised for faster completion times either. So projects who do have monitoring and evaluation criteria for measuring the quality of their products would have a greater capacity to successfully implement their projects.

**Question 24:** There was a work breakdown structure in place to ensure duties were assigned to competent staff

A system for assigning project duties to staff ensures that tasks and responsibilities were given to the right people within the project. This ensures that knowledge generated during the project is utilised by the right people. In this survey, about 85.5% positive response on the availability of a system for assigning tasks and responsibilities to project staff.

**Question 25:** I would consider this project a success in the light of stated objectives and stakeholders views

The success or failure of a project is dependent on various complex factors which include cost, completion time, quality and stakeholders requirements. It is assumed that project managers have a good knowledge of what success constitutes for the particular project they are working on. Each project has milestones and objectives on which project outcomes are measured. Positive response on this item is about 87.8%.

**Question 26:** The project also met the requirements of the clients and stakeholders.

About 88% of projects surveyed gave a positive response that their projects met the requirements of clients and stakeholders. Clients and stakeholders criteria or requirements often determine the direction of a project. Success on a project is also largely determined by meeting these requirements and objectives.
4.1.4.4 Codification

This sub-section discusses responses to the model construct-codification. Table 4.8 presents the responses to questions on the construct.

Table 4.8: Codification

<table>
<thead>
<tr>
<th>CODIFICATION</th>
<th>Count</th>
<th>Mean</th>
<th>%</th>
<th>S.E Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. The project was analysed at the end against stated objectives and stakeholders views</td>
<td>303</td>
<td>5.38</td>
<td>92.1</td>
<td>0.4</td>
<td>0.68</td>
</tr>
<tr>
<td>12. We had a system and process put into place to review projects</td>
<td>303</td>
<td>5.38</td>
<td>90.0</td>
<td>0.4</td>
<td>0.68</td>
</tr>
<tr>
<td>13. We maintain a repository/documentation/reports detailing activities from inception to conclusion</td>
<td>303</td>
<td>5.14</td>
<td>87.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>14. These reports are available for project members and interested parties</td>
<td>303</td>
<td>5.10</td>
<td>86.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>15. Staff who have been reassigned to other projects are available when issues about the project come up</td>
<td>303</td>
<td>5.14</td>
<td>87.0</td>
<td>0.6</td>
<td>1.11</td>
</tr>
</tbody>
</table>

The table above also shows the standard error of mean and the standard deviations around the mean. As have been discussed in the other tables, the values of the standard deviation and the standard error of mean are small relative to the value of the mean and therefore we can say our data is representative of the population.

**Question 27: The project was analysed at the end against stated objectives and stakeholders views**

Post project reviews are KM tools (Carrillo, 2005). They afford the project the opportunity for retrospection and for formalising tacit knowledge. The review process is often collaborative and teams try to review what worked or did not work during the project with a view of avoiding pitfalls in the future and also replicating success stories in future projects. About 92.1% of projects surveyed had review processes in place at the end of projects. Projects have been criticised for not making review processes a part of the project process. Merely reviewing a project at the end ensures that key knowledge gathered during the project is left uncaptured. Reviews undertaken at each phase of a project would ensure that key knowledge is captured and documented. Often
at the end of the project staff have forgotten the pain and other critical learning points and this is not good for the project.

**Question 28:** *We had a system and process put into place to review projects*

About 90% of projects surveyed indicated that they had a review process in place. This is expected due to the nature of DP. Funding agencies normally have a review process built-in with the funding process. This ensures that projects deliver their objectives and are also accountable. Furthermore, it ensures that there is an impact assessment of the projects deliverables especially among the beneficiaries. Seventy eight percent of projects are used to project appraisals at the end of the project cycle. Appraisals are often one of the things projects are well known for, however, one of the criticisms of project appraisal is that they concentrate on the tangible deliverables of cost, time and quality and ignore the intangibles like knowledge created, shared and stored.

**Question 29:** *We maintain a repository/documentation/reports detailing activities from inception to conclusion*

A good PM plan would ensure that information generated within or outside the project is captured and stored in accessible format. This survey sought the views of respondents on whether documentation, repositories and reports are maintained by projects throughout the lifetime of the project. The result was an 87.8% response. The majority of projects surveyed put in place information management plans and also stored information in repositories during and after the life of the project. Knowledge capture is critical to the sustainability of project practices. It is important for project learning. Projects that do not capture what has been learned during the life of the project would need to reinvent the wheel each time a similar project is commenced. The reason is because knowledge is regenerative and what has been reproduced previously need not be learnt again but improved upon.
**Question 30: These reports are available for project members and interested parties**

The availability of project reports and documentation is important for project staff members and other interested parties. The survey also sought the views of respondents on the availability of reports and documentation. About 86.8% of projects were positive that their reports are available for project members and other interested parties. This mirrors the openness in disseminating project documentation. The results here show that there is a high degree of democratisation of information within DPs. The information management competencies of a project are vital to reaping knowledge assets during the lifetime of the project. Inadequate access or restricted access to certain vital information may not work to the overall interest of the project as responsibilities, blame and buck-passing would begin to thrive. A pervasive knowledge sharing atmosphere would reduce mistrust and foster cooperation.

**Question 31: Staff who have been reassigned to other projects are available when issues about the project come up**

Access to people who have knowledge about a project is important from the knowledge sharing perspective. How this can happen may involve a variety of ways such as listing staff contact on the project website, or intranet, indexing each document and linking these to specific authors with full contacts. This could enable the sharing and exchange of information assuming issues arise regarding the project. About 87% of respondents were positive that their staff could easily be accessed after the end of projects.
4.1.4.5 Project Variables.

This section discusses the outcomes expected by this research for managing knowledge in development projects. Table 4.9 present the responses to these variables.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Variables</th>
<th>Count</th>
<th>Mean</th>
<th>%</th>
<th>S.E</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. The client is satisfied with the deliverables of the project</td>
<td>Project Success</td>
<td>303</td>
<td>4.99</td>
<td>83.5</td>
<td>0.7</td>
<td>1.17</td>
</tr>
<tr>
<td>17. The execution of the project was innovative in a number of areas</td>
<td>Innovation</td>
<td>303</td>
<td>4.88</td>
<td>77.3</td>
<td>0.7</td>
<td>1.30</td>
</tr>
<tr>
<td>18. There has been a process improvement as a result of the procedures adopted in this project</td>
<td>Operational Efficiency</td>
<td>303</td>
<td>5.23</td>
<td>89.8</td>
<td>0.6</td>
<td>0.98</td>
</tr>
<tr>
<td>19. In my opinion the project created new knowledge</td>
<td>New Knowledge</td>
<td>303</td>
<td>5.14</td>
<td>87.8</td>
<td>0.6</td>
<td>1.11</td>
</tr>
<tr>
<td>20. This project met the completion time agreed with the clients/stakeholders</td>
<td>Completion times</td>
<td>303</td>
<td>4.94</td>
<td>85.5</td>
<td>0.7</td>
<td>1.15</td>
</tr>
</tbody>
</table>

The above table shows the responses and perceptions of project managers on the five project outcomes/variables chosen by this research. As in previous tables, the standard errors of mean and the standard deviations are also indicative that the sample population is representative of the general population from which our sample is drawn.

**Question 32: The client is satisfied with the deliverables of the project (project success)**

This question measures the level of project outcome acceptability to the client. A project’s success or failure depends on the clients acceptance of the final product. If it was rejected, the project has been unsuccessful. Sometimes projects had to be redone or some specific aspects have to be reworked. This sometimes apply much more to construction, technology and information projects. Service based projects also do have areas which the client might request to be reworked. Client satisfaction is a major index of project success. On this survey, about 83.5% of respondents were positive that the clients were satisfied with the deliverables (outcomes) of the project.
**Question 33:** The execution of the project was innovative in a number of areas

Majority of respondents (77.3%) were positive that the project has innovative features in a number of areas. A project might not be entirely a new product development, however, new ways of executing the project might emerge during the project process. Small incremental improvements in the process and the product come about as a result of the contextualisation of knowledge created, shared and utilised. Rogers and Kim (1985) defined innovation in various ways, this included both incremental and radical. The sharing of knowledge is also regarded as facilitating innovation. Darroch and Mcnaughton (2002) empirically linked knowledge management and incremental and radical innovation.

**Question 34:** There has been a process improvement as a result of the procedures adopted in this project.

Process improvement deals with operational efficiency. Knowledge sharing in a project and communication, and efficient management would enhance process. This questionnaire item is aimed at measuring perceptions on operational efficiency (process improvement). About 89.8% of respondents witnessed an improvement in the way things are done during the course of the project. A lot of factors might contribute to operational efficiency. Knowledge sharing and communication are included. Effective flow of knowledge in a project would help improve the process. Operational efficiency also has to do with organisational capacity. It deals with the strengths and weaknesses of an organisation as they relate to the ability to execute projects.

At least 13% of respondents representing 41 projects out of 300 disagreed that their organisation had the capacity to execute the project. Given that the questionnaire process was confidential and online without any mechanisms of tracing respondents except if they were willing to give their names and email addresses, it is important that these views no matter how in the minority they are, should be considered. In total, 21% of respondents disagreed or had no opinion on whether their organisation had the capacity to execute the project. It is not often unheard of that project managers embarked on projects without
being totally convinced or having ownership of the project they are working on. Due to reasons that maybe, they feel the organisation is not yet ready to undertake such a project or the conditions are not right. Organisational project capacity has to do with project learning. What an organisation has learned over the years in project planning and execution is important in current projects. These experiences are often called up during a new project.

**Question 35: In my opinion the project created new knowledge**

Although the aim of a project is to deliver a product, one of the outcomes of a project is the creation of new knowledge. However, it is difficult to measure the level of new knowledge realised by a project, but project staff perceptions on new knowledge might lie in the area of whether they feel they have learnt new things significantly on the project and how confident they feel in carrying out the same type of project in the future. Positive response on this item was 87.8%. This questionnaire seeks the same information as Question 19. The reason behind this is to see the level of restatement of their perceptions. Response to Question 19 stood at 92.4% and Questionnaire 35 stands at 87.8% representing a 4.6% drop. This is not in anyway significant. So we can confidently state that projects are realising new knowledge during the project process. Gibbons (1994) work on knowledge production identified two types of knowledge production. Mode 1 is academic and research driven while mode 2 is problem-driven and multidisciplinary. The latter is mostly found among development projects. Nonaka and Takeuchi (1995) identified four distinct phases of knowledge creation; Internalisation, Socialisation, externalization and combination. Three of these phases (socialization, externalization and combination) involve social interaction among project members. (Chua, 2002) identified the structural dimension of knowledge creation, the relational dimension and the cognitive dimension. The relational and cognitive dimension relate mostly to project activity.
Question 36: This project met the completion time agreed with the clients/stakeholders

The perception of projects on whether completion times targeted were met was measured by this item. About 85.5% of projects were positive that completion times were met. What this survey did not try to get information on was how many times the client had extended the completion times of the project. A completion time does have various meanings. Respondents might be giving information on the new completion times agreed and met. Information was not sought on whether the project had an extension and for how long. Most often, projects do overrun their time. If projects overrun and new completion times were agreed with clients, then projects can claim they met their completion times. However, within the PM mechanism there is a provision for some extension not exceeding 30% overrun. This research is not concerned with measuring how long a project is extended for and how late it is running. This might be the subject of another research. The researcher is interested in determining if knowledge sharing affects completion times of projects.

The next section discusses the reliability of the model constructs on which the questionnaire survey is based.

4.2 Reliability of constructs

The CRAI model is built around four constructs and these constructs do have questionnaire items built around them as indicated in an earlier section. For ease of analysis, the various questions of each construct are integrated using the SPSS merge function and compute. SPSS computes and merges the ten questionnaire items under interpretation into a single construct (Interpretation) and the six items under assimilation were merged into a single construct (Assimilation). The ten items under reproduction were merged with the compute function of SPSS into a single construct (Reproduction) and the five items under codification were also merged into a single construct (Codification). At the end specific items are brought under the four constructs of the CRAI model. This focuses the analysis on the four constructs—interpretation, assimilation, reproduction and codification. Furthermore, it
enables the research to test reliability, correlation, regression, hypotheses and other issues associated with the data. This gave the result as outlined in table 4.10.

**Reliability:** A measurement is said to be reliable having reflected a mostly true score, relative to the error. The validity of the data gathered in a study is tested through reliability analysis. This enables the researcher to make conclusions with confidence given the level of reliability of the data.

The questionnaire items on Interpretation (10 items), Assimilation (6 items), Reproduction (10 items), Codification (5 items), were tested for reliability using SPSS Scale (reliability analysis function). The measurement criteria selected is the Cronbach's Alpha which measures internal consistency. The items under each construct were entered into the SPSS scale (reliability analysis function) and computed for Cronbach's Alpha. The result is shown in table 4.10.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Count</th>
<th>Mean Statistic</th>
<th>Std Error of Mean</th>
<th>Standard Deviation</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERPRETATION</td>
<td>303</td>
<td>19.2772</td>
<td>.18030</td>
<td>3.13848</td>
<td>0.628</td>
</tr>
<tr>
<td>ASSIMILATION</td>
<td>303</td>
<td>20.3036</td>
<td>.13979</td>
<td>2.43326</td>
<td>0.816</td>
</tr>
<tr>
<td>REPRODUCTION</td>
<td>303</td>
<td>24.5182</td>
<td>.16797</td>
<td>2.92378</td>
<td>0.719</td>
</tr>
<tr>
<td>CODIFICATION</td>
<td>303</td>
<td>19.8614</td>
<td>.14135</td>
<td>2.46040</td>
<td>0.731</td>
</tr>
</tbody>
</table>

Interpretation has a reliability of 0.628 alpha, assimilation has 0.816, reproduction has 0.719 while codification has 0.731. Interpretation has the lowest alpha score, however Robinson, Sharer and Wrightsman (1991) reported that data with 0.6 alpha is reliable for initial studies which is developmental. This study is at its developmental stages and the data with 0.628 reliability is therefore acceptable at this stage. These results are high and indicate that the constructs measure the population they are meant to measure.

Given the degree of reliability of the variables and their relationship to each other, the researcher would now proceed to analyse the data gathered from
the questionnaire using correlation, regression analysis, and general analysis of themes of the study.

4.3 Correlation Analysis
This section analyses and discusses the data using correlation analysis.

4.3.1 The model
This subsection correlates the model constructs with each other. Table 4.11 presents the results of the model correlation.

<table>
<thead>
<tr>
<th>Items</th>
<th>Correlations</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>Assimilation</td>
<td>.071</td>
</tr>
<tr>
<td>Interpretation</td>
<td>Reproduction</td>
<td>.114</td>
</tr>
<tr>
<td>Interpretation</td>
<td>Codification</td>
<td>.307</td>
</tr>
<tr>
<td>Assimilation</td>
<td>Reproduction</td>
<td>.248</td>
</tr>
<tr>
<td>Assimilation</td>
<td>Codification</td>
<td>.314</td>
</tr>
<tr>
<td>Codification</td>
<td>Reproduction</td>
<td>.428</td>
</tr>
</tbody>
</table>

The CRAI model elements were correlated against each other and the results are shown in the table above. Interpretation proves to have a positive relationship with assimilation but not a significant relationship. However, interpretation does have a positive and significant relationship with reproduction and coding. What this result might mean is that the initial project processes at commencement which involve recruiting project staff, their qualifications and experience have no direct or linear relationship with assimilation-the way project teams form cohesion and lead their productive activities although they may contribute indirectly to enhancing the building of relationships which are the basics for knowledge sharing. The knowledge inherent in the project group as a component unit is directly responsible for the successful execution of any project.

Interpretation takes a positive and significant relationship with reproduction and codification. The answer may lie in the fact that the technical competence necessary for executing projects lies in the experience, technical qualifications and training of staff, however these qualities and skills once they are acted upon and influenced by the community actions that assimilation provide at that
project stage, become refined and focused on the project thus helping to reproduce the project specifications at the implementation level. Secondly, the interpretation level of PM would play a significant role in codification-project winding up because the processes required for winding up a project are stipulated at the commencement stage (Interpretation). Because these may be clearly spelt out at the beginning, it is no wonder that interpretation has a positive relationship with codification.

Of the four elements of the model, the likely most unpredictable element would be assimilation because this involves people. The people element of KM and PM have often been unpredictable in some ways due to the fluid nature of relationships. At the assimilation stage, relationships are built, communities and networks are active and knowledge sharing takes place. These processes involve both formal and informal interaction. However, the building of communities cannot be said to be predicated on any previous foundation like interpretation, though it would help to give communities a head start during the project but the way project communities of practice form and interact has no bearing on interpretation or simply put the qualifications, training and competencies of the project staff or manager.

Assimilation is positively and significantly correlated to reproduction. The reason for this is that there is a direct bearing on project execution arising from project team interaction both formal and informal. These community interactions are part of the actual project implementation (Reproduction). The knowledge created, shared and refined within the project team at the interaction stage is often implemented during the execution of the project and so it is often necessary that knowledge is not just created and shared but also applied in the context of the project objectives aligned to the stakeholders requirements to meet the benchmarks of time, cost and quality. The objectives of KM is to create an environment where knowledge created and shared within teams are translated into product reality. There is a positive but insignificant relationship between assimilation and codification. The reasons for these are obvious. The processes that bring about knowledge creation and utilisation in a project team have little or no role to play in how these
knowledge are stored, accounted for and carried over for future use. Evidently, the data gathered may be explaining the often noted point in the literature that most projects upon completion do not pay attention to the necessities of documenting, storing and reusing project knowledge. It is also a difficult venture harvesting the tacit knowledge of staff who have worked on the project and once the project is completed, staff is dispersed and considerable and invaluable knowledge is lost. What this result is suggesting is that knowledge creation and use processes in a project also need to be aligned towards knowledge reuse processes which are more active in the codification stage of the project. It is important that knowledge creation and use strategies within a project take into consideration how the life of such knowledge could be extended beyond the life of the project and readily made available at the inception of a similar or related project.

Sections 4.4.3 up until 4.4.7 deal with correlating the model and the project outcomes. The four model constructs are combined together using the SPSS merge function (compute). They were combined into a single construct and then correlated with the five project outcomes mentioned in the hypothesis of this research "knowledge management in development projects is positively related to innovation, project completion times, project success, operational efficiency and the rate of new knowledge generated". Table 4.12 below shows the results of the correlation.

<table>
<thead>
<tr>
<th>Items</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Innovation</td>
<td>.513</td>
<td>.000</td>
</tr>
<tr>
<td>Model Operational efficiency</td>
<td>.400</td>
<td>.000</td>
</tr>
<tr>
<td>Model Completion times</td>
<td>.443</td>
<td>.000</td>
</tr>
<tr>
<td>Model Knowledge creation</td>
<td>.516</td>
<td>.000</td>
</tr>
<tr>
<td>Model Knowledge sharing</td>
<td>.650</td>
<td>.000</td>
</tr>
<tr>
<td>Innovation Knowledge sharing</td>
<td>.209</td>
<td>.000</td>
</tr>
<tr>
<td>Project success Knowledge sharing</td>
<td>.172</td>
<td>.003</td>
</tr>
<tr>
<td>Model Project success</td>
<td>.889</td>
<td>.000</td>
</tr>
</tbody>
</table>
4.3.2 The model and innovation
Correlating the model and innovation produced a result of .513 which is highly positive and a significance of 0.000 indicating that our model is related to innovation in DPs. This result supports our hypothesis that KM in DP is positively related to innovation.

4.3.3 The model and efficiency
A correlation of the model and efficiency gave the result of .400 and a significance of 0.000. This result supports our hypothesis that KM in DP is positively related to operational efficiency.

4.3.4 The model and completion time
A correlation of the model and completion time gives the result of .443 and a significance of 0.000. Completion time is one of the critical project success factors. It is a major benchmark for measuring project success, though literature has argued that completion times are very relative to project success and cannot be overemphasised as an indices for measuring success. However, literature searched in the course of this research gives very important consideration to completion time as a major factor in measuring the success or failure of a project but acknowledge that completion time varies. The results of the correlation relating to the model and completion times supports the hypothesis of this research.

4.3.5 The model and knowledge creation
The model has a positive relationship (.516) with knowledge creation and a significance of 0.000. Projects must create and utilise knowledge to be able to stay in business. Knowledge creation is a function of project knowledge base, staff willingness to contribute to knowledge, existence of communities of practice and networks in a project, leadership, senior management encouragement, technology, culture, strategy and people in the organisation. Creation of new knowledge must be tied to critical processes within the project to be able to make meaningful contributions to project success. The correlation results support the hypothesis of this research.
4.3.6 The model and project success

Various researchers have suggested alternative metrics to those of the iron triangle (Cost, Time and Quality) for determining project success; cost, time and quality do not go far enough in measuring success. Success is a subjective concept and unless defined by all stakeholders of a project before any undertaking, its definition may be subject to dispute when attempting to assess project results. The questionnaire item which recorded project managers' perception about project success was correlated with the CRAI model and the results are .889 and a significance of 0.000. This indicates a relationship between the model and project success. Does the CRAI model facilitate project success? This may depend on the project conditions and environment where it is applied, however, our current investigation shows that the CRAI model is positively related to project success and is worth further investigation. In section 4.5 a further analysis of the relationship between the CRAI model, project success, innovation, completion times, operational efficiency and generation of new knowledge was done using regression. The outcome is worth investigating.
4.4 Analysing the hypothesis using regression analysis

This section analyses the hypotheses using regression analysis.

4.4.1 Multiple regression

Table 4.13 below presents the results of a multiple regression on the variables expressed in the hypothesis.

<table>
<thead>
<tr>
<th>Variables</th>
<th>R</th>
<th>R Square</th>
<th>Adj. R Square</th>
<th>Mean Sq.</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>F Statistic</th>
<th>Sig. Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Success</td>
<td>.609</td>
<td>.370</td>
<td>.362</td>
<td>38.517</td>
<td>.7142</td>
<td>.9375</td>
<td>43.823</td>
<td>.000</td>
</tr>
<tr>
<td>Innovation</td>
<td>.585</td>
<td>.342</td>
<td>.334</td>
<td>43.388</td>
<td>.7580</td>
<td>1.057</td>
<td>38.780</td>
<td>.000</td>
</tr>
<tr>
<td>Completion Times</td>
<td>.561</td>
<td>.314</td>
<td>.305</td>
<td>31.435</td>
<td>.6452</td>
<td>.9590</td>
<td>34.179</td>
<td>.000</td>
</tr>
<tr>
<td>Operational Efficiency</td>
<td>.495</td>
<td>.245</td>
<td>.234</td>
<td>17.692</td>
<td>.4840</td>
<td>.8563</td>
<td>24.127</td>
<td>.000</td>
</tr>
<tr>
<td>New Knowledge</td>
<td>.560</td>
<td>.313</td>
<td>.304</td>
<td>29.237</td>
<td>.6222</td>
<td>.9277</td>
<td>33.966</td>
<td>.000</td>
</tr>
</tbody>
</table>

The hypothesis of this research is “KM in DP (The CRAI Model) is positively related to Innovation, project completion times, project success, operational efficiency and the rate of new knowledge generated (Project Outcomes)”. This section of the data analysis would look into this assumption to prove if KM is linked with these project outcomes.

The regression analysis is used to attempt to measure the level of relationship between the model and the outcomes. The elements of the model used in the regression analysis include Interpretation, Assimilation, Reproduction and Coding. The independent variables are project success, innovation, completion times, operational efficiency, and generation of new knowledge. The variables in the regression are represented in this typical equation

\[ Y = b_1X_1 + b_2X_2 + ... + A \]

\( Y \) is the dependent variable we are trying to predict, \( X_1, X_2 \) and so on are the independent variables we are using to predict it, \( b_1, b_2 \) and so on are the coefficients or multipliers that describe the size of the effect the independent
variables are having on the dependent variable $Y$, and $A$ is the value $Y$ is predicted to have when all the independent variables are equal to zero.

A multiple regression of the four independent variables of the CRAI model (Interpretation, Assimilation, Reproduction and Codification) was carried out on each project outcome (Project success, Innovation, Completion times, Operational Efficiency and New Knowledge). These variables have earlier been correlated with the model in the previous section and they have varying degrees of positive correlation with the model elements. The multiple regression is carried out to examine the output to see if a combination of the variables contribute substantially to the model's ability to predict the outcomes. The R Square column above gives us an indication of how much of the variability in the outcome is accounted for by the predictors. For the first model its value is 0.370 which means that the Model accounts for 37% of the variation in project success. In the same vein, the second model has an R Square value of .342 which means that the model accounts for 34.2% of the variation in Innovation. The results of the other models are also outlined in the table above. The general idea here is that the conceptual model in this population sample accounts for 37% of project success, 34.2% of innovation, 31.4% of completion times, 24.5% of operational efficiency and 31.3% of new knowledge. These figures are significant for the management of DPs. If for example, applying KM practices in DPs could account for 37% of factors that help with project success, this is a significant leap. Ideally, the researcher would like to explain most if not all of the original variability. However, care should be taken in considering these results as practical in every situation. The results are still in a preliminary stage of development as this is an initial research. They need to be confirmed with further researches.

The column showing the significance of the results all have 0.000 for all the models computed. Our significance threshold for this research is 0.05 (5%). It is assumed that there is linearity in the relationships between the variables and that the data is normally distributed. Overall, the most important value we are looking at is the P value of the whole regression model and the P value of the variables in the model. The P value of the regression model is 0.000 which
strongly indicates a significant relationship between the dependent variable and the independent variables.

The Durbin-Watson statistic helps to test for correlations between errors. One of the assumptions of regression was that the residuals are independent. The Durbin-Watson statistic helps to test whether the assumption of independent errors is tenable. The Durbin-Watson statistic for all the variables in the table above are all below 2 and greater than 1. These values are not different enough from 2 to cause concern. I can therefore uphold the assumption of independent errors as tenable.

4.4.2 Stepwise multiple regression: project success

The previous section has linked the CRAI model with the project outcomes formulated by this research. In this section, the analysis focuses on explaining the percentages of variations in the individual outcomes that could be explained by each construct of the CRAI model. A multiple regression of the model elements was carried out to find out the effect of each independent variable on project success. The results are outlined in table 4.14 below:

Table 4.14: Multiple regression: project success

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.349</td>
<td>.345</td>
<td>.349</td>
<td>80.467</td>
<td>2</td>
<td>300</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.362</td>
<td>.355</td>
<td>.012</td>
<td>5.816</td>
<td>1</td>
<td>299</td>
<td>.016</td>
</tr>
<tr>
<td>3</td>
<td>.370</td>
<td>.362</td>
<td>.009</td>
<td>4.167</td>
<td>1</td>
<td>298</td>
<td>.042</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), INTERP, ASSIM
b Predictors: (Constant), INTERP, ASSIM, REPROD
c Predictors: (Constant), INTERP, ASSIM, REPROD, CODING
d Dependent Variable: Project success.

In the hierarchical multiple regression, Interpretation and Assimilation were entered in the first step and explained about 34.9% of the variance in project success (F2,300= 80.467, p <0.05), each explaining a similar proportion of the variance. The partial regression coefficients were statistically significant for
Assimilation \((B=0.285, t=12.654, p<0.05)\) and insignificant for Interpretation \((B=0.05, t=0.001, p>0.05)\). Reproduction was entered second and explained a further 1.2\% \((F_{1,299}=5.816, p<0.05)\) of the variance. Codification was entered third and explained another 0.9\% \((F_{1,298}=4.167, p<0.05)\) of the variance. Interpretation and Assimilation explained most of the variance in project success while reproduction and codification explained smaller parts of the variance in project success. The F ratio in the model summary explains whether the increment in the proportion of the variance that is explained by all the predictors in that step is statistically significant. The Durbin-Watson statistic of 1.780 upholds the assumption that the variables are independent.

4.4.3 Stepwise multiple regression: innovation

Similarly, like in the last section, the model constructs are regressed with innovation to understand what proportion of the variance in innovation are explained by the constructs when entered into the regression analysis in a certain order and whether these proportions are significantly greater than would be expected by chance. Using multiple regression we seek to understand the proportion of the variability of innovation that can be explained by each construct of the model.

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Change Statistics</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.114</td>
<td>.108</td>
<td>.114</td>
<td>19.350</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>.314</td>
<td>.307</td>
<td>.200</td>
<td>86.979</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>.342</td>
<td>.334</td>
<td>.028</td>
<td>12.904</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Predictors: (Constant), ASSIM, INTERP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Predictors: (Constant), ASSIM, INTERP, REPROD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Predictors: (Constant), ASSIM, INTERP, REPROD, CODING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Dependent Variable: Innovation.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the hierarchical multiple regression, Interpretation and Assimilation were entered in the first step and explained about 11.4\% of the variation in innovation \((F_{2,300}= 86.979, p <0.05)\), each explaining a similar proportion of
the variance. Reproduction was entered second and explained 20% \((F_{1,299}=86.98, p<0.05)\) of the variation. Codification was entered third and explained another 2.8% \((F_{1,298}=12.9, p<0.05)\) of the variation.

**Conclusions:** From the statistical results of the multiple regression, the proportion of innovation that is explained by interpretation processes is much less when these other factors are taken into account. The results of the regression also show that reproduction has the biggest effect on innovation, followed by assimilation. This result is anticipated by this research. First, at the point of implementation of a project is when innovative capabilities of the project team are put to task more than at any other stage of the project. The reproductive knowledge of a project is that knowledge aimed at implementation. It therefore follows that the insight gained from interaction, sharing knowledge within communities, social capital, networking, collaboration and other knowledge activities in a project combine to help project staff render a project innovatively. The views of Lesser (2000), Bourdieu, (1985) and Brown and Duguid (1991) support this result. Codified knowledge has the least effect on innovation when combined with other factors as could be seen from the results above.

### 4.4.4 Stepwise multiple regression: completion times

This subsection discusses the stepwise multiple regression of the model constructs and the variable “completion times”. Table 4.16 presents the results.

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.089</td>
<td>14.709</td>
<td>2</td>
<td>300</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.252</td>
<td>65.108</td>
<td>1</td>
<td>299</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>.314</td>
<td>27.104</td>
<td>1</td>
<td>298</td>
<td>.000</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), ASSIM, INTERP  
b Predictors: (Constant), ASSIM, INTERP, REPROD  
c Predictors: (Constant), ASSIM, INTERP, REPROD, CODING  
d Dependent Variable: Completion times
In a hierarchical stepwise regression Assimilation and Interpretation were entered in the first step and explained about 8.9% of the variation in completion times ($F_{2,300}=14.71, p<0.05$) each explaining a similar proportion of the variation. Reproduction was entered in the second step and explained 16.3% of the variation ($F_{1,299}=65.11, p<0.05$) and Codification was entered last and explained about 6.2% of the variation in completion times ($F_{1,298}=27.11, p<0.05$). All the constructs had a significant relationship with completion times. However, the effect of each variable differs.

**Conclusions:** Overall, the model constructs in a stepwise multiple regression explains about 31.4% of the variation in completion times. Reproductive knowledge has the most effect on completion times. Again this is anticipated given that project implementation is the core of a development project. In the model here, the planning and knowledge sharing activities that go with the project account for 8.9% of the rate of completion times of the project. Furthermore, reproductive knowledge (team formation, communities of practice, networking, informal interaction, technology and other cultural elements of a knowledge system) accounts for 16.35% of the variation in completion times. This reinforces the idea that projects need to pay closer attention to the knowledge processes that enable actual implementation. Ideally I would like to explain most if not all of the variation in completion times. Codified knowledge plays a significant role in completion times going from the results here. It accounted for 6.2% of completion times. This study assumes that all the knowledge processes could run concurrently in a project. However, it identifies various stages of the CRAI model in a development project as has been proposed in this study. Knowledge could be captured and codified at any stage of the knowledge process of the model. However, at the end of each project the combined knowledge produced during the project is codified. Codified knowledge during or after the project is playing a part here in completion times. This reinforces the need for the capture and codification of project knowledge at various stages of the project to enable teams have vital knowledge to implement projects on time.
4.4.5 Stepwise multiple regression: operational efficiency

Assimilation and Interprétation were entered first in a stepwise multiple regression and explained 24% (F2, 300=47.41, p<0.05) of the variation in operational efficiency in DPs. The variables reproduction and coding have statistically insignificant effects on operational efficiency when combined with other factors in the stepwise multiple regression.

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square</th>
<th>Change Statistics</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>R Square Change</td>
<td>F Change</td>
</tr>
<tr>
<td>1</td>
<td>.240</td>
<td>.240</td>
<td>47.404</td>
</tr>
<tr>
<td>2</td>
<td>.244</td>
<td>.004</td>
<td>1.640</td>
</tr>
<tr>
<td>3</td>
<td>.245</td>
<td>.000</td>
<td>.136</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), ASSIM, INTERP  
b Predictors: (Constant), ASSIM, INTERP, REPROD  
c Predictors: (Constant), ASSIM, INTERP, REPROD, CODING  
d Dependent Variable: Operational Efficiency

Conclusions: The variables Assimilation and Interpretation are the most important factors in operational efficiency of a development project. Initial project planning, preparations and development would take into consideration operational processes of a project. Teams and communities of practice within a project all contribute to the effective running of a project. The reproduction stage is the stage of execution of the project and might have little to do with how efficient the project operates. The planning and team building stage sets the tone for project efficiency. The results of the stepwise regression supports this view. The codification might have little to do with the immediate project apart from contributing knowledge to future projects. A look at the table above shows the codification stage accounts for 0% of the variability in operational efficiency. The reproduction stage accounts for 0.04% of the variability in operational efficiency. These results show that the core processes that contribute effectively to enabling projects to operate efficiently are interpretation (interpretative knowledge) and assimilation (assimilative knowledge).
4.4.6 Stepwise multiple regression: generation of new knowledge

In a stepwise multiple regression, Assimilation and Interpretation were entered first to test the degree of effect they have on the variability of the generation of new knowledge in a development project. Both variables explained 0.03% of the new knowledge in DPs when combined with other factors. Reproduction was entered second and it explained 14.5% (F1, 299=51.08, p<0.05) of the variability observed in generation of new knowledge in DPs. Codification was entered last and it explained 16.5% (F1, 298=71.42, p<0.05) of the variability observed in generation of new knowledge.

Table 4.18: Multiple regression: Generation of new knowledge

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square</th>
<th>Change Statistics</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>R Square Change</td>
<td>F Change</td>
</tr>
<tr>
<td>1</td>
<td>.003</td>
<td>.003</td>
<td>.461</td>
</tr>
<tr>
<td>2</td>
<td>.149</td>
<td>.145</td>
<td>51.082</td>
</tr>
<tr>
<td>3</td>
<td>.313</td>
<td>.165</td>
<td>71.422</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), ASSIM, INTERP
b Predictors: (Constant), ASSIM, INTERP, REPROD
c Predictors: (Constant), ASSIM, INTERP, REPROD, CODING
d Dependent Variable: New knowledge

Conclusions: Assimilative knowledge and interpretative knowledge have little effect on the generation of new knowledge when combined with other factors in a development project such as reproductive knowledge and codified knowledge. The implications of this finding does not minimise the importance of interpretative knowledge or assimilative knowledge. Neither does it say categorically that new knowledge is not generated during the first two processes of the CRAI model. However, what the result implies is that new knowledge is at its peak at the reproductive and codification stage of a development project. At this stage the knowledge created and shared is used to reproduce a product. In implementing a project, knowledge could be combined, improved upon, and could emerge in new and innovative ways. A KM programme may realise new knowledge in the project at the implementation stage. This new knowledge is then codified at the evaluation stage. Post project reviews are an attempt to realise knowledge from what has happened in the project. Most reviews happen at the end of the project and
this is done to harvest new knowledge. This is why codification explains much of the variation in new knowledge.

4.4.7 Conclusion
This section has dealt with a general regression and stepwise multiple regression of the CRAI model elements and the project outcomes of project success, innovation, generation of new knowledge, completion times and operational efficiency. The objective was twofold. One, the effects of the predicting variables of the model on dependent variables to determine how each predictor accounts for the variability in the dependent variables was tested. Secondly, the stepwise multiple regression enabled the research to also prove further the hypothesis of this research (KM in DP is positively related to innovation, project success, completion times, operational efficiency and generation of new knowledge). The next section will examine the use of plots and charts to interpret relationships between variables in the model.
The plots above determine whether interpretation has a significant effect on assimilation with respect to both location and variation. Interpretation is the factor of interest here. The focus is on whether interpretation has an effect on assimilation. No 24 is the highest point of interpretation matched to a 22 for assimilation. The box plot is an important tool for determining if a factor has a significant effect on the response with respect to either location or variation. In this case, a look at the four charts would reveal a weak relationship between both variables. Interpretation is not a very strong factor to assimilation.
Previously it was said that the rate or level of interpretation of project documentation, qualification of staff and project capacity are not too relevant in determining how teams would be formed, the level of team cohesion and the rate of knowledge sharing during the life of the project. So assimilation is not entirely dependent on interpretation but a number of other factors come into play. The scatter plot shows a fairly scattered and non-linear relationship between both variables.

What this result entails for project team building is that the initial processes of signing documentation, staff recruitment, project design, information management strategies, human resource management standards, procurement plans, implementation plans, client project briefs and other processes that begin the project may not alone influence the level of knowledge that would be shared or assimilated during the project life-cycle but may depend on the combination of other factors. The reasons why individual project members would decide to share knowledge and participate in communities and assimilate knowledge has not been well understood. However, recent studies have shown that motivation is a key factor in sharing knowledge. Knowledge doesn’t flow easily even when a project makes a concerted effort (Szulanski, 1996; Ciborra and Patriota, 1998; De Long and Fehey, 2000).
The plots above indicate a relationship between codification and reproduction. The plots indicate that reproduction as a factor contributes to the response of coding relative to location and variation. The highest point of the Box plot for reproduction is 30 while that of codification is 23. The scatter plot shows a linear relationship fairly spread between the two variables and the probability plot also indicate a linear relationship. The relationship between reproduction and codification in the correlation tables is .428 with a significance of 0.000. Both variables have the strongest correlation in the model. The plots here help to further the understanding of the spread of data, strength of relationships.

Figure 4.7: Codification and reproduction
and the nature or significance of the data dealt with. The following conclusions can be made based on the findings above:

(1) The success or failure of the project is a significant factor in the carryover of knowledge into future projects. Project managers may be reluctant to share knowledge on the reasons why a project failed especially if career advancement is tied to the success or failure of a project. This singular factor is responsible for suppressing information, hoarding and most probably going ahead with a project even when all indications point to a possible failure. When project outcomes are tied to career progress, other incentives should be used to encourage project managers and staff to share knowledge about a project regardless of the outcome of the project (failure or success). Project knowledge is very vital for future sustainability of project capacity.

(2) Knowledge available to projects is tied to the conditions that created it. The reproduction, replication or execution of a project to specification right from the start to the end of the process creates a whole lot of information and knowledge which need to be captured and made explicit.

(3) The rate of knowledge created, shared and disseminated during the life of a project would affect the rate of knowledge codified and made available for similar projects in the future. This point demonstrates the urgent need for projects to manage knowledge efficiently.
4.6 Analysis of research objectives

This section analyses the results of this research in the light of the objectives of the research articulated at the beginning of the research. The objectives of this research are analysed as below:

4.6.1 Objective 1

To investigate the KM practices of DP.

As one of the objectives of this research, the KM practices of DP was explored. The KM practices of DP is explored here using the four KM dimensions of people, culture, strategy and technology.

People: Going from the responses from the questionnaire items, the people aspect of KM in DP appears to be robust. Several questionnaire items explored such people dimensions such as communities of practice. The table below brings out the questionnaire items and their results:

Table 4.19: Analysis of KM practices: People

<table>
<thead>
<tr>
<th>Item</th>
<th>KM Concept</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was a lot of team work during the project</td>
<td>Team work</td>
<td>90.4</td>
</tr>
<tr>
<td>Team members helped each other learn on the project and newcomers especially were able to learn from others on the job.</td>
<td>Learning</td>
<td>92.1</td>
</tr>
<tr>
<td>We held/hold regular progress meetings to review work done, brainstorm and to correct mistakes and also plan ahead for the project.</td>
<td>Collaboration/Face to face meetings</td>
<td>90.4</td>
</tr>
<tr>
<td>There was the presence of informal groups/communities within the project.</td>
<td>Communities of Practice</td>
<td>90</td>
</tr>
<tr>
<td>Team members are also allowed and encouraged to communicate with other similar external projects to gain knowledge.</td>
<td>Communication/Boundary crossing</td>
<td>86.8</td>
</tr>
<tr>
<td>Project team members are encouraged to share what they know and there are technologies that encourage them to document and share (please also complete the KM technologies section).</td>
<td>Knowledge sharing and online collaboration</td>
<td>91</td>
</tr>
<tr>
<td>The project leadership was very critical to its success</td>
<td>Leadership</td>
<td>87.8</td>
</tr>
<tr>
<td>The project was analysed at the end against stated objectives and stakeholders views.</td>
<td>Review</td>
<td>92.1</td>
</tr>
</tbody>
</table>
Based on the results of this survey, DPs have KM practices based on the people dimension.

Table 4.20 presents information on the KM practices of development projects from the culture dimension.

<table>
<thead>
<tr>
<th>Item</th>
<th>KM Concept</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We also conduct feasibility studies at the commencement of the project.</td>
<td>Feasibility studies</td>
<td>84.5%</td>
</tr>
<tr>
<td>Change management is a factor in our project planning</td>
<td>Change management</td>
<td>73.6%</td>
</tr>
<tr>
<td>We had a quality management procedure in place to ensure the project adhered to accepted standards.</td>
<td>Quality management</td>
<td>86.8%</td>
</tr>
<tr>
<td>Staff who have been reassigned to other projects could also be reached when questions regarding the project come up.</td>
<td>Networking</td>
<td>87%</td>
</tr>
<tr>
<td>Best practices are a very important aspect of our project considerations</td>
<td>Best practices</td>
<td>89.1%</td>
</tr>
<tr>
<td>We consider a KM process at the initial stage of the project</td>
<td>KM planning</td>
<td>87.5%</td>
</tr>
</tbody>
</table>

The questionnaire items above were used to explore the culture aspect of KM practices within DP. The cultural aspect of KM are those entrenched practices which tend to become a way of doing things within the project organisation and regardless of the kind of project, these practices would be present. These practices are related to the way a project organisation carries out its project activities. They usually evolve over the years to become standard practice for organisations.

**Technology:** Development projects have KM practices relating to technology. They also deploy several technologies to support project management processes. Section 4.8 dealt with the technology practices and tools of development projects.

**Strategy:** Section 4.7.2 deals with the second research objective which has to do with KM strategies of DP, so the researcher refers to this section as it covers what should have been treated here.
4.6.2 Objective 2

To find out whether DPs adopt KM-based approaches in their project planning and practices

<table>
<thead>
<tr>
<th>Item</th>
<th>KM Concept</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We had information management plans put into place at the beginning</td>
<td>IM strategy</td>
<td>92.1</td>
</tr>
<tr>
<td>of the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>We defined what constitutes success at the beginning of the project</td>
<td>Clear</td>
<td>86.8</td>
</tr>
<tr>
<td></td>
<td>deliverables/outcomes</td>
<td></td>
</tr>
<tr>
<td>Change management is a factor in our project planning</td>
<td>Change management</td>
<td>73.6%</td>
</tr>
<tr>
<td>We had a quality management procedure in place to ensure the project</td>
<td>Quality management</td>
<td>86.8</td>
</tr>
<tr>
<td>adhered to accepted standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project was analysed at the end against stated objectives and</td>
<td>Review</td>
<td>92.1</td>
</tr>
<tr>
<td>stakeholders views.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There was a work breakdown structure in place to ensure duties were</td>
<td>Work Breakdown Structure</td>
<td>85.5</td>
</tr>
<tr>
<td>assigned to competent staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the results above, this research has determined that DPs adopt KM strategies. How far-reaching these strategies are in individual project's scenarios are not tested here. The nomenclature for KM strategy may differ from project to project but the terms used by this research are common across the PM field.

4.6.3 Objective 3

To determine whether these KM practices in DPs contribute to: innovation, timely completion, project success, operational efficiency and generation of new knowledge

The hypothesis of this research states that "KM in DPs is positively related to innovation, completion times, project success, operational efficiency and generation of new knowledge". The hypothesis has been tested and proved to have a positive relationship with the project outcomes in section 4.5. The data analysis went on further to test the degree of each variable that the KM model could explain in the regression model as outlined in the subsequent sections under section 4.5. The conclusion is that KM in DP has been linked to
innovation, timely completion, project success, operational efficiency and generation of new knowledge.

4.6.4 Objective 4

*To recommend ways in which the KM practices of DPs could be improved if they are inadequate*

A number of recommendations (This includes perspectives from the survey and case studies) that could improve the KM practices of DPs have been itemised and explained in Chapter 6, section 6.3.

The next section discusses the KM tools and technologies used by development projects.

### 4.7 Technology use in development projects

A variety of KM tools are applied across projects to facilitate knowledge sharing. Responses with regard to KM tools gravitated towards the traditional seven knowledge sharing tools however, responding projects were allowed space in the questionnaire to indicate other KM tools in use in the project in case they have been missed out. Attempting to list and describe the KM tools in the market would be an onerous task due to the proliferation of technology.

#### KM tools classification

<table>
<thead>
<tr>
<th>Integrative</th>
<th>Collaborative</th>
<th>Search/Storage/Retrieval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portals</td>
<td>Groupware</td>
<td>Databases</td>
</tr>
<tr>
<td>Internet</td>
<td>Content Management Systems</td>
<td>Agent Technologies</td>
</tr>
<tr>
<td>Intranets</td>
<td>Email Groups</td>
<td>Internet</td>
</tr>
</tbody>
</table>

*Figure 4.8: KM tools classification*

For convenience and the purposes of this study KM tools are classified into three broad areas. For example, collaborative KM tools include groupware,
content management systems or email groups depending on the format. A website portal is classified under integrative KM technologies because websites provide seamless access to information. Integrative tools are those technologies which tend to combine various capabilities in one and provide seamless access to various sources of information. Collaborative tools are seen as tools which facilitate the building of community, sharing and interaction while search, storage and retrieval technologies play the role of enabling users to find information.

Figure 4.9 summarizes the results of this survey in relation to the usage of KM tools by DP

![Project KM tools usage diagram]

The situation is not grim, however, there appears to be circumstantial and not deliberate usage of KM technology across a whole range of projects. One of the reasons why projects would be able to use KM tools regardless of management apathy towards KM is that recently developed PM tools integrate KM features like collaboration, contextualization of knowledge, metadata,
tagging, email discussion capabilities, teleconferencing, search and retrieval, database capability, seamless access to project resources, knowledge expert mapping, and other features which enable the creation, sharing and management of knowledge. The results above however, are indicative of the fact that DPs are beginning to dig in to the realities of KM and also the fact that a variety of tools which will offer all kinds of KM capabilities are available to project managers.

4.7.1 Analysis of KM tools and background of respondents

The respondents to this questionnaire item are mostly project managers who are used to technology. The projects are based in developing countries, however, a lot of the managers who exercise administrative control of the projects work from America, Europe or other developed countries, so they are used to much of technology. The results of the survey relating to KM tools used by projects in this survey are explained below:

4.7.1.1 Web portals

Web-based portals appear to be the most popular form of KM technology available to projects with a 70% share of project KM technology usage in this survey. This percentage is high. It indicates that projects consider web-based portals necessary in carrying out their programmes. Furthermore, portals provide access to much needed technical information for DPs such as design specifications, professional documentation, project information, best practices, appraisals and evaluations some of which would not be available through conventional Internet access. The control features of portals using assigned privilege mechanisms like passwords, user groups, administrative and editing privileges make information stored in portals well protected from misuse, plagiarism, and copyright infringements. Duplication of information is also forestalled to a great degree through the controlled expert intelligent features inbuilt in portals. Indexing and classification of information in the portal is carried out through special taxonomies, enabling the tracking of information and also background checks of current inputs to ascertain if this already exists in the repository. Authors are warned that information relating to what they are
authoring exists in the repository and they may like to check this out to avoid re-invention of the wheel.

4.7.1.2 Email groups
Closely following portals with a 69.1% share of projects surveyed is email groups. They are also very popular. They help development project staff to share knowledge, exchange ideas, discover best practices, novel ideas and products. Email discussion groups have grown phenomenally. Another variation of email discussion groups is web logs. Blogging has become a veritable source of knowledge sharing among projects. One of the reasons why emails are popular is because of the ease of use, customisation features, spontaneity, alert features, multi-purpose usage of emails like storing of important documentation while travelling to enable instant access and also avoid loss of information when computers crash or fail.

4.7.1.3 Content Management Systems
The next KM tool used generously by projects is Content Management System (61.5%). A content management system (CMS) is a computer software system for organizing and facilitating collaborative creation of documents and other content. A content management system is sometimes a web application used for managing websites and web content, though in many cases, content management systems require special client software for editing and constructing articles. They can also be used for storage and single sourcing of documentation for a project including but not limited to operators manuals, technical manuals and project guides. Content management systems could be classified as collaborative depending on their features and customisation by the project using them. A CMS could also be classified as integrative if it provides access to various resources through one single interface as well as embracing its traditional purpose which is to manage and organise content purposefully. About 5% of projects in this survey used CMS and agent technologies, 49.2% also used databases, 43% used groupware as well, 31.7% also used the Internet to manage knowledge, while 42% used intranets also and 52.1% used web portals, and 56.4% also used email
groups too. Web portals may have a larger share of project use among the projects surveyed in this research but the most diversified KM tool is the Content Management System because it is almost used alongside every other KM technology and fairly well too given the percentage it garners from the total number of projects surveyed.

4.7.1.4 Groupware

Groupware are forms of collaborative tools which enable people working in a common task to collaborate through a single interface. DPs often comprise teams working in common tasks and could be dispersed and this needs a space to collaborate, share ideas and execute common tasks. The groupware interface could offer tools to perform different tasks nested within a common task. This is achieved through workflow attributes of the groupware. Groupware usage among projects surveyed is at 50.8%, the fourth major KM tool used by projects in this survey.

4.7.1.5 Internet and Intranets

About 50% of projects use both Internet and intranets. The Internet is perhaps the most important innovation of the nineteenth century. Its random and networked nature makes it the most feasible way to deliver information today. Every other KM technology uses or could be delivered through an Internet platform. Some of these tools have been existing before the advent of the Internet, but the development of the Internet brightened the prospects of using these tools remotely, widely and simultaneously by many users. It becomes almost impossible to differentiate these technologies from the Internet. However, professionals would understand that such technologies are driven from different sources and platforms but delivered through a single interface, the Internet.

4.7.1.6 Databases

About 49.8% of projects surveyed use databases to manage knowledge. A database is a large collection of information organised in such a way that a computer can search it randomly and retrieve desired pieces of data, and also
organise such data into information and feedback to the user based on a query submitted. Databases are very useful due to their random access features, and the ability to pull together separate information, both related and unrelated, and organise it in a meaningful way. DPs use databases to store project information and knowledge. Examples of project databases is the World Banks’ Development Gateway (www.developmentgateway.com) which holds information about DPs across the world. Individual projects also hold project information in a dedicated database to enable them store information which would be useful in the future.

4.7.1.7 Agent technologies
Agent technologies occupy the bottom 4% of KM tools used by DPs in carrying out their activities. Due to their nature which involves crawling web pages and trying to match and retrieve information intelligently, agent technologies are used more in competitive businesses. The utilitarian value of agent technologies lend them more to commercial usage. Maybe in the future this application may find more usage within DPs but right now intelligent systems like agent technologies are not popular among DPs. About 12 (4%) projects use agent technologies to manage knowledge. This result appears to tell that PM has not recognised the relevance of agent technologies in managing knowledge in DPs. Nuclear programmes do use agent technologies for collecting information and some other businesses that are highly technology dependent. Development project management (DPM) cannot be said to be highly technology dependent. The use of agent technologies may one day catch on to PM.

The next sub-section discusses other KM tools identified by respondents using a free-text tool on the questionnaire.
4.7.1.8 Other KM tools

Table 4.22 presents other KM tools identified by respondents as relevant to their project activities.

Table 4.22: Other KM tools

<table>
<thead>
<tr>
<th>KM tools</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small portal providers proprietary systems</td>
<td>.3</td>
<td>.3</td>
<td>86.1</td>
</tr>
<tr>
<td>Business Process Management (BPM)</td>
<td>.7</td>
<td>.7</td>
<td>86.8</td>
</tr>
<tr>
<td>Collaboration Systems</td>
<td>.3</td>
<td>.3</td>
<td>87.1</td>
</tr>
<tr>
<td>Collaborative Knowledge Sharing Platform</td>
<td>.7</td>
<td>.7</td>
<td>87.8</td>
</tr>
<tr>
<td>Decisioning Software</td>
<td>.7</td>
<td>.7</td>
<td>88.4</td>
</tr>
<tr>
<td>Enterprise Resource Planning systems</td>
<td>.3</td>
<td>.3</td>
<td>88.8</td>
</tr>
<tr>
<td>Extranet together with customers</td>
<td>.7</td>
<td>.7</td>
<td>89.4</td>
</tr>
<tr>
<td>Face to face meetings</td>
<td>.3</td>
<td>.3</td>
<td>89.8</td>
</tr>
<tr>
<td>FTP-SERVER</td>
<td>.3</td>
<td>.3</td>
<td>90.1</td>
</tr>
<tr>
<td>FTP virtual library password protected</td>
<td>.7</td>
<td>.7</td>
<td>90.8</td>
</tr>
<tr>
<td>Help Desk</td>
<td>.7</td>
<td>.7</td>
<td>91.4</td>
</tr>
<tr>
<td>Intranet</td>
<td>.3</td>
<td>.3</td>
<td>91.7</td>
</tr>
<tr>
<td>Intranet Portal</td>
<td>.7</td>
<td>.7</td>
<td>92.4</td>
</tr>
<tr>
<td>Intranet website portals (Email)</td>
<td>.3</td>
<td>.3</td>
<td>92.7</td>
</tr>
<tr>
<td>Lotus Notes</td>
<td>.7</td>
<td>.7</td>
<td>93.4</td>
</tr>
<tr>
<td>MSOffice:Excel and Word</td>
<td>.7</td>
<td>.7</td>
<td>94.1</td>
</tr>
<tr>
<td>Net meetings</td>
<td>.3</td>
<td>.3</td>
<td>94.4</td>
</tr>
<tr>
<td>Network File System</td>
<td>.7</td>
<td>.7</td>
<td>95.0</td>
</tr>
<tr>
<td>Process Mapping</td>
<td>.3</td>
<td>.3</td>
<td>95.4</td>
</tr>
<tr>
<td>Search Engine Matchpoint (SEM)</td>
<td>.3</td>
<td>.3</td>
<td>95.7</td>
</tr>
<tr>
<td>Survey Interview</td>
<td>.3</td>
<td>.3</td>
<td>96.0</td>
</tr>
<tr>
<td>Visualisation Technology</td>
<td>.7</td>
<td>.7</td>
<td>96.7</td>
</tr>
<tr>
<td>Web-based PM software</td>
<td>.7</td>
<td>.7</td>
<td>97.4</td>
</tr>
<tr>
<td>Web log</td>
<td>.7</td>
<td>.7</td>
<td>98.0</td>
</tr>
<tr>
<td>Web logs (public and private) Adobe Creative Suite work flow</td>
<td>1.0</td>
<td>1.0</td>
<td>99.0</td>
</tr>
<tr>
<td>Wiki</td>
<td>.7</td>
<td>.7</td>
<td>99.7</td>
</tr>
<tr>
<td>Yellow Pages, LL software</td>
<td>.3</td>
<td>.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Various other KM tools are employed in DPs apart from the traditional 7. The table above illustrates the range of KM tools project managers itemised as being used in their projects to manage knowledge. The next section attempts to classify these other KM tools into the three broad KM tools classifications.

4.7.2 Classification of KM technologies

The following sub-sections classify “other KM tools” into three broad categories as identified by this research.
4.7.2.1 Collaborative Systems
The collaborative systems included by project managers as relevant to their KM strategy include face to face meetings (Communities of Practice), Customer collaborative extranets, lotus notes, net meetings, web blogs, workflows, wiki, help desk and collaborative knowledge sharing platform (CKSP) and Enterprise Resource Planning Systems (ERPS). Collaborative systems are more prevalent in this survey than integrative and search retrieval systems.

4.7.2.2 Integrative Systems
The integrative KM technologies listed by project managers as applicable to their KM strategy include Business Process Management (BPM), small portal providers proprietary systems, File Transfer Protocol (FTP), virtual library password protected, Network File System (NFS), Decisioning Software (DS), process mapping, web-based PM software, intranet portal and visualisation technology.

4.7.2.3 Search Systems
Search systems recognised by projects as useful to their KM activities include; Yellow Pages, LL software, Search Engine Matchpoint (SEM), ftp-server and intranets.

The following conclusions could be made from analysing the KM technology in use in DPs:
- Collaborative KM technology is pervasive in development project management. Well over 60% of tools used in the projects surveyed use collaborative KM technology;
- Over 60% of DPs surveyed use one kind of KM technology or the other;
- Project staff are aware of the benefits of technology in leveraging KM capability but there are hurdles like lack of management support and so on;
Technology has been recognised as very important enabler of KM in DPs but they do not equate to real KM;

DPs should pay more attention to people aspects of KM as this research has shown that collaboration is very important. Understanding how project workers create and share knowledge is crucial to the management of knowledge in DPs;

Choosing of KM technology should be done after studying the KM processes of the project organisation;

Increasingly, PM tools are becoming knowledge based. A variety of DPs identify and use PM tools which have inbuilt capabilities for collaboration and contextualizing knowledge. Following from this, DPs should combine PM and KM tools. The best strategy is to integrate the Management of Projects with the Management of knowledge strategies in a single interface; and

This research found out that the following KM tools were the most popular among DP:

- Web portals (70%);
- Email groups (69.1%);
- Content Management Systems (61.5%);
- Groupware (50.8%);
- Internet/Intranets (50%); and
- Databases (49.8%).

4.8 Implication of results and conclusions
This section deals with the implication of results of the survey data and conclusions.

4.8.1 Implication of results
The results of the survey data collected are considered very high and therefore need caution and care when being considered in relation to adopting this for any practical purposes. There needs to be more studies to confirm or
reject the findings of the survey results. The researcher hopes that in the future, more quantitative studies will be carried out in this area.

4.8.2 Conclusions
This chapter has dealt with analysing the data collected during the survey of 1000 projects across 12 world regions. The Statistical Package for the Social Sciences (SPSS) was used to analyse the data collected through regressions, correlations, hypothesis testing, plots and charts and general themes analysis.

A descriptive analysis of basic statistics of the survey were presented showing project types, project regions, number of staff on projects, project status, and project duration. These gave an insight into the nature of projects responding to the survey, the pattern of response, the geographical spread of the survey, and the types of projects which completed the survey. Furthermore, the survey data was tested for reliability and this came out with a minimum reliability coefficient of 0.6 (Cronbach’s Alpha) for interpretation and higher for other constructs. This indicates that the data gathered in this survey is reliable and can be used for making predictions and conclusions in the course of the analysis of data.

A correlation analysis of the CRAI model and the elements of the hypothesis was carried out to test if the model had any correlation with the dependent variables. The variables are contained in the hypothesis (project success, innovation, efficiency, completion times and knowledge sharing). In each case, the CRAI model was proved to have a positive and significant relationship with each element (deliverable) of the hypothesis.

The regression analysis established that KM in DPs is positively related to project success. A number of variables in the survey (project success, innovation, efficiency, completion times and knowledge sharing) were regressed with the CRAI model. The results are that the CRAI model is positively linked to these variables which the hypothesis is trying to prove. The CRAI model was designed to facilitate knowledge sharing in DPs from the
social construction of knowledge perspective. Box plots, scatter plots, histograms and probability plots were used to express relationships between various elements of the model (interpretation, assimilation, reproduction, codification).

Finally, an analysis of the technology aspect of the survey was done. This was to determine the types of technology used for managing knowledge in DPs. These technologies were grouped into three mainly, collaborative, integrative and search and retrieval.
CHAPTER 5
CASE STUDIES

5.0 Introduction
This chapter presents the four case studies carried out during this research. It presents a description of the projects studied, and analyses the data collected. The chapter focuses on the knowledge sharing aspects of the case studies, the perceptions of project managers and other staff on knowledge sharing. It also analyses the research’s findings on the five project outcomes being considered by this research.

5.0.1 Procedure for data collection
Data collection for the case studies is based on the analysis of PM as a knowledge generation process as portrayed in Figure 3.5 in Chapter 3 of the thesis. Here the PM process is analysed in the light of the four model constructs of interpretation, assimilation, reproduction and codification and these are embedded in the four KM enablers of people, technology, strategy and culture. A number of sub elements are considered as indicative or facilitative of KM. The interview schedule items are drawn from these indicative KM items and the other schedules used to gather information during the case studies are also based on Figure 3.5 of the thesis. The researcher is therefore testing the KM practices and project outcomes of DPs based on the representation of KM as a knowledge process (see Figures 3.5, 3.6 and 3.7 in Chapter 3).

5.0.2 Procedure for data analysis
Data is analysed objectively by looking at the responses to questions on the interview schedule, examining project documentation, annual reports and evaluation of independent reviewers of the project.
5.1 Case Study 1: Lift Above Poverty Organisation, Nigeria

Lift Above Poverty Organisation (LAPO) is a development organisation which deals with poverty alleviation. Its main activities are carried out to improve the lives of people in Nigeria. Women are the primary target of the organisation, although men are also targeted especially when it involves improving the income of households, as this has an indirect effect on women as well. LAPO believes that women are more disadvantaged than men in the Nigerian society and they represent the bottom 30% on the economic ladder. In the 1980's there was severe economic recession in Nigeria and Africa in general. Oil revenue in Nigeria declined significantly around 1982 and this brought to the fore, the difficulties of a single product dependent economy. The resulting Structural Adjustment Programme of the Federal Government of Nigeria which was aimed at bringing the economy to the path of sustainable growth had instant biting effects on the populace. This made the programme unpopular and it failed subsequently. This was the setting, in which in a small town of Ogwashi-Uku, Delta state, Lift Above Poverty Organisation (LAPO) was initiated by Mr. Godwin Ehigiamusoe (LAPO, 2000a; World Bank, 1999).

Lift Above Poverty Organization (LAPO) is located in Southern Nigeria. In LAPO, there is a deliberate effort to reach poor women; they constitute 98% of the clientele (LAPO, 2002). Indicators that determine eligibility are size and condition of dwelling place; sex; level of education; type and size of business activity, if any. The structure of LAPO facilitates clients' involvement: credit transactions are conducted at union meetings, while all union leaders constitute a Branch Council, which performs oversight function in a LAPO Branch. Beneficiaries have six elected representatives on the Governing Board of eleven members. Over the years, microfinance products have been developed to meet the needs of clients; these include Regular Loan for working capital financing; Joint Project Loan for establishment of food processing projects; Emergency Christmas Business and Asset Building Loans. Savings products include regular savings, Common fund savings and Christmas Business Savings. LAPO is currently collaborating with a major insurance firm, to provide insurance services to poor women under the
proposed LAPO micro risk project (Interview with Dr. Godwin Ehigiamusoe, 2006; LAPO, 2003b)

LAPO is involved in a number of capacity building projects in the local environment. It helps other sister organisations to scale-up capacity and to leverage their staff knowledge. It engages in advocacy and civil society issues and lends its voice to the agitation for better living conditions for the rural and urban poor. Among the major features of LAPO's activities are; the quest for safe drinking water for rural and urban dwellers in Nigeria, capacity building, poverty alleviation, reducing child mortality rates, reproductive health, gender empowerment, micro-finance, consulting and skills acquisition. LAPO has other areas of activity depending on the need of the community. However, where a community's or individuals needs fall outside its areas of expertise, it identifies relevant organisations through its network and hands over the clients to such organisations for subsequent action. LAPO also follows the progress of people who have made inquiries about its programmes and probably were not able to be placed on any of its programmes.

5.1.1 Objectives of the Project.
LAPO seeks to empower the poor to break out of the grip of poverty. Specifically LAPO seeks to:

1. Enhance income generating capacity of the poor through access to flexible financial services;
2. Embolden poor women through self-esteem enhancing programmes and promotion of gender equity;
3. Empower Community Based Organization (CBOs); and
4. Promote healthy living through access to healthy living tips.

(LAPO, 2006; LAPO Interview 3)
5.1.2 Microfinance

Microfinance has in the past decade experienced tremendous growth in practice and outreach. Across Africa, as in Asia and Latin America, this innovative enterprise financing arrangement has become a thriving industry. The cassava farmers in Nigeria; fabricators in Kenya and restaurant operators in Cote d'Ivoire (Omoruyi, 2000) are increasingly turning to microfinance institutions (MFIs) for a number of financial services. Institutions with diverse financial products have emerged in response to this huge demand.

Microfinance, as it is currently practised has a poverty alleviation feature. It gives greater attention to the needs of women. This orientation is due to the fact that poverty in Africa is more of a female issue. Average female representation of clientele of microfinance institutions in Nigeria is ninety-four per cent. Data of clientele structure in other countries are not significantly different (LAPO, 2002).

LAPO's focus on women has enabled it take major steps towards attaining its major development goal which is to uplift the living standard of women and enable them break out of the grip of poverty. A meaningful assessment of the programme takes cognizance of the socio-economic role of its prime target (women). For their active involvement in a wide range of productive activities, in the urban informal sector and rural economy, availability of funds to women is central to poverty reduction. Women's involvement has also brought the benefits of access to credit to members of their households. Impact on nutritional status and education of children stands out.

Group methodology has also been critical to the success of LAPO. Besides its role in cost reduction, group formation promotes community mobilization for collective actions. LAPO female clients play vital roles in execution of joint economic projects as food processing projects. Currently, LAPO union in Egba community, Edo State, is the platform for discussions on Rural Telecommunication project for the community.
Some of the credit project's LAPO's microfinance initiative offers are:

1. Regular loan: This is obtained by members through their groups for income generating purposes;

2. Asset loan: This is meant to promote ownership of income generating assets among members;

3. Seasonal loan: This is disbursed mainly for farming activities of members. Repayment schedule is designed to suit the seasonal nature of such activities;

4. Festival Business loans: These are disbursed in the month of October to enable members benefit from the boom in business activities during Christmas/New year festivities;

5. Credit - for - shares: This is meant to assist poor people acquire shares in profitable companies and manage them; and

6. LAPO assists members to gradually build their capital with different savings products.
   - Mandatory savings
   - Festival business savings

(Izekor, 2000).

5.1.3 Programmes

The major programmes LAPO undertakes are as follows:

Gender, Environment and Leadership Training (GELT): This programme is a two-day training aimed at creating awareness among rural dwellers on injustice generating structures and practices in rural communities. Beneficiaries are informed of such structures that engender social injustice and are enlightened on utilising their natural resources in a sustainable way. Training staff uses stories, pictures and role-play as part of the training methodology. LAPO believes that women are benefiting greatly from this programme (Ehigiamusoe, 2006—see interview transcript 1).
Democracy and Governance (D & G): This programme is designed to sensitize the rural poor on the democratic process in Nigeria and how to participate in this process to select leaders of the country right from the local government level to the top. Rural sensitization agents are used to sensitize people and teach them how to critically appraise issues affecting them and to actively participate in the political process.

Skills Acquisition: The skill acquisition project is aimed at empowering rural women through such skills as business training, sewing, farming practices, entrepreneurship, banking and saving practices, and other income generating practices that could help the women improve their lives and families.

Micro business Management Training: This programme is part of the skill acquisition project, however it has branched off to an independent project due to its expanding nature. It now has a consultancy unit which is training local business men and women on business skills for a small fee. It also conducts local training on behalf of government projects, multinational corporations and foreign agencies (Sharmin, 2005)

Bridging the Gap: This project is a 30 minutes programme on television which aims to push vital issues of poverty, gender inequality and governance to public discourse. Discussions, interviews and drama sketches are featured on the programme.

Researches and Survey: LAPO undertakes researches and surveys in the community. These often relate to vital issues affecting women such as rural women and political participation, enhanced female income and household relations, credit needs of non-farm activities in rural communities, rural women's perception of harmful traditional practices against women.

Safe drinking water projects: LAPO initiates safe drinking water projects in rural and urban areas. It recognises that good portable water is important
for the wellbeing of women, children and their families in general. It therefore advocates those safe practices involving the treatment and use of water. There is abundance of water in Nigeria, however most of it is unsafe for drinking due to unhealthy practices such as pollution, dumping of toxic materials, and other environmental factors.

Better Farming Practices: In Nigeria, majority of the farming is mostly carried out by rural women. LAPO teaches women and men on better farming practices to improve crop yield and increase food production. This enables women gain more income from the sale of their economic crops.

Irrigation projects for rural farmers: In some arid areas of the North in Nigeria, farmers need irrigation projects to enable them sustain food production. Against this background, LAPO is collaborating with government and other organisations to help provide irrigation facilities and also teach irrigation skills to rural farmers. Source: (LAPO, 2006; LAPO, 2002)

5.2 Analysis of Case Study Data

Lift Above Poverty Organisation started operations in 1987 in a skeletal form, the organisation has grown through experience and practice for 19 years. This has given it ample opportunity to expand and learn. Successful PM requires that all knowledge areas (scope, time, cost, quality, human resource, communications, risk, procurement, project integration) be managed effectively. Below is an analysis of elements of LAPO's KM features. Some information sourced from LAPO (2006) operational handbook are also confirmed during interviews with Dr. Godwin Ehigiamusoe, Programme Director of LAPO (2006).
5.3 Case study analysis

Six senior project managers and officers in LAPO were interviewed for this study. They were selected after a review of the organisational chart. It was felt they were better placed to give broader perspectives on the organisation’s projects. The six people interviewed are itemised below according to their titles.

Table 5.1: LAPO staff interview table

<table>
<thead>
<tr>
<th>Position</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAPO health Manager</td>
<td>In charge of designing and executing health programmes for women and the community</td>
</tr>
<tr>
<td>LAPO Development Centre Manager</td>
<td>LADEC is a unit of LAPO which deals with development programmes such as women empowerment, Gender, Environment, Leadership and Training (GELT).</td>
</tr>
<tr>
<td>Assistant General Manager, Coordination</td>
<td>This position deals with Human Resources and the coordination of project activities in the different units of the organisation. There are many units within the organisation all carrying out projects. This position is responsible for ensuring that each unit projects align with the organisation’s objectives and also schedule the projects in harmony so they do not conflict with other projects in certain ways.</td>
</tr>
<tr>
<td>Manager, Finance</td>
<td>This position is responsible for receipt of funds from donors, disbursement to different projects of LAPO and accountability. It also carries out internal audits.</td>
</tr>
<tr>
<td>Manager, Information Systems Department</td>
<td>Here the technology policies of the organisation is formulated and implemented. This department is in charge of the Internet and email communications of LAPO. It is also in charge of producing reports, documentation and dissemination of information.</td>
</tr>
<tr>
<td>Programme Director</td>
<td>The PD is the overall head of the organisation. He started the organisation and his duties at the moment include coordinating, overseeing, and supervising activities.</td>
</tr>
</tbody>
</table>

5.3.1 Analysis of Interviews

This section analyses the interviews conducted during the case study visit to Lift Above Poverty Organisation, Nigeria. Each question asked is analysed
and where necessary, the analysis is linked to literature and results of the survey. The approach to analysis is an examination of each question in a similar approach as used in the survey analysis.

**Question 1: Do you belong to any informal groups in your project?**

This question is aimed at understanding the involvement of individuals in informal groups. Literature reviewed identify informal groups as a source of problem solving, innovation, induction and enculturation within organisations (Oluikpe, 2003). Informal groups also enable the acquisition of social capital which is considered a capital itself and a source of innovation (Brown and Duguid, 1991). The LAPO Health Manager was of the view that informal groups within the organisation helped her solve problems quicker and also served as a vehicle for induction when she joined the organisation (Appendix 3, Interview 1). Other officers of LAPO interviewed also identified informal communication as the channel used to get needed information while carrying out project duties. Survey results indicated 90% response to the question on the existence of informal groupings within projects. These results indicate that organisations need to pay more attention to the existence of informal work or project groups as these serve useful project ends.

During interviews and field visits to some of the branches, this research identified the existence of communities of practice within the organisation. At most levels of staff cadre, there are identifiable communities. The level of formality or informality of these communities was also assessed. On one hand it was determined that there is no official policy for facilitating communities among staff rather, communities just evolve. On the other hand, LAPO has an active policy of facilitating women unions which are peer groups acting as collateral for their loans. These groups of women are self-selecting i.e., they determine who would be a member. Meetings do not take a formal procedure, rather discussions are made on the fly. Often the woman with the most social capital and connections emerges as the leader of the group (LAPO, 2000b).

**Team building** — Working together and understanding what each other is doing is key to staff cohesion. LAPO recognises this important aspect of KM
and employs it usefully. The programme director during the interview emphasised this (Interview 6, Para 1). The organisation also looks into staff welfare even outside official areas. If a staff has personal issues which constrain them and influence their performance, LAPO would use informal staff networks to deal with such issues.

Access to information – There is a culture of openness in LAPO. The researcher was given access to a lot of information. LAPO observes the freedom of information policy. It also advocates openness among government ministries in Nigeria. This is to ensure democratisation of information. So it sets an example through providing access to any kind of documentation to individuals, organisations, members and governments on any area of its activities.

Communication – Communication within LAPO is mostly through personal contact, newsletters and through telephone. LAPO is a highly informal institution. It is only lately that formal documentation and procedures have been put into place. This is mostly due to donor requirements.

Storytelling: Storytelling takes a very important place in LAPOs procedures. One of the strategies for inducting new members (clients) is storytelling. LAPO’s clients consists mainly of rural women. In the rural areas of Nigeria, the oral culture is still very much a significant factor in imbibing values. LAPO utilises this feature very prominently both in recruitment and induction. Staff have to understand the rubrics of storytelling during meetings, conventions and field visits. This keeps the attention of the rural women and limits disruptive communication. It also helps share knowledge, communicate values and create a very conducive atmosphere for dialogue.

Apprenticeship: Most LAPO staff and members undergo the process of apprenticeship. In Nigerian culture, apprenticeship is very much alive as one of the ways knowledge is handed down. Despite western education, most educated people still undergo what we call observe-and-do process of learning at work. It is a cultural phenomenon. New employees on a project are
attached to a mentor who trains them on vital processes of the job even when such employees do possess requisite educational qualifications. A general notion in Nigeria is that certificates don't teach people how to do their jobs rather people do. LAPO has taken the cultural idea of apprenticeship to the next level. It now has a formal process of apprenticeship for every project staff. During interviews, it was discovered that this has served a very useful purpose in harmonising staff opinion, outlook, knowledge of procedures, collaboration and productivity. It has also done much to enhance the organisational culture. Knowledge sharing is made easy through this process (Interview 1 Para 1)

Question 2: Do you have a sense of community in your project?
In a way, this question is related to Q2, but is aimed at exploring the satisfaction group members derive from belonging to communities. Literature has confirmed that unless individuals have a sense of identity within communities, they might not participate actively towards the common good (Wenger, 2000; Lave and Wenger, 1991). The survey results show that apart from formal project team constitution, there are informal groupings within these projects which might gravitate around similar interests. LAPO staff interviewed indicated that there was a sense of community among these groups. The Finance Manager (Interview 4) explained that she organises informal meetings aimed at problem-solving especially when there are issues that need to be addressed. Every project team member is free to contribute ideas and views on how to go about problems. Although the different managers within LAPO emphasize that there is a lot of informal communication in the organisation, the Programme Director explained the reason why this is so. He identified the reason for a rich informal communication culture and sense of community as a deliberate plan from the beginning of the organisation (Interview 6). In essence, majority of the current staff have not been with the organisation from inception and may not be aware that this was deliberately planned to enhance productivity. Meetings have always been avenues for planning and solving problems in LAPO. Against this background, it is understandable that staff are very comfortable utilising informal channels for work-related problem solving.
Common Identity – Many of the women who work with LAPO identify with poverty and the efforts of the organisation to tackle poverty. There is a sense of common identity within the staff of the organisation and among the clientele (LAPO interview 1, Para 2; Interview 2, Para 2; Interview 3 Para 4; Interview 4, Para 1).

Question 3: Do you rely on your project group for information and career goals?
Staff interviewed in LAPO indicate that they have opportunities for personal development both within their project groups and outside the organisation (networks). In-house communities and outside networks serve the professional interests of LAPO staff. Peer to peer exchange and knowledge sharing could be relied upon for personal career advancement. Literature has argued that organisations should link individuals career and personal goals to participation in communities and this will provide the fuel for sustaining the life of communities (Hildreth, Kimble and Wright, 2000). Johnson-Lenz (1997), COVIS (2003) and Brown and Duguid, (2000) defined informal groups as being goal and interest oriented. Project groups which devise means of fulfilling the goals and career aspirations of members to the group activities will find members more supportive, and participative. LAPO staff have internal avenues for advancing their career goals such as training and collaboration with other staff (Interview 3). These results support the survey results (Assimilation) which relates to informal activities, the way teams form, collaborate and share knowledge during projects.

Question 4: Do you have external sources of personal improvement?
Staff of LAPO identified external sources of personal improvement such as workshops, conferences and symposia in other organisations. There are visible staff networks in LAPO. The desire to keep up to date with events, progress and innovations in their project areas motivate staff to network with others both within and outside the organisation. Most of these is done face to face at conferences and seminars which are a regular feature of the organisation’s activities. Other methods of networking include telephone
conversation, text messaging, email, email groups and chat. Blogging is becoming a feature of NGOs in Nigeria.

The Programme Director gave an insight into the opportunities and goodwill LAPO has benefited from, locally and internationally. Through participating in local training opportunities, it has been able to scale-up capacity by training its workforce in strategic leadership programmes. A partnership with Shell Petroleum Development Company Nigeria, has seen 10 managers of LAPO sent for special leadership development training overseas. The head of the training department considered LAPO's training activities as crucial to its outreach and positioning in Nigeria's microfinance sector. Staff are encouraged to develop themselves. Each staff member is required to attend not less than three training programmes in a year. LAPO's model of staff development is collaborative and continuous. There is the belief that community empowerment is derived from the ability to empower leaders to take control of motivation and leading. Staff remuneration has become a major part of capacity building within LAPO.

**Question 5: Do you find informal discussion helpful in solving project problems?**

This question was designed to gather information on knowledge sharing among project groups and how these help with problem solving. Problem solving is a core activity among project staff in LAPO. Interviews reveal that most staff do not follow official procedures for solving problems. Simple use of the telephone or walking over to a colleague's office represent the major ways through which problems are solved. There is an emphasis on collaborative problem solving (see LAPO interview 1, Para 1). A number of other questions exploring the role of knowledge sharing in solving project related problems were asked (See Appendix 2; heading-knowledge sharing). The interview results support survey results which show that 90.4% of respondents were involved in problem solving arising from knowledge sharing. Literature also supports this notion (Gibbons, 1994).
Question 6: Did your work colleagues play vital roles in helping you come to know your job well?

Workplace induction in LAPO is informal. This is noted in Interview 1, paragraph 1 where the LAPO health manager stated that when he joined the organisation, he learned much more through informal contact with colleagues than through formal procedures. Other interviews also revealed this aspect of LAPO's organisational culture. The literature of communities of practice agree that workplace induction takes place within communities of practice (Oluikpe, 2003; Jashapara, 2003; Wenger, McDermott and Snyder, 2002). The interview results confirm the survey results which indicate that 92.1% of respondents agree that team members help each other learn on the project.

Question 7: Do you think you have made major achievements and significant changes on the job as a result of interaction with colleagues?

This question is aimed at measuring the level of innovative activity resulting from knowledge sharing among project members. LAPO has a culture that supports innovative activities. Staff are motivated and encouraged to find new ways of doing their job or executing projects. During interviews it was discovered that over the years various kinds of change have taken place and this all came about due to a shift in the ways of doing things (incremental innovation). There have also been some radically new changes which came about as a result of new staff and discoveries. Staff are used to change and new ways of carrying out activity. There is increased talk of innovation within LAPO as a whole (see Interview 1 Para 6; Interview 2 Para 5).

From interviews conducted, it is evident that staff consider each project as an opportunity to innovate. One of the incentives to innovate is LAPO's inclusion of staff innovativeness in the criteria for promotion and salary increment. There are reward systems in place to encourage staff to innovate. Apart from formal supervisors assessment, the documentation provided by individual staff on their activities and the projects they worked on serve useful purposes in staff evaluation. These also are sources of knowledge and learning for the organisation.
Question 8: How would you assess the competence, confidence and performance of the project group?

This question was designed to measure efficiency and performance of project groups. A number of other sub-questions were asked such as: Do you often solve problems faster as a group than as individuals on the project? And Would you prefer working alone to working with a number of people at the same time? These questions helped explore the relationship between group dynamics, knowledge sharing and operational efficiency. Interview 3 paragraph 5 of LAPO indicate that group mechanisms make people to push themselves to the frontiers of their work.

Question 9: Do you feel your project completes on time? Explain and give reasons why this is so.

Staff of LAPO interviewed indicated that in many cases projects completed on time and in some other cases they overran. Reason given is that sometimes there are too many projects running and this would have a knock on effect as priority may be placed on a number of these projects. The Finance Manager indicated that her unit has the knowledge base to execute most jobs because they work collaboratively and share knowledge. When a key staff leaves, it’s not often a big problem because there is always a switching of roles on projects so each staff gets to know how to do someone else’s job.

Question 10: Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

Within LAPO, what constitutes project success is relative to the aims and objectives of the project. Secondly, due to the fact that the organisation is mostly dependent on donor funds to implement programmes, what constitutes success depends on the donors requirements. At the end of each project an impact assessment is normally carried out (See LAPO interview 2, Para 8). Here the LADEC manager talked about project success. “All our donors evaluations have always given a pass mark but also noted that we need to have more capacity to touch more lives and this requires more funding”. LAPO interview 1 para 9 also had this to say about project success definition:
"We monitor impact assessment to determine project success. This is the major criteria for assessing success of our project". Overall, donor expectations play significant roles in determining project success. Standard practice within LAPO is that projects are woven or planned around donor expectations and funding requirements.

An analysis of LAPO's project processes indicate an 88% success rate. This figure is gleaned from donors' project evaluation and assessment documents made available to the researcher. This is the most objective information that could be collected by the researcher. LAPO's internal documentation make a claim of about 92%, which is not farfetched from the donor figures (LAPO, 2000a).

The following sections will analyse other issues identified from the case study interviews and review of documentation.

5.3.2 Issues from interviews and review of documentation

This section discusses other issues and findings from the interviews and review of documentation provided by LAPO.

KM Process: About three of the staff interviewed (The Programme Director, LADEC Manager and Information systems manager) were aware of the concept of KM. The other three were familiar with information management concepts of documentation (LAPO Interview 5, para 5). This interview statement and other answers given in the course of the interviews show that LAPO does not plan for a KM process formally within projects. Recent studies especially in construction have shown that organisations are beginning to realise the need for a KM strategy (Carrillo, 2004) and development projects like LAPO who operate in Sub-Saharan also need to have a KM strategy. When things go wrong during project execution, staff come back to the drawing table for informal discussions and to seek the way forward. This is a good thing to do, however some of the projects interviewed during this research had a formal issues management approach which is part of a KM
process especially the JEWEL project. Having a formal KM plan or strategy is the best way forward for projects (Robinson, 2005).

On the other hand though, the Programme Director during the interview indicated that the organisation plans for information and knowledge exchange across the whole organisation. This is done through a newsletter (LAPO interview 6, para1)

This researcher agrees with the programme director that the newsletter in question helps to share information and knowledge across the organisation. However, the newsletter does not help share knowledge within live project scenarios. It can only be retrospective. There needs to be a plan to share live project knowledge among staff and not just what had happened in the past.

Technology: Most project and KM strategies concentrate on technology. To the contrary, LAPO’s concentration on technology is lower than any other aspect. The dangers this portend is that a lot of knowledge is probably lost or tacit and is not captured by any means. The headquarters has expanded the acquisition of information technology. Each office is equipped with computers; however this research discovered that vital networking software technology is absent. Email is the major package used. Work done by employees is saved in computer hard disks and floppy disks. This leaves the organisation open to the loss of data and information. Staff admitted that sometimes floppies could get corrupted and they lose information. Hard disks could crash and a whole lot of information is lost. The implementation of a central file store which is backed up in different servers will help forestall this potential problem. Secondly, the organisation has not implemented a website or an intranet. These are all potential technologies that could aid sharing of knowledge and information. A further analysis shows that facilitation and technology play roles in sharing information but these are not central to the organisation’s knowledge strategy. At the inception of each project, relevant technology has to be earmarked to enable the project work successfully. Organisations have to choose the most reliable collection and codification approaches that would allow them to access the information they choose to map at the inception of the project. The complex nature of technologies for PM presupposes that
organisations would have to adopt the most appropriate technologies for their purposes.

LAPO has a number of these policies in place but they do not have wide applicability across the organisation. Secondly, there is a perceived inadequacy about an enterprise wide technology policy, lone a project specific technology framework.

A major weakness in LAPO's operations therefore is the low level planning for technology use before commencement of a project.

*Organisational culture:* A sound understanding of organizational culture, human (social) interactions, communication and relationships is required in order to make progress (Davenport, 1992). LAPO has an identifiable organisational culture. The study of organisational culture is outside the purposes of this research. However, this research is finding out the consideration given to culture during the lifecycle of a project to maximise its chances of success. LAPO's organisational culture is not inhibitive of KM neither is it very strategic and consciously nurtured. Senior management is seen as supporting knowledge sharing at least in the sense that they help facilitate communities. A number of factors shape LAPO's organisational culture and these impact on social learning. First and foremost is the client base of the organisation. Women represent 90% of LAPO's clients. These women are not just clients but members of the organisation as well. They have a stake in how the organisation is run and they make contributions to how the organisation should be managed. There is often an annual general meeting which involves all the women or whom they would nominate for meetings (LAPO, 2002). There is an organisational policy of openness and informality. Within LAPO, the factors that have shaped the organisational culture were identified to include the following: common identity; problem solving; team building; access to information; development of Individual expertise; communication; and induction and enculturation.

There is a high level of know-how and know-what within the organisation. The resource centre within LAPO is particularly noted for holding information about
the organisation. A greater percentage of staff are aware of certain vital documentation in the information resource centre and where they are also located. Because LAPO operates in a high-risk environment—Benin City, Nigeria, the staff do have incentive systems to carry out their activities. The road network from Lagos to Benin and other parts of Nigeria is particularly deplorable, yet the organisation thrives on daring staff who work sometimes outside work hours to move the organisation forward. Flooding, absence of water facilities, traffic jams, decaying infrastructure, high number of road accidents within the city, poverty especially among women, high rate of infant mortality, HIV prevalence, poor health facilities, political disenfranchisement, and the muzzling of civil society have given rise to the determination to make a change within the environment. LAPO’s mission statement is “a commitment to community development”. During the years of military dictatorship, a number of LAPO staff were harassed and intimidated by the military junta during campaigns for change in the civil society. LAPO has been a willing advocate for better road conditions, health infrastructure, reduction of infant mortality, poverty reduction and a plethora of other social problems. With donor funds, it has been making significant impact in individual lives, but LAPO believes that government is the best equipped social system to make a lasting change in the society hence it’s continued campaign on local media for change (Ehigiamusoe, 1999; Osunde, 2001; Osehobo, 2000).
5.3.3 Conclusion

This section has presented the results of interview and review of documentation of Lift Above Poverty Organisation. It examined and analysed the questions asked during interviews and relates these to survey results and literature. Despite having a rich knowledge culture, there are constraints as have been identified like poor IT facilities. LAPO could do well to invest more on information technology even though this cannot make much difference. Speed of Internet access in Nigeria does not depend so much on the IT facility purchased, but rather on the hosting services available in the country. Generally Internet access in Nigeria is slower than Europe. This makes access to certain databases very limited and slow. However, the organisation can purchase better IT equipment, subscribe to better Internet services, commission an intranet where it could put up its internal documentation for staff. LAPOs executive director sounded optimistic about implementing and intranet facility in the near future. He pointed out that it would be cost effective for LAPO to upload documentation on the intranet and have staff across the country access and print them off. This would remove the need for staff to travel long distances across the country to the head office to collect a few manuals used for field work. This is one constraint identified in the way work is done. Effective knowledge and information management would shorten the length of time a project is executed. For example, staff could use more of their time purposefully if they are not to travel for days or a week to collect a few documents from the head office. Secondly, posting documentation through courier services is very expensive and email or an intranet could cut costs drastically. Not every member of staff in LAPO has an email address. LAPO has no organisational email domain at the moment, however it was suggested that every member of staff should be encouraged to open an email address and submit this to headquarters. This would be used to contact people, forward important official documentation in order to shorten project time.

The next section discusses the second case study—Jigawa Enhancement of Wetlands Livelihood project (JEWEL)
5.4 Case Study 2: Jigawa Enhancement of Wetlands Livelihoods Project

The JEWEL project is initiated and managed by the Department For International Development (DFID) and its Nigerian state government partners. Figure 5.1 below details the geographical areas covered by the project.

![Jewel Project Map](image)

**Figure 5.1: Jewel Project**

This project was initiated and planned in 2001 and the main project activities got underway in 2002. Nigeria is a country in the West African sub-region with almost half the population of the entire region. The World Bank (2002) predicts that the population will double to 240 million by 2030. It is a rich country but has a predominantly poor population. The riches of oil revenues have been diverted to serve personal needs instead of empowering the masses. The majority of Nigerians live below the poverty line and most live on less than one dollar a day. The Human Development Index (HDI) has crept upwards slightly (0.379 in 1980 to 0.456 in 1997) but Nigeria's HDI is 146th out of 156 countries listed by the UNDP Human Development Report (2003). DFID has been active in Nigeria, even during the periods of military dictatorship when sanctions were imposed on Nigeria by the EU and the Commonwealth from 1994 to 1999. It has a considerable capacity to implement and expand its programmes. Work with civil society organisations during the sanctions included capacity building of civil society organisations-capacity building for decentralised development (CBDD) and exploratory work...
in the Wetlands in partnership with Hadejia Nguru Wetlands Conservation Project (HNWCP).

The CBDD programme has been largely successful in Nigeria but has had some difficulties in working through local Civil Society Organisations (CSOs) and the long lead time required to support effective local structures (DFID, 2003).

The HNWCP project has received funding support from the EU and had a more general conservation approach to work in the Wetlands. Contact with DFID has engendered a new approach in project practice. DFID's involvement has also led to detailed work on Participatory Rural Appraisal (PRA) training tools and social capital research coupled with a number of surveys of natural and institutional environments. Stakeholders at the local level have acquired considerable knowledge in regard to managing their natural resources.

The year 1999 saw the installation of a new civilian regime and this changed the institutional landscape of the organisation's work in Nigeria. Sanctions on the country were lifted and slowly it began to creep back on the path of economic recovery (DFID, 2003). DFID's objective is to work with project actors who are most likely to make a lasting impact on the beneficiaries. Although the organisation also targets local civil society groups such as NGOs and Capacity Building Organisations (CBOs), the JEWEL project was unique in the terms that its deliverables were far beyond what a single local organisation could take on. Besides, the organisation, using it's goodwill and track-record of joint delivery of projects with the governmental agencies in Nigeria, felt it was at a vantage position to implement the JEWEL project (Blench, 2003).

Using a focused approach which integrated support for federal level reforms, four state governments and support for a programme to fight against HIV/AIDS, DFID repositioned in Nigeria after the commencement of the civilian regime (DFID, 2003). A February, 2000 pre-appraisal directed the project's attention to issues of governance and management of natural
resources as an approach to improve livelihoods in the wetlands area. Using learning gathered for the past five years and the new approach document of Nigeria, DFID was able to plan strategically for the kick-off of the JEWEL project. This it did using PRA work and other surveys and built this into the approach that concentrates on issues of governance as a means of improving livelihoods.

5.4.1 Project aim

The central aim of DFID is the elimination of poverty. It achieves this through projects which directly address poverty problems and projects which indirectly address such problems. The JEWEL project is on the one hand an indirect intervention in the escalation of poverty in the four states targeted by the project. On the other hand, it is also a direct intervention.

1. This project addresses poverty through improvements in poor people’s access to natural resources on which they depend. This will be achieved through better management at community, local and state levels. The project focuses on access to Common Property Resources (CPRs) and conflict management and is thus directly relevant to the elimination of poverty.

2. The Target Strategy Paper (TSP), Achieving sustainability, DFID (2000) makes explicit links between poverty reduction and environmental protection (see, for example, sections 2.32, 5.27 A and 5.6.). The commitment in the White Paper (DFID, 2000) to “protect the environment and improve its management” is not separate from the need to work for poverty reduction.

The TSP states that the main causes of environmental degradation are:

- Unsustainable consumption, particularly of the rich;
- market failures, which cause goods and services related to the environment to be systematically undervalued; and
- poor and ineffective governance, which leads to the environment being relatively neglected and not integrated into the development of national policies and programmes.
The project's strategy towards poverty reduction is achieved by enhancing and sustaining access to CPRs. This also embraces addressing the first and third causes as outlined in the TSP. The Nigeria CSP states that "We expect to take forward technical assistance for institutional and policy reform and for work on rural livelihoods. The latter will initially be focused on helping manage conflicts over land and water that threaten livelihoods in the eastern part of the (Jigawa) State and neighbouring areas of adjacent States" (Section E16, p13). Conflict management is a major part of the projects focus. Conflicts have become a major factor impeding poor people's livelihoods in the area. Project activities involve a range of measures aimed at institutional and policy reform which impact directly on natural resources management. The need to seek solutions in co-operation with neighbouring states is acknowledged in the advisory structure of the project and in the design of certain activities.

5.4.2 Project partnership

At the state level, the project is working to provide a platform for policy coherence. There are a lot of policy initiatives which are disparate and sometimes conflicting. The project works to pull these initiatives together in harmony and to ensure they speak with one voice. Links between the project and the state government are strong, and both seek to influence resource allocation. Jigawa state has significant resources available for rural development activities. The 2000 state budget, for example, earmarked US$5 million each for a sugar factory and an agricultural research institute, and US$1 million each for sunflower and cotton production. These sums dwarf the allocation to ministries involved in agriculture and rural development (around $4.5 million). The project works with state ministries to support investment appraisal processes which consider financial and environmental aspects.

Within Jigawa state, ministries have been dispersed to different parts of the State. The approach may provide benefits when communications between ministries is improved. The project promotes devolution of management of natural resources to the lowest appropriate level where appropriate and
locates itself geographically to avoid being seen as attached to any particular ministry or interest group.

5.4.3 Project Approach
The project approach was to establish a core government stakeholder committee (Consultative Committee) through which the project co-ordinated and sought ownership of activities (ownership of the project purpose and output areas was affirmed at a stakeholder workshop in Dutse in January 2001). This Committee had the core of Jigawa state ministry staff, and also invited membership from other riparian states and from key federal agencies. During the life of the project, a wide range of platforms for stakeholder interaction was established promoting macro-micro linkages at all levels from inter-community to state – federal interaction. Those fora with an enduring value to the people of the wetlands were expected to flourish and form the institutional basis for sustained support to the rural poor after project end. This is how processes of institutionalisation are promoted with stakeholder meetings and grouping being supported whilst they deliver useful dialogue and improvements in management of CPRs.

5.4.4 Analysis of Case Study Data
An interview was carried out for the JEWEL project. The major contact for this project is the DFID country office at Maitama, Abuja, Nigeria. The project coordinator was contacted by telephone and email and he agreed to do only a maximum of one hour interview on the project. However, he promised to email some documentation on the project which would give detailed information about the project. Furthermore, the project contact also was cooperative in responding to emails regarding the project which sought to gain more information about areas the interview did not cover. Broadly speaking, the required interview areas were covered and more insight was also gained from documentation received and email responses to questions as well. The project coordinator gave a detailed interview on the ideas and concepts behind the project and the state of the project at the moment. The project has the support of the Federal Government of Nigeria. Project activities ran from 2002 to 2005 and an evaluation has been carried out as well. The interviews
focused on gathering data on the KM practices of project staff and how these affect project delivery and outcomes. A total of three staff were interviewed for the JEWEL project. They were senior staff, including the project coordinator. It was felt that these category of staff had very good knowledge of the project and were in a position to provide informed views on the questions for the case study.

During the field visit to Nigeria with regard to case study 1 (Lift Above Poverty Organisation) the researcher also paid a visit to the DFID country office in Abuja, Nigeria to meet with project staff working on the JEWEL project. Due to the fact that he had already interviewed the project coordinator over the phone, it was standard practice only to respond to informal enquiries about the project. So staff did not agree to go on record (taped) regarding the information they were giving about the project. The project coordinator was away in Europe and was not around to give permission for formal interviews with other staff involved in the project. The researcher however took notes of their views on different aspects of the project and also promised to maintain anonymity on the issue. He also secured an understanding to use their views for analysing the results of this research as long as the views remained anonymous. In the analysis following, the researcher would not mention the positions of officers responding to interview or discussion questions except that of the project coordinator who was formally interviewed as DFID procedures stipulates.

When asked to identify some of the knowledge areas of the project, the project coordinator referred the researcher to the project document which gave details outlined in Table 5.2 as the areas which require KM attention and focus within and without the project (DFID Interview 1, para 2). On a closer examination of documentation provided, it follows that these areas requiring KM attention are very crucial areas outlined as the projects activity areas in the project document (JEWEL, 2003).
Table 5.2: Definition of knowledge areas of JEWEL project

<table>
<thead>
<tr>
<th>Knowledge areas of JEWEL Project</th>
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</thead>
<tbody>
<tr>
<td>1. Survey and documentation of access rights issues for common property resources</td>
</tr>
<tr>
<td>2. Documentation of conflict situations and of options for resolution</td>
</tr>
<tr>
<td>3. Development of institutional capacity in sustainable livelihood approaches and in environmental and social appraisal</td>
</tr>
<tr>
<td>4. Capacity building and other support to civil society organisations, community based organisations and traditional resources managers</td>
</tr>
<tr>
<td>5. Promotion of the role of traditional leaders in the management of common property resources</td>
</tr>
<tr>
<td>6. Focus on the livelihoods of women in the wetlands and their vulnerability to environmental change and increasing pressure on wild resources</td>
</tr>
<tr>
<td>7. Identification of appropriate livelihoods and environmental indicators and establishment of a participatory monitoring system in collaboration with Jigawa state departments</td>
</tr>
<tr>
<td>8. Identification of the need for, and facilitation of the establishment of, a range of user group and stakeholder fora for development of management approaches and conflict resolution</td>
</tr>
<tr>
<td>9. Establishment of an information and media strategy to service the needs of user groups and other stakeholders in collaboration with Jigawa state departments</td>
</tr>
<tr>
<td>10. Identification and commissioning of specific support to communities on the ground where pilot projects will demonstrate and aid dissemination of the key project outputs</td>
</tr>
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</table>

The researcher sought further clarification on this. Response received indicated that DFID places KM emphasis on the crucial activities that help achieve objectives. It builds its KM capabilities into the process and activities with the objective of achieving desired outcomes. This is similar to what the CRAI model does. The model tries to identify critical knowledge processes of a project and then builds a KM capability to match those processes with the aim of achieving stipulated outcomes.

5.4.5 Analysis of interviews

This section analyses the case study interviews of the JEWEL project.

Question 1: Do you belong to any informal groups in your project?

Informal groupings and discussions are part of the project strategy of JEWEL. Due to the nature of the project, there is a conscious effort to nurture communities of practice and informal networks that could serve in enabling conflict resolution in communities. The project has a good multicultural mix of
people from different countries and groups working together on the project. There are also other project partner organisations and so communities just evolve.

**Question 2: Do you have a sense of community in your project?**

The project coordinator was of the view that a multi-stakeholder project like JEWEL requires a sense of community to succeed. If all the stakeholders of the project do not feel they are part of the action, problems might arise. There are project staff from Egypt, India, Nigeria, UK, America and some other countries all working together in the local environment in Nigeria. One of the KM policies of JEWEL is to facilitate communities even among stakeholders. The project involves four states of Northern Nigeria and this involves building a community of stakeholders. This minimises misunderstanding, mistrust and encourages participation, especially in these areas where religion, low level of education and ignorance play a big role in undermining projects. Management of the JEWEL project is saddled with the responsibility of managing multiple number of project staff across states both DFID staff and staff of institutional partners. This creates the need to be flexible, motivational and participative.

**Question 3: Do you rely on your project group for information and career goals?**

The project is highly people oriented, although there is a tight project control process. The informality of groups in the project enables project members to rely on one another for sharing knowledge and keeping abreast of developments and issues as they arise. The project intranet is a tool for collaboration as it hosts an email group through which project members share what they know about the project.

**Question 4: Do you have external sources of personal improvement?**

JEWEL staff have external links and sources of information. Opportunities are available for project members to attend conferences and symposia which enable them to network, share information and also learn from what others are doing in the field. The project networks with other projects in Nigeria and other African countries. It also has key networks outside Africa. The European
Union is a major partner on a number of projects. For project members, these partnerships present the opportunity to learn and improve.

**Question 5: Do you find informal discussion helpful in solving project problems?**

Many project members have an informal and relaxed working schedule. The project regards informal discussions as crucial to solving project problems. This perception comes as a result of experiences within the Sub-Saharan region. Storytelling was discovered as a major factor in passing across lessons learned and problem solving. Junior staff who are having their first roles on the project get motivated through informal relationship with senior project members. This enhances knowledge sharing and increases the opportunity of project members to learn. Sometimes, problems can be solved faster through discussions which lead to insight and understanding and some of these discussions are informal.

**Question 6: Did your work colleagues play vital roles in helping you come to know your job well?**

Through the intranet, staff get to know who is in charge of which area and who to contact for a particular issue. Project members are encouraged to meet and discuss with new project members to help them understand the project and ask their questions in an informal setting. Mentorship is another feature of this project. New project members are assigned with senior members and this has the potential for knowledge sharing and transfer of competence among others.

**Question 7: Do you think you have made major achievements and significant changes on the job as a result of interaction with colleagues?**

The individual opinion of the project coordinator is that the project has been highly innovative. He emphasised that there had been so many innovative areas that have been introduced since the project began. For example, new approaches were adopted in dealing with conflicts arising from the struggle over common property resources. A strategy of direct negotiation and engagement was adopted whereby communities were engaged directly and not through intermediaries. It was discovered that this had the potential of
reducing misunderstanding and misinformation. The process of going through intermediaries who imposed their own agenda on these communities sometimes worsened the situation. A second example of an innovative feature of the project is that the Participatory Rural Appraisal tools adopted during the project were novel. This format had not been used previously. It was developed specifically for the project and it is said to be working excellently.

Question 8: How would you assess the competence, confidence and performance of the project group?
The project coordinator was satisfied that the staff competence on the project was professional. He highlighted that they accomplish more as a group than as individuals due to the fact that the team was cohesive. The process was also efficient because it had evolved over the years and had been very efficient. The staff strength, institutional capacity and experience, knowledge and expertise were identified by the project coordinator as responsible for enabling projects to succeed and also complete on time. Due to collaboration and the sense of community, the competence and collective experience of the project team was strengthened.

Question 9: Do you feel your project completes on time? Explain and give reasons why this is so.
The JEWEL project was regarded as having completed on time. Although there was a need to extend the project beyond the agreed completion time, the project had already met the objectives for which it was initiated. However, due to the perceived benefits of the project and the issues that arose during implementation and consultation with stakeholders, it was realised that new areas were emerging and new situations that needed to be dealt with were continually arising. This represented an opportunity to learn. So it was decided that the timescale of the project should be extended.
Question 10: Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

The staff of the project indicated that the project succeeded. The factors commonly mentioned as responsible for the success of the project were good planning, managing relevant knowledge, ability to mix the right sort of people, team work, collaboration and openness to ideas. It was also pointed out that the fact that the project succeeded overall, does not mean there are aspects of the project which did not fail. Some phases of the project had problems and had to be reconsidered and re-planned. There were also plans that went wrong along the way and this led to the restructuring of the system. For example, there were certain aspects of the project which the project team had to rework because they were not done appropriately. However, one of the things the project considered as very vital was to communicate the learning outcomes of the project to everyone involved during team meetings, briefings and stakeholders meetings.

5.4.6 Other findings from interviews and review of documentation

This section deals with other findings and issues arising from the interviews and review of documentation.

5.4.6.1 Interpretative Knowledge

Interviews revealed the interpretative knowledge of JEWEL to concentrate on knowledge of local areas and issues, good grasp of conflict resolution, familiarity with local history and issues, networking, project scheduling, scaling up capacity within local groups, innovativeness in adapting technology to suit local needs and understanding of local economics. Technology considerations play a vital role in the design of projects (DFID, 2003). A particular competency required of project staff in Jigawa state include alertness and responsiveness to power relationships which change constantly in the state. Project staff are required to understand and learn how to engage with different actors at different times to promote support for project initiatives. This is a major survival strategy for project staff who work in an environment that is much fluid and fragmented. During interviews, the PM indicated that recruitment of project staff took into consideration the need for knowledge of
the riparian areas of the North of Nigeria, history, and conflict resolution, community building skills, participation and local consultation (DFID Interview 1, Para 15). It was identified that the Jigawa state government had a low level competency in stakeholder accountability, thus one of the knowledge areas for this project include how to increase the capacity of the state government in participatory evaluation of government programmes. The following areas of interpretative knowledge are identifiable in the project from interviews and documentation reviewed:

**KM Sharing:** The project manager is very conversant with KM concepts. At the inception of this project, DFID determined that the process of knowledge flow would be through stakeholders consultation. Given the low level of technology use and implementation in the Jigawa state government, DFID decided to scale up institutional support for knowledge generating activities such as community building, documentation and technology use. Supporting the state government in using appropriate management systems was of priority in scaling up knowledge exchange between government programmes and beneficiaries (DFID, 2003).

**Change Management:** Staff were required to be very conversant with the political climate and situation of the state. Power relationships change constantly and it was necessary that staff understood the fluidity and fragmentation which were features of the politics of the state so they could be able to engage with different actors at different times. This was important if institutional support for projects would be enabled. Secondly, it was important that staff managed conflicts among:

- Farmers and pastoralists over grazing routes and grazing land, resulting in many deaths;
- Farmers and fishermen (over water use and damage to crops);
- Farmers producing different crops with different requirements;
- Fishermen using different gears and strategies; and
- Government wildlife authorities and collectors of wild resources.
These are situations that required staff to adapt and learn how to manage. Knowledge of the local conditions that generate these conflicts was extremely important if the project was to succeed (DFID, 2004).

Risk Analysis: The project documents indicate that DFID took into consideration the following risks before embarking on the project:

- The major risk to this project was given as political instability in the region and country. However, apart from this risk there is also that of the institutionalisation of the functions created through the project and the sustainability of the project initiatives;
- The risk of being regarded as partisan in its activities; hence DFID sited its project activities in areas that have remote consequences for its operations being seen as partisan or patronising to a particular sector of the state or tribes;
- The risk of non-acceptance of project activities and deliverables by beneficiaries. There was the need to engage actors and all parties to the resources in a debate to increase the chances of success of project activities;
- The lack of capacity by existing state institutions to address the needs of the wetlands; and
- There is also the risk that the viability of the wetlands themselves is unknown at the present due to the fact that they have undergone major degradation and are vulnerable to the ever increasing needs of an increasing population (DFID, 2003).

Success definition: The following are the learning outcomes of the project and they also constitute the success criteria for the project as indicated by the project documentation reviewed: (DFID, 2003; DFID, 2004; Blench, 2003)

- Assist stakeholders to debate, define and reach agreements on access rights to common property resources and to make widely available the lessons learned both in the wetlands and nationally;
- Help to inform government stakeholders on the livelihoods strategies and outcomes of the wetlands poor and enhance their capacity to
develop policies and service delivery mechanisms which favour the poor;

- Help to establish information collection and dissemination systems for livelihood and environmental factors important to the livelihood strategies of the wetlands poor; promote dissemination locally, nationally and regionally;
- Assist wetlands customary and statutory stakeholders to debate and clarify institutional responsibilities and to generate widespread understanding of those responsibilities; and
- Identify effective mechanisms for managing conflicts in the wetlands and demonstrate the value of these mechanisms in selected areas; disseminate the lessons learned locally, regionally and nationally.

The project coordinator emphasised that these were often communicated to the staff and stakeholders during team meetings, briefings and stakeholders meetings. This was done to keep everyone involved abreast of developments and also to maintain focus on the project’s objectives and success criteria: (Interview 1, Para 10)

Organisational project memory: DFID has a long history of working in Nigeria. During the periods of military dictatorships when the country was sanctioned by the European Union and the Commonwealth, DFID was still operating in Nigeria trying to scale up capacity of grassroots organisations and the informal sector. There is a lot of documentation and learning that has occurred over the years and this places the organisation in an advantaged position in planning and implementing the JEWEL project.

Information Management: The project manager was interviewed about the information management processes and capabilities of the project and he mentioned that there was in place IM processes. Some of the information management processes and activities that took place within the project are listed out below:
Available environmental and livelihoods information reviewed and catalogued;

Appropriate environmental and livelihoods indicators identified and agreed with community and government stakeholders;

Mechanism for capture and management of information from a range of sources identified;

Poverty indicators identified and agreed with community and government stakeholders;

Monitoring sites and methodologies for participatory data collection identified;

Necessary monitoring equipment installed and operator training completed;

Appropriate database for environmental, livelihoods and poverty indicators;

Information from monitoring programme produced quarterly in formats appropriate for feedback to government and community stakeholders;

Lessons learned disseminated throughout Nigeria and DFID worldwide;

Availability of data publicised at national, state and local level through press articles, media coverage, project fliers and stakeholder meetings in line with project work plan;

Multi-stakeholder training workshops on the methods, value and relevance of data collection to livelihoods held according to work plans; and

Information tailored to the needs of specific user groups (e.g. state government departments or conflict resolution fora) prepared and supplied on demand (DFID, 2003).

Best practices: Some of the best practices identified by the project manager as crucial to the success of the project include:

- Survey and document access rights to the CPRs of major importance to the livelihoods of the poor;

- Identify and catalogue key access “hotspot” issues (not conflicts);
- Develop appropriate dissemination routes and pathways for survey information;
- Promote the use of data to state department of statistics and other agencies;
- Identify and debate (through stakeholder workshops) the existing institutional framework for access to wetlands CPRs and catalogue the different users and stakeholders;
- Help to develop the skills that user groups need to negotiate their access rights, particularly with regard to the more marginalised groups and users (women, migrants, transhumant herders);
- Establish and revive mechanisms (stakeholder forum), through which different users are able to debate and define their access rights to wetlands resources;
- Identify communication strategies to disseminate and publicise different users' access rights. Others must be aware of these rights; and
- Document patterns of land use allocation and seasonal variation.

5.4.6.2 Assimilative knowledge
The assimilative knowledge of the JEWEL project revolves around collaborative strategies put into place by project staff to enable transfer of knowledge. The core government stakeholder committee established by the project served to strengthen alignment of forces towards project progress. This committee served as the nucleus for cross-fertilisation of ideas and project implementation. DFID project staff approach is inclusive. Interviews indicated a high level of consultation with stakeholders. The nature of the project itself involved conflict management and required a lot of direct engagement with actors involved in harnessing the resources of the riparian areas which result in conflicts. The following areas of assimilative knowledge process in the project are identifiable from documentation and interviews carried out:

**KM Strategy:** The KM strategy put into place by the project was collaborative. The JEWEL project manager during interviews emphasised the need for
community knowledge exchange and sharing as these reduce conflicts, misrepresentations and misunderstandings. He also indicated that information management systems were put into place to ensure that knowledge is captured and leveraged for project purposes. The stakeholders meetings were the major platform for managing the project and as such it represented the core avenue for sharing knowledge. Project staff weaved their project duties around consultation with stakeholders. Since governments were involved in the planning and implementation of the project, there was a constant emphasis on sharing of knowledge between project and the different constituents and actors involved. This helped to increase the sense of ownership of the project among the community (Interview 1 Para 3 and 4).

**Learning:** Project learning was at its peak during interactions and stakeholders meetings. The monitoring and evaluation system put into place for the project included a mechanism for capturing and leveraging lessons learnt and disseminating this across DFID and Nigeria (Interview 1 Para 5, 7; Interview 2, Para 3);

**Networking:** The JEWEL project networked with other projects both in Nigeria and Africa. The project had some lessons to draw from similar projects in the country. There were also other donors working in the same region, so project staff consulted with these to learn from their experiences (Interview 1 Para 4, 5; Interview 2, Para 5; Interview 3 Para 1);

**Communities of Practice:** The major platform for facilitating a COP for this project was the stakeholders forum which brought together all kinds of actors and interest groups involved in the project. This included state governments-Adamawa, Yobe, Jigawa, Kano and Katsina. Although the project is sited in Jigawa, some components of the project required consultation with neighbouring states due to the interlinked nature of the resources being exploited;

**Technology:** DFID made use of satellite technology to map the areas of project activity, it also involved the state governments in teleconferencing,
email, chat and other technologies. There was a conscious effort to create, share and disseminate knowledge (DFID, 2003; Interview 1 Para 13).

5.4.6.3 Reproductive Knowledge
From interviews conducted, the implementation of the project flowed from the knowledge leveraged through the consultative assembly of the stakeholders. Those regular meetings shaped and defined the direction of the project. The following areas of reproductive knowledge process of the project are identifiable from the documentation and interviews carried out:

Quality Management: After priorities have been identified and the team has been deployed to execute the project, the stakeholders meeting was responsible for monitoring and evaluating progress and assessing quality outputs (DFID, 2003; Interview 1 Para 9);

Communications plan: The project had a standing communications plan and structure. Essentially this was collaborative and horizontal. Although the project preferred a horizontal knowledge sharing and reporting process, it also took into consideration the bureaucratic nature of most Nigerian states and also followed these processes in project practices. Documentation reveal that bureaucracy slowed down the process sometimes but the stakeholders meetings which brought together the actors, served to speed up the pace of work;

Leadership: The project was coordinated by DFID country staff and the project team included a range of local staff with appropriate skills and experience in community development. They were drawn as secondments from the Jigawa state ministries;

Issues management: Issues raised during the project were channelled through the Project Coordination team based at Hadejia in Jigawa state;
Monitoring and Evaluation: Monitoring and evaluation were done at annual intervals by:
- a DFID-appointed review team;
- Six monthly support visits by the appointed management agency; and
- progress review at the end of the 9 month inception period by Project Officer (Nigeria) (DFID, 2003).

Implementation: The main focus of implementation of this project is conflict resolution. The project aims to work with locals to forestall sabotage of the natural resources of the area, rent seeking by authorities and individuals who do not have the interest of the area at heart, manage conflict among locals arising from the utilisation of common resources and collection of information that could help with solutions envisioned.

5.4.6.4 Codified Knowledge
The codified knowledge of the JEWEL project basically resides in documentation, reports, manuals, monitoring and evaluation documents. During the project, a lot of knowledge had been created, shared and utilised. The project had also learnt lessons from activities and documented these. Interviews indicated a good level of knowledge activity going on during the project due to the nature of the project. The project deals with community and individual engagement on the part of project staff and the stakeholders committee. The following areas of the codified knowledge process are identifiable from documentation and interviews carried out:

Results analysis: The project periodically assessed results of individual components of the project and documented these for future use. Project staff are charged with responsibility of collecting information about activities and their immediate impact on the beneficiaries;

New knowledge review: The project staff indicated during interview that it was sometimes very easy to realise that new knowledge had been added or discovered by the project. The rigorous information and documentation
processes during the planning and implementation of the project makes this possible. Secondly, the stakeholders committee used to manage the project is an avenue for creating and sharing knowledge (Interview 1 Para 11; Interview 2, Para 2, 3; Interview 3 Para 3);

**Success assessment:** Success criteria for the project were clearly delineated as could be found in documentation and also indicated during interviews. Project staff were aware of these criteria (Interview 1 Para 10);

**Organisational learning and capacity:** Organisational learning was rapid during the project process. DFID had institutionally entrenched structures in Nigeria so it was not difficult for the project to identify learning opportunities during the process. Many previous project experiences fed-back into the current project and enabled learning. Furthermore, the staff on the project were experienced in community development and this helped leverage capacity (Interview 1 Para 7);

**Stakeholders analysis:** The stakeholders of the project were in the mainstream of decision making regarding the exploitation of the natural resources and they are often in the middle of the conflict resolution process. The DFID ensured the relevant people were brought on board to maximise the potential for success. Local and state authorities in Northern Nigeria are very powerful and sometimes the decisions of some government officers trigger or feed the conflicts in communities. It was important to include every segment of concerned parties to ensure success. Secondly, these stakeholders views on the achievements and impact of the project are documented periodically. This represents useful feedback for project staff;

**Impact assessment:** The impact of the project is determined through periodic assessments and evaluation. Monitoring and evaluation provide a feedback on how the project is impacting on the lives of intended beneficiaries; and
Issue logs: Problems or issues encountered during project design and implementation are logged and communicated to the project coordination team.
5.5 CASE STUDY 3: Water Utility Partnerships (WUP)

The Water Utility Partnership (WUP) was formed as a cooperation between the Union of African Water Suppliers (UAWS), Centre for Low cost Water Supply and Sanitation (CREPA), Centre for the Training, Research and Networking for Development (TREND) and the World Bank. It's main reason to exist is to assist in improving the performance of water supply and sanitation utilities in Africa with the aim to reform and improve services rendered to peri-urban areas. Involving stakeholders using specific projects across the length and breadth of Africa is a major strategy and method of WUP.

Water supply is a major problem facing populations of the developing world. Of every ten people, two lack access to safe water supply, five have inadequate sanitation and nine do not have their wastewater treated to any degree. In total there is an estimated 1.1 billion people lacking access to safe water and 2.4 billion with inadequate sanitation facilities (Noll, Shirley and Cowan, 1998). These estimates are not enough to underscore the wide gap in water supply in the developing world. Majority of the countries who do have water supply systems installed, often have a low water service quality. Most water is unsafe to drink and most of the time the pipes are empty due to the failure of public infrastructure. Sanitation facilities also do not meet the standard requirements, or are overloaded, in a state of disrepair or simply do not exist. The level of water supply in developing countries fall drastically below acceptable standards.

Better water supply and sanitation would help to improve social, educational, health and environmental services and condition. The migration from rural to urban areas, and the urbanisation of many African cities, coupled with political, religious and sectarian conflicts help to aggravate the situation. There is a generally accepted notion that the water infrastructure in Africa need a complete rehabilitation, yet this leaves room for learning and making mistakes on the part of water utility services (Parliamentary Office of Science and Technology, 2002).
WUP came into being due to the need to improve the performance of the water and sanitation providers. Its objective is to build a bridge among players in the water services sector and provide a platform for sharing knowledge and exchange of experiences in the quest to find lasting solutions for the myriad of infrastructure and service constraints in the African water and sanitation sector (WUP, 2006). The partnership helps experienced and less experienced service providers to pool knowledge and information towards the same objective. The sector was strongly influenced by the winds of reorganization, at that time understood mostly as privatization. Currently, private-public and public-public approaches are beginning to gain prominence in public debate. In Africa, the commercialisation of public services like water supply has been a contentious issue, but today it is no longer a taboo topic. It has recently been seen as the most sustainable way to go for the utilities in order to improve and expand their services and cut the previous seemingly eternal dependency for renewed financing at recurrent intervals. The global effort towards fulfilling the millennium goals for water supply and sanitation has during the last years seems to have affected the work of WUP.

5.5.1 Objectives

The objectives of WUP include the following:

- Foster collaboration;
- Creating an enabling environment for collaboration;
- Building capacity through accumulation and dissemination of knowledge;
- Promoting efficient, well-managed, accountable and responsive utilities, which provide equitable, sustainable and quality water and sanitation in their areas of operation;
- Promoting water supply and sanitation sector policies and institutions that provide the right incentives for utilities to;
- Extend services to the poor through partnership with stakeholders;
- Foster a culture of capacity building, knowledge sharing and networking; and
- Ensure a sound environment and sustainability of water resources.
5.5.2 WUP Projects

Some projects are currently operated by the Water Utility Partnerships. They include:

- Reform of the water and sanitation sector in Africa;
- Development of performance indicators and benchmarking for utilities in Africa;
- Water utilities management and reduction of unaccounted for water;
- Strengthening the capacity of water supply and sanitation utilities in environmental hygiene education and public health; and provision of services to the urban poor (peri-urban areas and informal settlements); and
- Information and communication networks funded by the Union of African Water Suppliers.

5.5.3 Analysis of Case Study Data

The key contact for this organisation resides in Dakar, Senegal. A former WUP managing director is currently studying at Loughborough University. The researcher also approached him for his views on the KM aspect of the organisation. The main interview for this organisation was carried out over the telephone with the current managing director of the project in Dakar, Senegal. Case study interview with the WUP staff concentrated on the KM aspect of the organisation's activities as it relates to the achievement of the overall objectives of the project as outlined in section 5.5.1. This component interested the researcher because WUP has a deliberate policy of KM as a part of the projects carried out. The KM programme was expected to significantly improve the availability and dissemination of knowledge. The KM programme has received significant funding support from various donors and an information and knowledge specialist was contracted to map out a KM strategy for the organisation (WUP, 2002). The benchmarking of utilities basically required knowledge sharing, feedback, and a consistent flow of information to be successful. The performance of utilities participating in the benchmarking process is often measured and performance improvement plans prescribed and monitored when the utility starts implementation.
5.5.4 Analysis of interviews

This section analyses the interviews carried out with the staff of Water Utility Partnerships.

Question 1: Do you belong to any informal groups in your project?
The Managing Director of WUP was of the view that networks and communities were formed since the project began and that these help the project team members to bond with each other. This in turn builds trust and oneness. As a result, team members are not afraid of sharing what they know or speaking their mind. The MD is of the view that staff are not threatened of each other, so people tend to share and not withhold information from others.

Question 2: Do you have a sense of community in your project?
Regarding this question, interviews revealed that team work on the project was considered excellent. The MD said, although teams freely share knowledge and information with each other, there was also mutual understanding and respect for each other. He emphasised that the staff is the most important asset of the organisation and so he ensures that their capacity is leveraged as much as possible for everyone's benefit. He reiterated that informally, outside official channels, a lot was going on among the project team and this was good for the project.

Question 3: Do you have external sources of personal improvement?
WUP as an institutional actor has various opportunities for staff to increase their capacity. Conferences and symposia organised by the organisation for NGOs in Africa bring staff into contact with other people outside the organisation and networks arise as a result. Apart from workshops facilitated by WUP, staff also attend workshops in other organisations in order to network.
Question 4: Do you think you have made major achievements and significant changes on the job as a result of interaction with colleagues?
Staff of WUP interviewed indicated that a lot of ideas which enable the project to operate are identified during team work, discussions and interaction with other colleagues. So this aspect is responsible for creating opportunity to explore new areas of problem solving which individuals may not come up with unless there was an interaction with others.

Question 5: How would you assess the competence, confidence and performance of the project group?
The competence of WUP staff is on the high side as indicated by the interview. The MD regarded the staff as high calibre working hard to achieve project objectives. Because staff are specialists in their area, this adds to the efficiency of the project. Staff are drawn from people who have years of expertise in the project area and a track record.

Question 6: Do you feel your project completes on time? Explain and give reasons why this is so.
According to the staff interviewed, WUP projects complete on time due to the scaled up institutional capacity. Due to the fact that the organisation has more partners to contribute to the project, there is a lot of knowledge and expertise available for the project and this leads to achieving objective faster. Recently, WUP has transformed into an institutional information disseminator rather than designing projects. The implication is that the organisation has scaled down the type of projects carried out. Currently, it limits its activities to the role of sharing information and knowledge across institutions, sensitising governments, communities and the water industry on relevant issues. They now serve as a gateway to water and sanitation information. WUP is now a knowledge provider to other organisations. The major reason why projects complete on time is that the organisation now has a focused target.
Question 7: Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

In response to this question, the MD noted that the organisation has been making a huge impact in the region because the target groups have been benefiting from the projects carried out by the organisation. A recent institutional review (WUP, 2004) gave the organisation an excellent mark. Although the organisation has undergone some changes, the MD considers their projects hugely successful due to the success in initiating change in government and organisational policies in the area of water and sanitation in Africa.

5.5.5 Other issues from interviews and review of documentation

This section discusses other issues identified from interviews and review of documentation of Water Utility Partnerships.

5.5.5.1 Interpretative knowledge

The Interview reveals a wide-ranging knowledge of the sector in Africa, a commitment to reformation, and a good understanding of the processes for monitoring and evaluation. As a facilitator, the knowledge needed by WUP include a basic ideology on how to start institutional reforms, supporting the process through effective dissemination of information and knowledge, monitoring and evaluating implemented reforms. WUP requires senior project staff to have a firm grasp of the water and sanitation sector in Africa. It regards previous experience in the water and sanitation sector as very important for recruiting staff. Ability to interpret wide ranging issues in the sector is an advantage (WUP interview para.6).

WUP's core function is, within its agreed mission, to disseminate information, create partnerships, arrange workshops and seminars, enable exchange of best practice, and assist the utilities in benefiting from the outcome of the projects. This makes the acquisition of expertise to facilitate knowledge exchange one of its core interpretative knowledge competences. WUP has
remained a program and not a permanent structure. It does not desire to compete with other NGOs for funds and influence (Interview para 7).

One of the initial problems of the project at commencement was the weakness of WUP in disseminating knowledge and information. This was put down to the low level of participation of utilities at the onset, but this situation has since changed. To serve utilities better in Africa and ensure continued donations and support from those utilities, WUP’s services must have a market value. Probably, it might be useful redesigning its website to have a marketable appeal on other utilities. It can also use its website to provide services to other utilities in Africa (WUP, 2002; WUP, 2004).

5.5.5.2 Assimilative Knowledge
WUP’s approach to its projects is three-pronged:

1. Creating awareness for the need for reforms in the water and sanitation sector;
2. Supporting the reform process through disseminating knowledge and information in order to increase the success of reforms; and
3. Monitoring and evaluating implemented reforms and issues relevant in the reform process.

The organisation uses a variety of means to achieve these objectives and they include: workshops, knowledge dissemination and support, strengthening existing networks, development of a website on reforms. These processes enable collaboration between WUP staff and the utilities they serve.

**Leadership:** The managing director is the focal point of leadership here. Documentation shows that recommendations have been put forward for WUP to create positions such as Programme Director-external relations, Head of Information--assimilation and dissemination of results, Head of communication-run workshops and communicate with utilities (Institutional Review, 2004). Basically, the MD leads a number of other project staff who are basically low cadre staff. He has direct responsibility for organising and supervising. The institutional review, WUP (2004) is recommending that this should change and more senior staff should be brought on board.
WUP is typically approaching the end of the road: funds are drying up, the conflict in Cote Devoir threatens its operations and staff, even though the conflict has eased, it did have a considerable impact on the organisation. A number of supporting partners have undergone institutional change and no more give required support. These and other factors necessitated a rethink of WUP's objectives. Consequently, WUP has withdrawn active service in project execution and has undergone a transformation from a project planning and execution organisation to a capacity building organisation—more or less like facilitating information and knowledge exchange among water and sanitation utilities (Interview para 8; WUP, 2004).

5.5.5.3 Reproductive knowledge

WUP's product is knowledge, collaboration and facilitation. The experience gained in doing this has accumulated over the years and WUP is seen as being better positioned to act as an umbrella body of organisations providing water and sanitation in Africa. Funding from the World Bank, DFID, SIDA, and the EU among others has enabled the organisation provide a range of services to its clients in Africa. The staff are basically no more regarded as project staff but as facilitators, knowledge officers and liaisons. This is in conformity to WUP's new identity as bridge builders in the water and sanitation sector. It packages capacity building seminars, workshops, and conferences and works towards ensuring participation by African utilities in the sector. To achieve a fair level of participation has not been easy but the interview reveals impact is being made and WUP is achieving objectives. The recent institutional review WUP (2004) done by external consultants also reveal a rising level of participation by utilities in Africa.

The organisation's ability to learn through interpretative and assimilative knowledge is seen in its ability to reproduce what is learnt through its projects and facilitation of workshops. Benchmarking of water and sanitation utilities and impact assessment indicate positive results. As mentioned in a previous section, one of the initial problems of the project was that it had difficulties with
dissemination of information and knowledge which ironically is it's major product to the utilities. This was due to the low level of participation of utilities in the projects at the onset, but as the project continued, the institutional review WUP (2004) reveals a rising and encouraging participation by utilities. This shows that WUP is delivering the product despite having difficulties initially.

Knowledge is being created and shared during the opportunity workshops WUP facilitates and utilities now form partnerships and collaborations and probably take issues on themselves from where WUP stopped.

5.5.5.4 Codified knowledge

There is a general perception that most information and knowledge generated during project processes is documented, shared and utilised for future projects: The organisation recognises limitations in information technology for sharing knowledge but emphasises proper documentation, debriefing of staff at the end of projects, monitoring and evaluation, benchmarking of projects, performance evaluation and commissioning of periodic review of projects. These are aimed at harvesting vital knowledge about projects and using these to further project objectives in the future. These winding up processes of the projects might be too much for the staff of the organisation. WUP contracts external reviewers to look into projects and report on processes so far. These reviewers observe projects, sift through and study project documentation and also interview project staff. At the end, they produce a comprehensive report of the project to the organisation making recommendations and identifying problems and prospects of projects. WUP uses the documents as a guide for making project adjustments to avoid repeating mistakes of the past.
5.6 CASE STUDY 4: Nile Basin Water Resources Project

The Nile Basin Water Resources Project (NBWRP) was formerly called Operational Water Resources Management and Information System in the Nile Basin Countries. It is implemented by the Food and Agricultural Organisation with major funding from Italy. Its major aim is to strengthen and increase capacity in the Nile Basin countries to enable them negotiate joint management, equitable sharing and utilisation of water resources and environmental protection of the Nile Basin in the interest of supporting regional cooperation under the umbrella of a wider Nile Basin Programme. Countries which have signed up for participation in this project are Burundi, D.R Congo, Ethiopia, Rwanda, Kenya, Tanzania, Sudan and Uganda. Participating governments appoint coordinators and focal point institutions to liaise with the project for mutual benefit. The organisation is headquartered in Entebbe, Uganda. Staff make frequent visits to participating countries and the FAO provides technical and administrative backup (NBWRP, 2006).

The Nile Basin has potential to leverage development across a considerable part of Africa. Population is growing fast in the areas linked by the Nile and it is expected that this would increase the demand for agricultural production and the generation of hydro-electricity in the region, despite the heavy drought experienced in this area. To maximise the economic potentials and benefits of the basin needs focused technical support which will enable these countries overcome policy, economic, political, cultural and religious barriers to joint management of the land and water resources of the basin. The most important basis for collaboration is the joint planning and equitable sharing of benefits accruing from the resources of the basin. About 10% of the African continent lie along the Nile Basin with a population of more than 330 million people, and 160 million people out of this have their home along the boundaries of the Nile Basin. Agriculture is the most important economic sector of this region (NBWRP, 1998).
5.6.1 Objectives

The objectives of the Nile Basin Water Resources project include to:

1. provide capacity in support of cooperation and joint action for development in the Nile Basin;

2. foster prosperity, security and peace for all people in the basin. To achieve this, the project aims to institute a common knowledge base and equal technical capacity as a prerequisite for equitable and sustainable utilization of the shared Nile waters; and

3. build a common knowledge base involves many areas, including: (i) building common data sets; (ii) creating common case assessment tools; and (iii) facilitating an equal level of technical expertise and institutional capacity (NBWRP, 2006)

5.6.2 Projects

1. Establishment of a trans-boundary hydro meteorological monitoring network;

2. Establishment of national geo-referenced databases and spatial layers including hydro meteorological parameters, water use information, hydro-graphic features, land use, land cover, and soil types;

3. Development of a Nile decision-support tool (Nile DST) that models the entire Nile system and assesses the trade-offs and consequences of various development scenarios; and

4. Improving capacity in setting out the needs of the institutional basis for cooperation and in promoting stakeholder involvement (NBWRP, 2006)

5.6.3 Analysis of Case Study Data

The case study interviews follow the same patterns of previous interviews as structured. They are structured to elicit response in the various areas the CRAI model elements represent. The Nile Basin Water Resources Project (NBWRP) is essentially a capacity building project with trans-boundary features. Given their multi-ethnic, multinational, and multi-sectoral constitution, the Nile Basin countries require a knowledge-based collaboration to utilise the benefits accruing from the potentials of the Nile. This include generation of hydro-power, irrigation, development of fishing, agricultural development and
various other economic benefits. The answer to the development of a common knowledge base is the Nile Basin Water Resources Project. This research interview involved the most senior management staff of the project at its headquarters.

5.6.4 Analysis of interviews
This section analyses the interviews carried out with the staff of Nile Basin Water Resources Project.

Question 1: How do you see team work on this project?
According to staff interviewed, this project was meant to be team-based. Because the essential nature of the project was to bring together actors and stakeholders of the Nile-Basin in a collaborative environment, the Project Manager was certain that if team work is not practiced the project will fail. The perception of the necessity of team work was strong.

Question 2: Do you have informal groups on your project?
The Project Manager emphasised that informal interaction is a major part of the way the project operates. During his tenure, informal groups had grown commendably. Friendships develop among team members and this goes a long way in fostering a team spirit and helps project execution. The project management allows informal activities and interaction because it is aware that this enables project staff to help each other and indirectly this will contribute to the project.

Question 3: Do you come up with new ideas and ways of doing things during discussions and team work?
The project staff is optimistic that when they share and discuss with each other during team reviews and appraisals, or progress meetings, ideas will flow and the team taps into these ideas and make improvements on the project. Meetings are seen as avenues to contribute to the project not just to create documents and minutes. The Manager was of the view that if documented information is not implemented, then the project may fail. Meetings are aimed at helping appraise progress and helping to identify areas where improvements are needed.
Question 4: How would you assess the competence, confidence and performance of the project group?

The project management is not worried over the competence of the group because it is confident that they have the capacity to execute the project and that they can only grow. Recent performance evaluations also show that staff were performing optimally. A variety of staff worked with the project—especially staff from the Food and Agricultural Organisation (FAO), the technical partners of the project. The FAO helps to build staff capacity through training and provision of expertise for certain key areas of the project. Staff competence before recruitment is also required especially in the area of issues that relate to common resources such as the Nile. Expertise in Water Management in the countries where the project operates is also considered an advantage for potential recruits.

Question 5: Do you feel your project completes on time? Explain and give reasons why this is so?

The project management is confident that objectives are being met. Although a few phases of the project might overrun, the project completes on time overall. Whenever it is likely that a phase of a project might overrun, stakeholder involvement and approval is normally secured. This is seen as crucial.

Question 6: Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

Staff interviewed indicate that projects succeed due to the fact that people are taken on board. Information about what the aims and objectives of the project is shared in relevant quarters to raise awareness and gain support. In this type of project, political support is very vital to success so the project determines from the beginning to involve people who have the power to make decisions. Policy makers and people who have influence in the countries and parastatals are involved to gain public and grass root support. The project acknowledges that it does have a lot of odds against it, especially the multicultural and transboundary nature of the project. It sometimes could be a
disadvantage and requires a lot of effort and capability to implement but the technical expertise of the staff and partners is crucial to success. On the other hand, due to the open nature of information sharing, dialogue and involvement, the project is succeeding even in communities where resistance was anticipated.

5.6.5 Other findings from interviews and review of documentation
This section reviews other findings from the interview and review of documentation.

5.6.5.1 Interpretative knowledge
Interview with staff reveal that the take-off knowledge for the NBWRP include a very sound understanding of the social issues relating to the Nile and the countries with borders along the Nile river. There is need to build equity and shared understanding among nations in the utilisation of the Nile resources. A knowledge of infrastructure development which would include the resettlement of people affected by the development and the impacts this could have on culture and traditions, is a vital area the project is looking into. The Nile is bordered by about 10 countries and the development of an international water is a highly political issue which needs to be pursued with clear understanding of development applications within the context of each country. The understanding of national policies, priorities and concerns regarding the development of international waters constitute a building block for fostering dialogue and collaboration among riparian countries. Bringing countries to the dialogue table to pursue common development interests relating to the common resource—the Nile is of prime importance to the project. A knowledge of environmental implications of development and utilisation of the Nile resource and how to protect the resource from over-utilisation, water-shed management, fresh water weed control, pollution control and other issues become of primary importance to the project staff (NBWRP Interview, para 6).

Staff of the project is highly technical and specialist. Staff also have experiences in international river basin management, they have also implemented actual cases.
5.6.5.2 Assimilative knowledge

The NBWRP uses a variety of communication strategies to create synergy, enhance collaboration and cooperative development of the Nile resources among the participating countries. Bringing the riparian countries to the dialogue table has been a major accomplishment of the project. The project has been providing institutional support for development. It also specifies the benefits accruing from the implementation of the scenarios and putting together a criteria, methods and framework for sharing the benefits and costs of developing the Nile river resources. These can only be achieved through cooperation. The staff interviewed for this project indicate that the project is knowledge-based. The knowledge-based nature of the project enabled it to commence efforts to cultivate communities of practice bringing major stakeholders to deliberate on issues that touch on the commonality of use of the Nile resources (NBWRP, 2006).

Collaboration: Consultation is crucial to achieving objectives due to the nature of this project. The major aim is to foster collaborative development of the Nile resources and the benefits of this include: greater regional integration, poverty reduction-half the number of the riparian countries are among the world's poorest; food production; industrial development; transportation; environmental conservation and other related benefits. The project recognises that the riparian countries have a long history of touchy issues about the Nile and to overcome the barriers to collaborative development, there needs to be more consultation and participation. A joint forum on the Nile was instituted in 1997 to bring together stakeholders to discuss common issues. The project also recognises that the process of collaborative development requires time and effort and this informs its action on knowledge sharing to create awareness and dispel mistrust, misinformation, and foster a common identity which would form a platform for action (Interview, para 4; NBWRP, 2006).

Knowledge sharing: As a result of intervention, there is increased knowledge sharing and collaboration among the riparian countries. Strategic policies for managing the Nile resources have also evolved where there was none, or refocused where they were inadequate. For reason of confidentiality, a
number of policies are not mentioned in this thesis. Knowledge sharing has been instrumental to creating a greater understanding among the riparian countries. Working groups have emerged, consultative processes started, strategic action programmes, partnerships and various consortia have emerged, all facilitated by the Nile Basin Water Resources Project (NBWRP, 2006).

5.6.5.3 Reproductive knowledge

The project through its knowledge-based activities has been able to encourage the implementation of a transboundary hydro meteorological monitoring network. This has enabled the countries to have hydro meteorological data which is immediately available on demand. With the help of the Food and Agricultural Organisation (FAO) technical and infrastructural assistance has been given to participating countries towards building a common knowledge base for monitoring data.

The project has also been able to oversee the reestablishment and upgrading of about one hundred meteorological stations since its inception. Training programmes and capacity building have also been carried out by the project in a number of countries. In addition, the project group has trained staff to be qualified to operate the technologies. Each country's staff now serve as trainers for their national colleagues who aim to broaden their knowledge about meteorology. A common database has also been established taking into consideration the individual data structures of countries. A common metadata was also instituted and this makes it possible for countries to cross reference and contribute data to the database (NBWRP, 1998).

A major achievement of the project through knowledge dissemination is that all the countries have adopted the data structure designed in an interactive process with respective water management agencies. With the acceptance of the data structure, a lot of historical data has been converted into digital format. Capacity has also been strengthened at national geographic and information systems departments nationally. National and regional workshops have been held as part of capacity building programme, information
technology training, and training on international geographic information systems link up were carried out. All the basin states now have a relevant operational unit well equipped and trained. The project is currently looking into the value and possibility of liaising with research institutions, proprietary software developers, international agencies, and universities to look into ways of cutting costs of information acquisition (NBWRP, 2006).

5.6.5.4 Codified knowledge

The project through its activities has acquired a greater capacity to replicate its projects and further strengthen activities in the Nile Basin. It has further given greater confidence at the level of each Nile Basin country in confronting the complexities of managing resources and tackling issues that relate to utilising the Nile. The countries involved are continually learning from each other and from the pooling of resources, sharing information, collaborative projects and adoption of a uniform data sharing protocol. Knowledge gained from the initiative is stored and exchanged through the information exchange system. Knowledge is codified and shared constantly. Reinvention of the wheel is not going to be common due to the collaborative nature of projects leading to joint and collaborative learning processes. In essence, all the countries know what each other knows at least at the project level relating to the shared utilisation of resources of the Nile.

The ability to represent data in a geographically referenced mode and the capability to convert this into socio-economic and political information enables improved understanding between stakeholders. The project has great capacity to apply what has been learned in future projects. Its technological base is formidable and the people aspect is also well developed. It has also been involved actively in trying to change the cultural dynamics of the region in relation to the Nile. Strategically speaking, the project is sound and well intentioned and garners support from local countries. It therefore has the clout to promote a common front and also provide a platform for unified action and greater integration within the region. This is achievable through knowledge sharing and application of what has been learned in projects.
5.7 Analysis of the hypothesis

The preceding sections have explored the four case studies of this research: Lift Above Poverty Organisation, Nigeria; Jigawa Enhancement of Wetlands Livelihood Project; Water Utility Partnership; and the Nile Basin Water Resources Project. This section would explore the results of the case study as they relate to the hypothesis of this research.

The study hypothesis is "KM in development projects is positively related to (1) innovation (2) completion times (3) project success (4) operational efficiency and (5) the rate of new knowledge generated".

(1) Innovation: The case study interviews above indicate that projects are very much aware of innovative practices that enhance project activity and project outcomes. KM is well accepted as a contributory factor to innovation in the management of DPs. Lift Above Poverty Organisation and the JEWEL project both utilise collaboration and community of practice elements to drive innovation. The Nile-Basin Water Resources Project utilises technology and collaboration for driving innovation, while the Water Utility Partnerships tends to place emphasis on organisational culture, linkages and cross-country network building to share ideas and facilitate innovative practices. Interviews, documentation and other information sources indicate that the CRAI model is relevant to the management of DPs as it relates to innovation. The functions and processes involving the model elements are identifiable in the DPs used as cases, although some of the concepts have different terminologies. Where appropriate, project managers were asked to explain the use of certain terms to ensure accuracy and true depiction by our model elements. The CRAI model elements that are found to be mostly responsible for innovation are Assimilation and Reproduction. These support the findings of the survey.

(2) Completion times: The availability of knowledge requisite for designing and implementing a project is a contributory factor to project completion. Project staff interviewed in the case studies do have perceptions that prove this statement. Projects running on schedule is very important and stakeholders
often demand that projects are delivered on time. Managers interviewed, indicated that sometimes stakeholders show understanding when certain conditions give rise to the extension of the project timing. In the case of the JEWEL project, the lifespan of the project was reviewed after the project had got underway. It was realised that most of the expected outcomes cannot be delivered within the timeframe given. However, at other times projects are expected to meet the target times stringently. Regardless of the situation, the availability of knowledge and its utilisation is key to project implementation.

(3) Project success: The interviews sought to find out the important elements of project success for DPs. The cases used here have different views on project success. However, the project success criteria of each project is tied to the objectives and outcomes of the project. Projects see KM as an enabler useful in driving project outcomes. Common KM practices which projects found useful in driving project success are community, networking, familiarity with best practices, dissemination of information, documentation, communication and motivation. The success or failure of the projects were hinged on the skills of project staff and their abilities to take advantage of local conditions that gave rise to the project (this includes a knowledge of the community).

(4) Operational efficiency: Interviews were structured to determine if KM contributes to operational efficiency. The JEWEL project demonstrated a good level of operational efficiency. The project manager and staff interviewed perceived their project process as efficient. The interpretation process was seen as contributing more to operational efficiency than any other element of the model. This is consistent with the survey results as well. Lift Above Poverty Organisation had a medium level of efficiency as compared with others. The JEWEL project, WUP and NBWRP were all projects which had technical partners who have had a long history of project design and implementation. Besides, their project processes have been institutionalised over the years and this level of organisational culture and staff competence was evident at the project level and through the documentation and interviews carried out on these three projects. LAPO designed and implemented its own
projects although it had donors which held it responsible and accountable for projects. Its level of efficiency is perceived as lower than any of the other project organisations interviewed. However, KM was found to contribute significantly to staff and project efficiency.

(5) Generation of new knowledge: Interviews and documentation sought to find out if KM practices enable projects generate new knowledge. There is a mass of documentation produced by the projects interviewed and these arise from the project process. These documentation provide insight on how projects were carried out and they yield new knowledge. There is also a lot of information existing about the projects both on corporate intranets (this is especially the case with the JEWEL project), paper formats, email, email groups, project blogs and other formats of information. As indicated by the survey analysis, new knowledge is mostly realised during the reproductive and codification processes. Questions were put to managers on whether the projects were seen as learning new things and documenting such knowledge and learning processes. They gave detailed views on the types of knowledge realised during their projects and how these were documented. In the case studies here, there is evidence that projects are creating new knowledge. A consideration of annual reports items on repeatable projects suggests that each year, projects make incremental improvements arising from new knowledge created in previous projects.

5.8 Analysis of the objectives of the study
This section will analyse the case study data as they relate to achieving the objectives of this research.

5.8.1 Objective 1: To investigate the KM practices of DP

The case studies carried out support the fact that DPs do have KM practices. Some projects do have KM plans put into place at the beginning of the project like the case of WUP and JEWEL. However, other projects consciously or unconsciously create an environment and practices that encourage the sharing and utilisation of knowledge. LAPO is a typical case in point here.
Some of the KM practices in DPs include communities of practice, networks, documentation, collaboration, formal and informal meetings, knowledge sharing, technology deployment, progress meetings, post project reviews, leadership, information management, and risk and change management. These are clearly identifiable from the interviews, project documentation, annual reports and other sources of information on the projects.

5.8.2 Objective 2
To find out whether DPs adopt KM-based approaches in their project planning and practices.

Three of the four case studies (JEWEL, WUP and NBWRP) adopted a KM-based strategy during project planning. In practice though, all of the projects had KM-based practices. One of the benefits of adopting a KM approach to project planning at the inception is that it influences project practices and direction. LAPO does not have a consciously adopted KM strategy, but its community based project nature is also a KM aspect. This has been largely responsible for its success. The community based aspect is not a policy but a practice which has evolved over the years in LAPO. The other case studies do have stronger focused KM policies but LAPO's community of practice feature has a stronger drive in project success.

5.8.3 Objective 3
To determine whether these KM practices in DPs contribute to: innovation, timely completion, project success, operational efficiency and generation of new knowledge.

Section 5.7 above has dealt with the analysis of the research hypothesis which has to do with linking KM with innovation, timely completion, project success, operational efficiency and generation of new knowledge.

5.8.4 Objective 4:
To recommend ways in which the KM practices of DPs could be improved if they are inadequate.

In chapter 6, section 6.3, recommendations were made on how KM practices of DPs could be improved.
5.9 Conclusion

This chapter has examined the case studies of this research. Four case studies were used to strengthen the results of this research. They include: Lift Above Poverty Organisation; Jigawa Enhancement of Wetlands Livelihood Project; Nile-Basin Water Resources Project and Water Utility Partnerships. The project managers were interviewed on their perceptions on the roles of KM practices in project design and implementation in DPs. The results of the case studies were analysed using the four constructs of the CRAI model as a basis of analysis. Secondly, project managers' perceptions were sought on the five project deliverables earmarked for this research (innovation, completion times, project success, new knowledge and operational efficiency) and an analysis of the objectives of the study and the hypothesis were done as it relates to perceptions and data gathered from the case studies.
CHAPTER 6
DISCUSSIONS ON SURVEY AND CASE STUDIES

6.0 Introduction
This research set out to investigate the KM practices of DPs and how these could impact on deliverables vis a vis innovation, project success, completion times, new knowledge, and operational efficiency. Having undertaken a survey and four case studies, this chapter will tie in the survey and the case studies with a view to examining their relationships, common grounds, lessons learnt, findings and a number of other relevant issues associated with the research.

In the course of the survey and case studies, similarities and differences in data gathered have been observed and certain trends are familiar both with the survey data and case study data. The survey is meant to give statistical insight and numerical outlook to the research while the case studies brought in the qualitative aspect to balance the research. This gives more confidence on the data and study and enables the researcher and the audience to gain more insight into the nature of the research and the results as well. Conclusions are drawn based on the combination of the mixed (qualitative and quantitative) research methods.

6.1 KM problems
The context of PM is continually shifting due to new markets, economic fluctuations and geographical constraints (Lewis, 1998). Projects have a problem with finding a stable situation to manage knowledge generated during project activity. The major problems observed common to the survey and case studies include:

1. What technologies to use in managing and sharing knowledge within a project. Selecting a knowledge-based PM tool is not easy. The survey indicates an 80% positive response on the usefulness of technology in managing project knowledge. However, an analysis of technology use in the case studies show some gaps in the utilisation of knowledge-based technology for KM. Out of the four cases considered, only
JEWEL and the Nile Basin Water Resources Project incorporate technology as a component part of their project activity. For the rest, technology use for managing knowledge is moderate. The survey identified that a lot of projects utilise or claim to utilise technologies for KM. Maholtra (2005) articulates the dangers of over-reliance on technology for KM. A balanced use of technology for managing knowledge and the understanding that KM is not technology and technology is not KM is required to make good use of KM technology;

2. The lack of a clear definition, purpose and goal of KM is identified in literature as a common problem for organisations. Al-Ghassani (2002) researched on the need for organisations to define their knowledge needs. To define knowledge needs, they would need to understand KM and draw a clear line on what needs to be managed and what needs not to be managed. In section 2.3 of the literature review, it was concluded that organisations do not often draw a line between KM and IM. These two sometimes are interchanged. The survey and case studies gave credence to the conclusions of literature. This research discovered that many organisations are taking to KM in principle. The survey indicates a very general awareness of KM and the benefits. The case studies too reveal an awareness of KM and also show a lack of strategy for achieving measurable results;

3. Definition of success: The criteria for measuring or defining success varies from project to project. Even despite this, there is still an unclear notion of what constitutes success at the end of a project. The survey derived from the model identifies with the four types of knowledge processes as relative to project success (Interpretation, Assimilation, Reproduction and Coding). The case studies too identify with these processes as important to project success, but there tends to be a lack of clarity on indices for measuring success. The model is meant to facilitate a KM intervention in project processes to enable successful execution, it does not interpret or define what constitutes success for each project. The goal of KM is to focus its processes on those goals of the project which are important for achieving objectives. If success
criteria are not spelt out clearly, KM strategies cannot successfully be applied to leverage the project process; and

4. Management support: For KM to take root in an organisation, top management must be seen to support those KM processes that would be beneficial to the project process. The survey reveals a strong element of KM within projects, but does not give an indication of a clear management support of those KM processes. The case study interviews however do reveal that most KM processes are informal, self organising and less structured. Only two case studies (JEWEL and Nile Basin Water Resources Project) have articulated a clear management support for KM and also designed strategies for creating, sharing and codifying knowledge. WUP had a KM objective and plan but it was not apparent how these were supported by management.

6.1.1 Innovation and KM

The role of KM in facilitating innovation is well received among projects surveyed. About 90% of survey responses acknowledge the positive roles that KM could play in fostering innovation. The CRAI model also established a positive and significant relationship between KM and innovation. The case studies have a common perception about how KM could add value to the innovation process. The following are some of the similarities in data discovered between the survey and case studies:

**Social process:** Observed case study data indicate that social processes of knowledge creation are very significant to the innovation process. Social capital generation and the existence of communities of practice are very essential for innovative processes within projects. Survey data also confirm this tendency. About 87% of projects perceive group knowledge generation in communities of practice as very vital for project success and innovation. Communities of practice are a KM tool. Lift Above Poverty Organisation, one of the case studies, makes use of communities of practice as a potent tool for project execution and organisational learning. KM practices are therefore viewed as very crucial to the project process. Projects essentially realise the importance of KM in their project process whether they directly practice KM or
not. In the researchers estimation, this realisation is very important to creating a shift towards a knowledge-based PM paradigm. The Nile Basin Water Resources Project also builds its model of project execution on dialogue, collaboration and cooperative execution. This has worked well in this circumstance given the political and cultural issues at stake for the project.

**Incremental innovation:** The commonest form of innovation found within DPs is incremental (Marquis, 1969). This does not imply that radical shifts in productivity do not occur in DPs. They do and continue to occur, however, in the day to day running of DPs, new ways of doing things continue to emerge. 78% of surveyed projects do indicate a continuous improvement in services and delivery of products. Case studies clearly emphasise this point further. Staff of JEWEL acknowledged improving on their services and delivery as projects continue to run. This incremental innovative capability is hinged on the sharing of knowledge, improved communication among clients, stakeholders and project staff. Workplace learning is innovative in conception and indicates the increase in capacity of the organisation itself (Matthews, 1999). Again the impact of knowledge sharing cannot be overemphasised.

**Radical innovation:** This dimension of innovation within a project is mostly found in this survey among New Product Development projects. Data collected shows that New Product Development projects are more familiar with the process of developing something new. Literature also confirms this (Robertson, 1974; Buckler, 1997; Udwadia, 1990). On the other hand, a variety of other projects in construction and information technology are very active in radical innovation.

### 6.1.2 Project Success and KM

This research has established that it is generally accepted that KM leverages capacity and enhances success. A correlation and regression of the model against project success gives a clear indication that KM is a key factor towards project success. This result is tested out also in the case studies and it held out.
**Measuring success:** The success tripod (Time, Cost and Quality) still remains the most important measures of success for DPs. The rate of knowledge generated during a project is a factor to its success. Ironically though, there is an increased tendency towards developing internal measures of success unique to the project. Project managers interviewed, all have different perceptions about what constitutes success for their project. KM is beginning to be sounded out as a major indicator of project success (Bresnen, Goussevskaia and Swan, 2003). Having a strategic plan of managing project knowledge and how to carry this over to future projects reflects a measure of success for the project. Knowledge-based projects would include KM processes of the project as a major index for measuring success. On the whole, there appears to be a lack of convention on KM measures and how this impacts on project success. Because KM deals with intangible resources, there is a difficulty putting it down as a measurable resource within the organisation.

**Knowledge sharing:** A correlation of project success and knowledge sharing takes on a positive but weak relationship. What this implies is that knowledge sharing alone cannot guarantee project success. There needs to be strategic utilisation of what is shared and focused on project objectives. The case studies also reveal that organisations do acknowledge the roles of KM in project success but the researcher did not observe neither was he told of any strategic plans to utilise knowledge generated during the project process. A strategic KM plan would include how to create and share knowledge and also how to manage what has been shared. KM should be systematic to make sense in organisations.

### 6.1.3 Project completion time and KM

Finding out whether KM affects the completion times of projects is not a straightforward process. Staff of projects surveyed, and those used for case studies were asked to provide their views and perceptions about utilising knowledge to carry out projects faster. Conversely, this involved letting them air their views on the implications of not having the required knowledge and the combinations of knowledge, insight and expertise necessary for carrying
out the project. The feedback always paints a grim picture for the project assuming there is an absence of requisite knowledge. So with requisite knowledge, a project can complete faster and with an appropriate KM strategy in place, a project's chances of completing on time are greatly enhanced. A KM strategy often includes a knowledge-mapping of the project. Knowledge mapping examines the internal dynamics of the organisation and determines what knowledge the project needs, where they are, who have them and strategies for harvesting such knowledge. It also recommends technologies that would be appropriate for leveraging knowledge within the project.

It is therefore not a surprise that projects are overwhelmingly positive about the roles of KM in helping projects complete on time. The more knowledge project staff have at their disposal, assuming there is a strategic intention to manage and share knowledge, the faster projects would be completed. The four case studies were unanimous in voicing their perceptions on the benefits of KM towards completion times. Some of the staff interviewed narrated how previous project execution used to be slower than what is obtained now. When asked the reason why there are improvements in meeting deadlines, their responses could be pinned down to a number of factors:

1. Increased knowledge;
2. Improved infrastructure;
3. Increased capacity and experience;
4. Organisational learning; and
5. Technology

These are factors linked to KM. Literature also supports the trend of response data gathered (Argyris, 1978; Garrick, 1998; Kerzner, 2001; Sena, 2000).

6.1.4 KM and operational efficiency

Majority of surveyed projects aim to achieve a level of efficiency that enables all project departments to run smoothly. Case studies and the survey indicate that efficiency boils down to various areas of PM: design and development; people management; documentation; knowledge sharing; strategy; competition; organisational learning; process management; and technology selection, deployment and use (Nguyen, Ogunlana and Xuan Lan, 2004;
Sena and Shani, 2000; Agarwal and Rathod, 2006). Organisations surveyed and studied actually have problems achieving optimum performance. There is a difficulty defining what point the organisation is performing efficiently. The internal operations of the projects need to be consistently integrated and focused to impact on the project objectives. The implication is a bridge building KM strategy that would align major forces within the organisation, combine knowledge, integrate competences, and deliver required outcomes.

The goal of KM is to assist the project process make meaning out of the information flowing in and out of the project. The survey seems to be particularly strong on operational efficiency of projects through KM utilisation. Careful project planning is the best lever for efficiency. Few project managers would argue against the case of optimising the efficiency of projects but few are actually willing to invest sufficient time and resources to actualise this. In the same vein, few managers would argue against the usefulness of KM in impacting on efficiency of operations however, when getting down to earth about KM programmes for a project, there is little evidence to suggest a conscious and strategic effort towards managing knowledge. Staff of projects interviewed acknowledged that operational efficiency is at the heart of quality projects. Lift Above Poverty Organisation particularly has a quality assessment procedure which incorporates knowledge of past project procedures into current ones. JEWEL incorporates quality planning at the design stage of each project, yet it does acknowledge having difficulties leveraging knowledge from other projects especially if staff have dispersed or staff have resigned or moved on. For the Nile Basin Water Resources Project, there is a strategic objective to continually increase quality of service delivery through capacity building. Technical support from donors have enabled the training of staff nationally and staff trained in turn become facilitators. This has enhanced the level of efficiency of service.

Planning for efficiency could involve KM considerations as it relates to the product quality, effective project process and staff involvement in the project. The CRAI model correlates strongly with efficiency, giving hints that KM is crucial to achieving operational efficiency.
6.1.5 Best Practices

A number of project practices could be regarded as best practices but this research identified about five practices which run common to projects and are qualified as best practices. These are: planning; time and cost estimation; and scheduling and organisation (process). These five constitute the major PM best practices observed through the course of this research. Other best practices could include: scope definition; stakeholders definition; standards; outlining of constraints; risk analysis, Strength Weakness, Opportunities and Threat Analysis (SWOT); and clear goal orientation. Furthermore, financial planning is often a very important best practice because this constitutes an important area of the project. Case studies are split in their perceptions about the most important best practice of the project organisation. A number of the organisations highlighted planning as the major plank of their project best practice. The perception differs from organisation to organisation but in all, project managers often know the best practice on which their project success hinges most.

The perceptions of the project organisations on how KM impacts on their project best practices also differ, though there is a general consensus that KM is of relevance in leveraging best practices. Best practices like project planning could benefit more if they could be embedded in KM processes. From interview data, it was gathered that the role of KM in leveraging best practices has more to do with facilitating effective collaboration between teams, availability and interpretation of information as and when needed, the contextualisation of knowledge and relevant pieces of data, capture and storage of project memory and seeing ways these can be applied to projects. Increasing the capacity of project staff to grasp the complexities of the project and facilitating decision-making processes require access to and understanding of issues related to the project. This is a function of a good KM project. Organisations agree with the researcher that KM should not be overlooked but should become part and parcel of project planning.
The researcher noted an increasing awareness of KM benefits to best practices in PM. Organisations are beginning to make conscious efforts to manage what they know. Management meetings are beginning to adopt the nomenclature of KM. Most staff of organisations used as case studies look at conferences and seminars as opportunities to share knowledge and learn from each other. A culture of openness is also predominant in PM more than you could find in functional organisations.

6.1.6 The interplay of the model in survey and case study scenarios

This section examines the relationships and rankings of the model in survey and case study scenarios using a Grameen Bank (2000) project perception evaluation technique. This technique makes allowance for researchers to rank perceptions in surveys and case studies based on the rate of positive or negative response to each variable. Numbers are assigned between 1 and 50 for each variable and these together sum up to 100. This is a simple method similar to asking respondents to rank their attitudes on a scale of 1 to 10.

Table 6.1 represents the rankings.

<table>
<thead>
<tr>
<th>Elements</th>
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<th>Assim</th>
<th>Reprod</th>
<th>Coding</th>
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<td>20</td>
<td>26</td>
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<td>Case Study 2</td>
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<td>Case Study 4</td>
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<td>Survey</td>
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</table>

The table shows an analysis of organisations on the CRAI model during the case study and survey. Each project organisation has a different application of KM strategies within its project. The table above demonstrates how KM practices could differ from organisation to organisation. For example, case study one concentrates on reproductive knowledge. Its major strength lies on the ability to reproduce project specifications to the finished product. The reasons may not be farfetched: The organisation lacks technological capacity to enable network communication and virtual collaboration which is becoming
a fast evolving medium of peer to peer communication in DPs. Secondly, the
dependence of this organisation on donor funds makes it implementation
oriented. There is the pressure to produce results which are the final products
rather than actually concentrating on knowledge producing activities of the
project. In the process, knowledge could be lost and the core
interconnectedness and building of relationships which is a major component
of project activity might be lacking. However, the organisation is membership
based and assimilative knowledge has also become a major strength. Face to
face meetings and communities of practice replace technology effectively in
leveraging project knowledge and enhancing organisational learning.

On a general note, project organisations are becoming more assimilative
knowledge-based. This means a major shift towards collaborative PM.
Participative project leadership is becoming very popular in PM. As could be
seen above, assimilative knowledge and reproductive knowledge are the
major focus. How to combine what is known and using it to produce results is
the major concern of projects. However, this bias has implications. Projects
neglect codifying their knowledge. In essence, most lessons learned in PM
activity is not captured and codified for future reference. Projects do not also
pay much attention to initial planning, risk assessment and scheduling than
they would to implementation. A lot is wrong with this type of PM approach.
There would be much failure in project execution as well documented in
literature and secondly, knowledge generated during projects would not easily
be available for other projects. So, projects would not learn as much as they
are needed to for sustainable project activity.
6.1.7 Perception Analysis of case studies and survey

Table 6.2 utilises the Grameen Bank (2000) project evaluation technique as used in the preceding section to rank perception on survey and case studies.

<table>
<thead>
<tr>
<th>Elements</th>
<th>Case study 1 (%)</th>
<th>Case study 2 (%)</th>
<th>Case study 3 (%)</th>
<th>Case study 4 (%)</th>
<th>Survey (%)</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation</td>
<td>15</td>
<td>18</td>
<td>15</td>
<td>22</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Best Practices</td>
<td>25</td>
<td>20</td>
<td>19</td>
<td>15</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>Efficiency</td>
<td>21</td>
<td>30</td>
<td>14</td>
<td>25</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Completion Times</td>
<td>20</td>
<td>25</td>
<td>19</td>
<td>15</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>22</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Project Success</td>
<td>28</td>
<td>23</td>
<td>17</td>
<td>17</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

(Method adapted from Grameen Bank Project Evaluation Technique, 2000).

From the table information above it could be deduced that innovation, project success, efficiency and best practices are at the top of the agenda for DPs. Project success is important, although objectives will differ from project to project. Some project might emphasise different indices other than simply “project success”. This doesn’t diminish its central role in project design and management. What it implies is that sometimes, other factors become the major drivers in project management. Success comes at the end of the project and is relative to the clients criteria. Sometimes innovation occupies a more central place in project delivery than project success. The aim of a project is not just to deliver a product, but to deliver a product which would be innovative and competitive too. The emphasis is shifting from doing things the way it is always done, to doing things in new ways through the discovery and use of new knowledge.

The survey data analysis has linked the CRAI model to each of the variables in the table above. KM is a factor in leveraging innovation, new knowledge, efficiency, completion times, and project success. DPs stand to gain from the
adoption of KM principles in managing every step of a project. The five deliverables have been found to be very important to projects as is deducible from the survey and case studies. As could be seen from the table, innovation was found to be ranked highest in their list of priorities by projects in the survey. Case study four (Nile Basin Water Resources Project takes a second place in prioritising innovation. Case Study one (Lift Above Poverty Organisation) ranks highest in prioritising best practices. This means its knowledge sharing practices are focused more on improving best practices with the rationale that an improvement of best practices would hopefully spur innovation and project success. Case study two (JEWEL) focuses on building collaboration and efficiency. For this project, the speed of transfer of knowledge from one project to the other and the adoption and replication of models of service delivery is a major preoccupation. The prioritisation of collaboration and efficiency is understandable in this context. Projects need to be delivered with quality given the peculiarity of the JEWEL project and the continuous movement of staff from one region to the other. Deadlines are therefore an important aspect of each project. Lift Above Poverty Organisation (Case Study one) ranks highest in prioritising knowledge sharing. Its membership orientation, community base and dialogue features clearly communicate this intention. There are communities everywhere within the organisation and this puts knowledge sharing at the front of the agenda.

6.2 KM Practices
The KM practices of DPs were investigated in the survey and the case studies. The following are found among others, to be common within the survey and case studies:

1. **Documentation**: DPs document in practice or in principle, the processes of project execution, lessons learnt, problems of the project, results of stakeholder consultation, reviews, evaluations, and other project activities. Documentation as a KM practice aims to present knowledge in a durable format for consequent consultation;

2. **Communities of practice**: Communities of practice were found to exist in DPs and project managers are very keen to harness the capabilities
of COPs for project benefit. The benefits of communities of practice have been documented in literature elsewhere;

3. Networking: The survey and case studies show that projects are active in networking both within and outside the projects. Networking enables a project access knowledge which would not otherwise be available to the project if it keeps to itself. The rate of technology use among surveyed projects and the case studies also show the drive for information and knowledge to support decision making among projects;

4. Information management: Generally, DPs surveyed and used for case studies recognise information management as crucial to their activities. The JEWEL project came across as having a strong information management feature. At the beginning of the project, there are very formal information management planning as indicated in the case study interviews and documentation;

5. Lessons learnt repositories: DPs due to the need for sustaining the benefits of the project beyond its life, document the lessons learnt from the project. This practice was found common to the survey and case studies;

6. Leadership: It was discovered within the surveys and case studies that leadership is a very important KM practice. Development project leadership has to encourage knowledge creation and sharing to enable the team get motivated to share what they know; and

7. Technology: Various technologies are in use in DPs as has been analysed in the survey and case studies. Collaborative technologies (groupware, email groups and content management systems), Integrative technologies (Internet, web portals and intranets) and Search/retrieval technologies (databases, agent technologies and the Internet/intranet) are used by DPs for their project processes.
6.3 Improving KM practice

Although the survey provided a free text area for managers to provide their perceptions on what could improve their KM practices and their ideas about the ideal KM scenario, the case studies proved to be more useful in gathering information on what could improve KM practices of DPs. The following are areas which were identified during interviews for improving KM practices in DPs:

1. **KM Leadership**: Providing a leadership for a KM initiative in DPs is seen as critical to improving KM practices in DPs. Leadership would help provide a direction for a KM initiative. The case studies proved vital in recognising this factor. Project managers are optimistic that when staff see them as encouraging knowledge sharing, this would positively affect the exchange and sharing of knowledge. The survey provided a background for further investigation of this factor within a case study scenario. Some of the staff interviewed in the case study projects were of the opinion that leadership provides a great advantage for encouraging KM practices;

2. **Knowledge mapping**: This is seen as a precondition for implementing a KM agenda. The JEWEL project carried out a consistent knowledge mapping of their proposed project. This included finding out knowledge critical to the project and where they likely reside, who has such knowledge and how to leverage this for corporate benefit;

3. **Appropriate technology**: The results of the survey strongly indicate that DPs take technology seriously. The case studies confirm this. The case studies go further to indicate that technology decisions are not made with adequate consideration of the KM processes of the project. Sometimes decisions are made based on what is convenient and not what is necessary. It is important that the technology needs of a development project are diagnosed at the interpretative knowledge stage of the project to enable these to be implemented through the whole project process. The case studies and survey also show that technology is not as important as people considerations in a development project;
4. **Effective and relevant information management system:** DPs need to put into place effective information management systems to enhance KM practices. Information management is a preliminary stage to KM. What this implies is that IM is part and parcel of KM. The survey provided ample opportunity to investigate the information management practices of DPs. The CRAI model provides a context for applying information management systems in DPs;

5. **Make the project cycle knowledge-driven:** Project managers were of the view that the basic instrument for managing DPs—the project cycle should be knowledge-driven to make any impact. The implication is that KM processes should be embedded in the project process (cycle) and in this way, the project process would be knowledge intensive and knowledge focused. The CRAI model is designed to enable a knowledge-based management of DPs. It aims to leverage knowledge within projects using existing and familiar project processes—the project cycle. The results of the survey confirm this basic idea. The CRAI model was linked to all project outcomes selected by this research. The case studies analysis as well confirm that utilising the CRAI model could enable KM practices in DPs;

6. **Contextualise knowledge:** Knowledge must be put into the context where it makes more meaning—DPs. Improving the KM practices of DPs would require designing strategies to situate knowledge within relevant contexts. One of the practices the JEWEL project undertook was to define the knowledge needed and what contexts such knowledge are situated; and

7. **Community building:** Collaboration is a major feature of most DPs surveyed or used for case studies. Using communities to leverage project knowledge is a way for improving KM practices. However, one of the problems identified was that project community efforts were not being channelled by project leadership towards desirable ends.
6.4 Conclusion

This chapter has provided a link between the survey and the case studies. It examined the problems common to both, the project deliverables and the features they take within the survey and case studies. It also provided an insight into the relationship of the survey and case studies to the CRAI model and performed a perception analysis of both in relation to innovation, best practices, efficiency, completion times, knowledge sharing and project success.

Projects by their nature are transient and this makes the creation and utilisation of knowledge much more urgent. The pressure to provide products and services in new ways is much higher today than previously and this justifies the need to constantly renew and reuse knowledge to achieve innovation, best practices, efficiency, faster completion times, and project success. The results of this research are proving very crucial to the management of DPs because it provides an insight into the need for projects to take on board strategic KM practices to achieve desired results.
7.1 Introduction

Knowledge management in development projects is aimed at discovering the role of KM in helping the management of DPs to achieve project success, faster completion times, efficiency, innovation, and generation of new knowledge. It also aims at investigating the KM practices of DPs with a view to suggesting ways of improving these practices. A KM model (The CRAI model) was developed by this research with a view to discovering the KM focus of projects. The model was developed after consideration of the traditional PM process and KM dimensions. These were merged together to develop the CRAI model. The basic assumption is that the PM cycle is a knowledge generating process.

In developing the model, this research discovered four types of primary knowledge needed by DPs for successful execution. These constitute the elements of the CRAI model. Various other sub-elements of the primary four were developed to help in mapping the KM orientation of organisations. These are regarded as KM indicators. Using literature, a survey and four case studies, the research provides an insight into the interplay of KM processes within DPs and how these affect the five deliverables of this research which were identified as being very prominent PM expectations.

KM in DPs surveyed one thousand DPs across eight world regions and covers eleven development project areas. The data was collected through a web-based questionnaire posted to the researchers project website. An email was sent to each project contact selected with a link to the web questionnaire. The survey achieved a 30.3% (303) response rate. The data gathered was analysed using quantitative analysis tools (SPSS) and techniques (regression, correlation, hypothesis testing, analysis of the model and other general analysis themes).
Furthermore, to consolidate and strengthen the results of the survey, four case study scenarios were carried out in Nigeria, Senegal and Uganda. The research applied the model within these case studies and also compared the results of the survey data with the case study data.

7.2 Research Overview

KM is as relevant to development PM as it is to the corporate sector. This research discovered wide-ranging KM practices both formal and informal in development project practice. It also collected data on the four kinds of knowledge (Interpretative, Assimilative, Reproductive and Codified) at work in development project organisations. Finally, it analysed data gathered on KM in DPs to determine the level of influence of KM on such variables as project success, completion times, innovation, efficiency and best practices.

The aim of this research was to investigate the KM practices of DPs to discover if they contribute to expected project outcomes or not. This aim was pursued by the use of a mixed research (quantitative and qualitative) method. It was seen as the best option to give the researcher the most opportunity to test out the model in project scenarios. First, the quantitative studies carried out were done because it was perceived that since KM is a relatively new concept and discipline, it was necessary to start out with a quantitative overview of the subject under research. This would enable the research test the perceptions of projects on KM generally and specifically. Secondly, there are no known quantitative researches in KM in DPs. The researches well-known in KM studies have been ethnographic in nature and not quantitative. Third, qualitative studies were included to give a more detailed perspective of KM. The use of four case studies as opposed to just one, was felt to enable the possibility of misinterpretation of research findings to be minimised. The four projects studied were Lift Above Poverty Organisation (LAPO), Jigawa Enhancement of Wetlands Livelihood Project (JEWEL), Water Utility Partnerships (WUP), and Nile Basin Water Resources Project (NBWRP). The data collected come from project actor interviews,
public and private documents, expert assessments, internal project evaluations and donor project evaluations.

The research aim was broken down into four objectives. The first objective was to investigate the KM practices of DPs. It was assumed that the management of DPs do have KM practices whether formal or informal. Such KM practices need to be investigated and leveraged consciously to enable projects maximise their potentials. This objective was pursued through the use of the survey and case study interviews to demonstrate insight gained from literature review. It was anticipated that the findings relating to KM practices in DPs would be generalised to be representative of all aspects of the management of DPs. Thus, KM practices in DPs add value to the project organisation. It is a function of a conscious effort by management to utilise knowledge creation and sharing for leveraging project objectives.

The second objective was to find out whether DPs adopt KM approach in the project practices. The second objective was pursued through some parts of the survey questionnaire which asked specific questions on the perception of project managers and staff on whether the project adopted KM practices in systematic ways. The second objective was further pursued through specific questions in the case study schedules which were designed to gather data on staff awareness of KM requirements and practices within the project framework. Project managers gave their views on the projects stand on KM and systematic ways the project has adopted to manage its knowledge.

The third objective was to determine whether these KM practices in DPs contribute to: innovation, timely completion, project success, operational efficiency and generation of new knowledge. This objective was pursued through the use of certain aspects of the questionnaire to gather data on what project managers perceived as the role of KM in facilitating innovation, timely completion, project success, operational efficiency and generation of new knowledge. Project managers were at a vantage position to give informed opinion and facts on these project deliverables. The case study interviews also pursued this objective through asking managers to describe
how creating and sharing knowledge in the project helps in achieving project outcomes.

The fourth objective was to recommend ways in which the KM practices of DPs could be improved. This objective was pursued through the design of the CRAI model and testing this within the survey and case study scenarios. The CRAI model was analysed through reliability tests, correlation of the model elements and regression. These series of analysis were to determine that the model fits the data gathered and that there are no inconsistencies. The case study interviews were designed with the CRAI model as a guide, to apply and find out ways in which this model could help projects create, leverage and share new knowledge. The CRAI model is a result of an effort to enable projects improve their KM practices and bring a systematic approach to these practices. The results of the survey also give an idea on ways in which DPs could improve their KM practices. Finally, the case study interviews also enabled the researcher find out what could improve project’s KM processes.

7.3 Research findings
The following findings were made during the course of the research and analysis of data:

Innovation: What constitutes innovation in a development project is relative to the project itself. There are often no widely accepted measures of innovation in a project. However, there tends to be a general consensus that innovation relates to discovering new knowledge and utilising this to develop and produce new services which could give the project a competitive edge. Knowledge management appears to be responsible for driving innovation in DPs. As surveyed, KM has a greater potential to facilitate innovation than other PM drivers. There is an increased shift towards a knowledge-based PM within DPs. New Product Development projects have more radical innovation projects going on than any other area in this survey and case study. In this survey, KM is positively related to innovation and has been found to be a major driver.
**Knowledge sharing:** DPs do have knowledge sharing capabilities. Knowledge is constantly being created, shared and utilised but what is lacking within projects is a strategic thrust in managing what the project knows. Social interaction in project activity result in the exchange of knowledge and the interplay of actors, the functions of obligation, trust, mutuality and common language and shared context foster the creation and sharing of knowledge. Projects increasingly have communities of practice, networks of practice and collaborative interactions. Management has become very conscious of the need for collaboration during the project cycle and this is based on the view that knowledge sharing is a catalyst for successful project innovation. Project knowledge is not limited to what is known by the organization. Projects now utilize various other networks to harvest knowledge needed for successful execution of projects.

**Technology:** The most important technology used by projects are web portals (70%), email groups (69.1%), Content Management Systems (61.5%), groupware (50.8%), Internet and intranets (50%) and databases (49.8%). The case studies did not mostly have a technology strategy for managing knowledge created within the project. Web portals are still the most dominant range of KM technologies within the case studies. Other technologies are in use in DPs and they include email groups, CMS, groupware, Internet and intranets, databases and agent technologies. Projects are not limited to the choice of certain KM systems. It was discovered that projects do not have a KM-technology policy, rather the choice of technology for the project is dictated by other PM factors like costing, scheduling, PERT analysis and CPM. Technologies that have core PMS functions are mostly in use in development PM, however they do incorporate elements of KM like collaborative scheduling (Outlook; Outlook Express). Overall, there is a low use of technologies specifically made for enhancing KM functions within a project. The current practice is adapting existing tools to support KM roles and this has limitations.
**Project success:** Project success is relative. However, the majority of projects do claim to succeed but when measured against other indices, there are indications that what constitutes project success mostly is meeting schedules, cost, and client requirements. The CRAI model proved useful for using KM to leverage project knowledge which leads to project success. Among projects surveyed, there is a whole lot of different views on what project success means. A standard metric for measuring success does not exist and may probably not exist as long as PM is concerned. What is observed though is that projects do have internal methods of evaluating success. Lift Above Poverty Organisation has adopted the Grameen Bank model of project evaluation and this works best for them as various other models have been experimented with.

**Best Practices:** No standard best practices exist, but each organisation adopts what works best. Some of the organisations interviewed, regarded KM as a core best practice for successful project execution. Other best practices include scheduling, planning, human resource management, time and cost estimation. KM leverages best practices and this has an effect on the productivity of project staff. Projects surveyed, had an above average (68%) knowledge of what constitutes best practices in their respective fields of knowledge. The survey yielded positive results on the relationship between KM and PM best practices (PMBP). The case studies also proved knowledge sharing to be a significant factor in acquiring best practices both at individual and organisational level.

**Completion times:** KM has been proved a factor in speeding up the project process. The more knowledge available to projects, the faster decisions are made and this speeds up the project process. As a result, projects are completed much more on time. One of the case studies observed that certain projects which used to take a 14 day cycle has been cut down to 7 days. A combination of technology, capacity building, and knowledge sharing was responsible for this drastic decrease in the length of time it takes to perform those operations. Organisations which know what knowledge they need and where the knowledge resides have more likelihood of timely completion of
projects than those organisations which do not map their project knowledge appropriately.

**Efficiency:** This relates to optimising the resources available to project organisations. Utilising knowledge for operations like scheduling cuts down staff time and minimises waste. Procurement practices relying on efficient KM practice would save the project a lot of money. Reasons are that prices of project materials and infrastructure vary across regions, time and space and having a good knowledge of where to buy and also a comparison of prices would help projects make the best decisions on pricing. A project would be effective if it delivers quality products at lower costs, time and also meeting client specifications. Projects are very positive that knowledge sharing especially during conferences and seminars enables them to have a wider perspective about the project market and also creates links with other actors in the field. This brings immediate and long term benefits which help the project optimise their resources effectively.

**The model:** The CRAI model is found to be relevant to project KM needs. This research tested the four types of project knowledge postulated at the beginning of this research (Interpretative knowledge, Assimilative knowledge, Reproductive knowledge and Codified knowledge) within survey and case study scenarios. The results prove that organisations go through these cycles of knowledge during the project cycle. This does not mean that these constitute different phases or cycles of knowledge for a project to undergo. However, it was discovered that some of this could run concurrently within the project and so does not really have any stipulated cycle. Some exceptions were discovered though. Some of the project processes discovered in the case studies were diagnosed to have inadvertently utilised the same sequence of knowledge for their project design and execution. So the CRAI model is typical of what knowledge process projects undergo.
7.4 Recommendations
The recommendations made in this section are based on the research findings which are as a result of the chosen research methodology. It is recommended that care is taken in implementing the recommendations. The researcher recommends further research, ethnographic and action research methods to either reject or confirm the research findings. There are not many mixed researches carried out in KM in DPs, so there is the need for further studies.

1. DPs should begin to design KM strategies as part of PM systems. KM should be seen as a component part of PM to make sense. The nature of PM which includes collaboration makes KM essential.

2. KM should be included as part of the PM Body of Knowledge. It should be regarded as a specific PM area of competence. This would enhance project success and innovation.

3. Knowledge sharing should also be included in the list of critical success factors for the management of DPs. The research confirmed that knowledge sharing is pervasive in the management of DPs. There is therefore a need to give KM a prominent position in PM.

4. DPs should pay closer attention to technology at the design stage of the project. There is some evidence in the case studies suggesting that technology decisions are made on the fly during PM. The technology projects can adopt to maximise knowledge and create innovation would make significant difference in project outcomes.

5. It is recommended that development PM should pay closer attention to the existence of communities in the project. Management should be seen to encourage the growth and development of communities of practice within the project as this holds the potential for creating and leveraging innovation, best practices, project success, knowledge sharing, efficiency and faster completion times.

6. DPs should look into adopting and experimenting with the CRAI model of KM to enable them to gain the benefits this model could bring to PM.

7. A development project should begin with mapping essential knowledge needed by the project, determining where these knowledge lie and how to leverage them.
8. Development project staff should be required to have competence in networking, knowledge sharing, contributing to a knowledge repository and having expertise on where critical project knowledge resides before being taken on in the project.

9. Projects need to make a difference between knowledge sharing and KM as this research has discovered that both are not one. These are different concepts. Knowledge could be shared without being managed effectively. There is a whole lot of knowledge sharing going on within PM but whether these knowledge are actually managed and utilised effectively remain a subject of further study. Projects should therefore concentrate on effective management of knowledge to achieve project success. In doing this, the people and technology dimension, the strategy and culture dimensions should be taken into consideration.

7.5 Limitations of the study

This study had a number of constraints:

(1) Investigating Sub-Saharan Africa in development activity is a difficult area due to the low level of technology, poor infrastructure, conflict, low level of education, ignorance and difficulty in collecting data. This informed the use of four case studies as well, because the researcher considered the difficulty of visiting various organisations in relation to transport, poor technology and willingness to provide information.

(2) The survey aspect of the study is limited by the structured nature of the questionnaire which only allowed respondents to give certain information. This limitation has been discussed in chapter 3 on research methodology.

(3) The data analysis of the survey achieved very high results which might raise questions regarding validity and reliability. However, the reliability and validity of data was tested before proceeding to analyse the data gathered. The researcher is satisfied that given the prevailing conditions under which this research was carried out and challenges of the development project
sector, the results are justified and useful. The researcher however, is issuing a caution in utilising the results of this research without further confirmatory studies to prove or disprove the findings.

7.6 Contributions to knowledge

This research provides the first opportunity to study and survey KM in DPs in this level of detail. The descriptive case studies are significant contributions to knowledge in their own right and the survey of three hundred and one projects in eight world regions is a significant contribution to knowledge as no other research has ever carried out a large survey as this in this field of knowledge. In addition this research contributed to existing knowledge by:

- Strengthening and furthering the theoretical understanding of KM in DPs by applying quantitative and qualitative methods;
- Developing a novel KM model which enables a rigorous examination of DPs;
- Providing evidence on the impact of KM on DPs relating to innovation, project success, new knowledge creation, completion times, best practices and efficiency;
- Identifying the forces within development PM which encourage or discourage the implementation of a knowledge-driven PM;
- Developing potential solutions to the problematic issues identified in development PM as they relate to KM; and
- Providing a future direction and clarifying the agenda for KM in DPs.

This research had a number of unexpected findings. The general KM notion is that project success is directly related to knowledge sharing. This is very true in some sense, but the survey provided a weak direct positive relationship between knowledge sharing and project success. Knowledge sharing has to be strategic and focused to make sense. This unexpected finding was further explored during the case studies and it was found out that knowledge is constantly being created and shared within projects but still many projects are failing. Where the real problem lies for DPs is how to contextualise and utilise such knowledge for useful project ends. In essence, projects are struggling on
what to do and how to manage what they know for purposeful project activity. This research has therefore discovered a difference between knowledge sharing and KM. Knowledge sharing is a component of KM. One is not the other and both are not one.

The problems of PM on how to adopt the right technology, foster a good organisational culture, leverage people knowledge and adopt the right strategy militate against KM in DPs. The solution lies in adopting the CRAI model which recommends mapping project knowledge using the four cardinal types of knowledge (interpretative knowledge, assimilative knowledge, reproductive knowledge and codified knowledge) which are embedded in the four enablers of PM namely, culture, technology, people and strategy.
References


Appendix 1: Survey Questionnaire

Knowledge Management in development projects
Survey Questionnaire

Please indicate which type of project you are currently working on:
- Construction
- Water and Sanitation
- Education
- Technology
- Social services (health, etc)
- Sustainability
- Information
- Women Welfare
- Children and Youth Services
- New Product Development
- Design.

If others not mentioned here please indicate in the text field below....

--------------------------------------------------------------------------------------------------------

What is the number of staff on the project?
- Less than 10
- 10-20
- 21-30
- 31-40
- 41-50
- Over 50

What is/was the duration of the project?
- Less than 1 year
- 1 Year
- 2 Years
- 3 Years
- 4 Years
- 5 Years
- More than five years

Please provide your email address if you would like to receive an executive summary of this report
Please tick the KM technologies that your project uses to manage knowledge and information.

- Website portal
- Intranet
- Internet
- Groupware
- Agent Technologies
- Content Management System
- Email Group
- Database

Which of these tools do you use to communicate with colleagues during the project? (Please tick all that apply)

- Email
- Telephone
- Mobile
- Bulletins
- Message Boards
- Chat
- Text Messages
- Newsletters
- Groupware

In which region is your project operating?

- Europe
- North America
- Latin America
- The Caribbean
- Sub-Saharan Africa
- North Africa
- East Asia
- The Pacific
- Central Asia
- South Asia
- Australia
- Middle East

What is the status of the project at the moment?

- Completed
- Ongoing
What role do/did you play in the project (Please tick all that apply)

- Manager
- Assistant Manager
- Facilitator
- Director
- Team Member

What is the size of the project?

- Small
- Medium
- Large

Please respond to these statements to the degree that they relate to your project at the identification stage.

<table>
<thead>
<tr>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>We consider a KM process at the initial stage of the project</td>
</tr>
<tr>
<td>Change management is a factor in our project planning</td>
</tr>
<tr>
<td>We conduct a risk analysis of our project at the planning stage</td>
</tr>
<tr>
<td>We estimate the time necessary for completing various aspects of the project</td>
</tr>
<tr>
<td>Our project defines what constitutes success for this particular project</td>
</tr>
<tr>
<td>We reviewed similar project reports/lessons learnt in the past before planning this project.</td>
</tr>
<tr>
<td>We also conduct feasibility studies at the commencement of the project.</td>
</tr>
<tr>
<td>We consider the experience and qualifications of staff seriously before assigning them to any project</td>
</tr>
<tr>
<td>Best practices are a very important aspect of our project considerations</td>
</tr>
<tr>
<td>We had information management plans put into place at the beginning of the project</td>
</tr>
</tbody>
</table>

Please respond to these statements to the degree that they relate to your project at the preparation/development stage.

<table>
<thead>
<tr>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was/is a lot of team work during the project</td>
</tr>
<tr>
<td>Team members helped each other learn on the project and newcomers especially were able to learn from others on the job.</td>
</tr>
<tr>
<td>We held/hold regular progress meetings to review work done, brainstorm and to correct mistakes and also plan ahead for the project.</td>
</tr>
<tr>
<td>There was the presence of informal groups/communities within the project.</td>
</tr>
<tr>
<td>Team members are also allowed and encouraged to communicate with other similar external projects to gain knowledge.</td>
</tr>
<tr>
<td>Project team members are encouraged to share what they know and there are technologies that encourage them to document and share (please also complete the KM technologies section).</td>
</tr>
</tbody>
</table>

290
Please respond to these statements to the degree that they relate to your project at the implementation stage.

- Knowledge gained from group collaboration, discussions and sharing were critical to executing this project.
- There were attempts to translate innovative ideas into practical equivalents during the execution.
- In my estimation, our project created new knowledge during its lifecycle.
- The project leadership was very critical to its success.
- The team work on this particular project was adequate in helping project delivery.
- There was an issues management process which enabled project staff to identify concerns and raise them appropriately to leadership for necessary action.
- We had a quality management procedure in place to ensure the project adhered to accepted standards.
- There was also a Work Breakdown Structure in place to ensure that various aspects of the project were successfully assigned to competent staff.
- I would consider our project a success from the point of the stated objectives at the commencement of the project.
- The project also met the cost, schedule and time requirements of the stakeholders.

Please respond to these statements to the degree that they relate to your project at the evaluation stage.

- The project was analysed at the end against stated objectives and stakeholders views.
- We have a system/process put into place to review our projects.
- We maintain a repository/documentation/reports detailing the activities that went on from the identification to the evaluation stage of the project.
- This report is available for project members and other interested parties.
- Staff who have been reassigned to other projects could also be reached when questions regarding the project come up.

Please respond to the following statements to the degree that they relate to your project outcomes.

- I think this project has contributed something new to project execution.
- There are some aspects of this project which have improved our organisational ability to handle issues related to this area of project activity.
- This project met the time/deadline schedule of the client.
- In my estimation, the project created new knowledge during its lifecycle.
- The client is satisfied with the project outcomes.
Appendix 2: Case study interview schedule

Building and Leveraging Capacity

Do you belong to any informal groups in your project?
Do you have a sense of community in your project
Do you rely on your project group for information and career goals
Do you have external sources of personal improvement?
What resources are available for you to improve yourself?

Knowledge Sharing

Do you find informal discussion helpful in solving project problems?
Do your work colleagues play vital roles in helping you come to know your job very well?
Do you always have someone to turn to when you need information within the project?
Are there times when you help other colleagues with information on a particular problem?
Do you benefit from each others knowledge in the group? Explain.

Knowledge generation and preservation

Do you feel you have sufficient inside knowledge from your colleagues on the project?
Do you feel you have learnt a lot by sharing information and discussing with colleagues since joining the project
Do you think tapping into colleagues experiences on the job is very useful and helps you learn faster
**Innovative best practices**

Do you come up with new ideas and ways of doing things during discussions?

Do you feel group discussion, sharing information with colleagues on the project help generate new ideas for your project?

Since belonging to the project have you witnessed significant changes in the way you work?

Have you made major achievements and significant changes on the job as a result of interaction with colleagues?

**Performance and efficiency**

How would you access the competence, confidence and performance of the project group?

Do you often solve problems faster as a group than as individuals on the project? and would you prefer working alone to working with a number of people at the same time?

**Timely completion of projects**

Do you feel your project completes its assignments on time? Explain and give reasons.

What factors do you think are responsible for your project completing on time?

**Project Success**

Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

If the project is a failure, why do you think it failed?

Are there certain processes within the project that failed, or plans which failed to be executed and what do you think was responsible for this failure?
Appendix 3: Interview Transcript: LAPO

Interview 1: LAPO health manager.

Informal discussions:
Answer: Yes, I believe there are some people doing the work before I came. They have more experience then. I met people in informal settings to ask how they do things around here. Interactions. People had been willing to put me through. They also point out documents where I could find info am looking for. There might be people doing such work as part of their duties before I came and I met them and they elaborated. Informal discussions helped me get a grip on my job.

Sense of community: Yes, we have a sense of community on my job. When you are working among people you feel are very close to you feel belonged especially when they are willing to help. They are friendly.

External sources of personal improvement: Of course by virtue of my position, I have the opportunity of attending some workshops. They may not be formal courses but other organisations do organise workshops, invite us and we attend the training. In the spirit of collaboration, there are some other organisations as well which give us invitations to attend seminars and workshops that develop us. We form collaborations with other organisations who also have alliances with our own staff. They or us could exchange documentation or information which could help us do our job. We also get to know people during seminars and workshops and these are vital to carrying out our jobs.

Access to people with info; Yes I always have someone to turn to when I need information. People come to consult me on what I know on the job.
Organisational knowledge capacity: Yes, we do have sufficient organisational knowledge base to carry out our activities. I would say what we have now is adequate, but knowledge is not always enough. We have the resource centre where we can get information on documentation.

Innovation: I think everyday we always try to improve upon what we have been doing. We don't believe in “that is how we have always been doing it”. We review, evaluate and identify challenges and try to see how we can overcome the challenges. We meet, discuss, get suggestions and work. We don't have a static way of doing things. We are always looking for new ways to do things. We have been able to do things in radically new ways. I have seen myself making a number of changes in the way things are done. In the process of filing information, there is an improvement. In the process of sharing what is known within the organisation there is a marked improvement. Programme implementation has improved greatly. We look at what has been done in the past and see new ways to do those things. We evaluate possible things to be changed. We include things which have been overlooked in the past. We make our activities community focused. Previously, the activities we have been implementing were across board. Right now, what we do is to make our programmes context specific. Some areas are prone to cholera, and other areas are prone to shortage of water supply. What we do is to design our programmes to meet specific community needs. For example we look at villages and see how they dispose their refuse. We do needs assessment of communities, see ways we can improve what has been done previously.

Faster completion times: Projects can now be completed faster than before. We have more staff now, knowledge of projects has increased, there is familiarity with the way things are done, we have more information at our disposal. Our projects complete on time. As a project keeps going, you encounter a lot of problems not envisaged. Donor expectations could also impact on the completion time of a project. Disbursing of funds also affect the completion of projects. Sometimes there are crises in communities where we are executing projects. These environmental constraints restrict our execution. Because crisis intervention is not part of the conditions of funding of the
project, we have to wait until the crisis is over before we commence execution of the project.

**Project cycle:** Yes we use a formal project process to design and execute our projects.

**Project success:** We monitor impact assessment to determine project success. This is the major criteria for assessing success of our project. 90% of our projects succeed. Olukwu project was very successful. Our partners even came and assessed the project. That project won an award from our partners.

**Technology:** Email, telephone, chat, email discussion groups, network technologies. Information centres. PM Software. Our project partners do provide project software to enable us carry out our operations.

**Funding:** We can't say all the projects are well funded. Some projects, the funds available may not be much but the activities are many and require better funding. We've found ourselves in such situations before.
Interview 2: LADEC Manager

Informal communication: We always use the Internet to check for information. I was trying to widen our ideas about leadership training. There are people I can always call upon to provide certain information which I need.

Community: We work like a family. It's one of those things that has helped us greatly to do our work.

Networks: We partner with other NGOs. Within the state here, outside the state, within the country and outside the country. We do have opportunities to share with other others.

Inside knowledge: LADEC has sufficient knowledge to carry out its activities. However, one of our constraints is that we are short staffed. One of our staff is leaving soon and she has been pivotal in helping the work of our unit. LADEC has the knowledge base. There is someone who would be able to do the things that she does at the moment. I would bring in a new person, train the person to do this job. I hope she would have the opportunity to talk to the next person who would take over the job she was doing and also debrief her so she could impart knowledge. We need to get someone to understudy her to some extent.

Innovation: We have new projects. We have new ideas and new ways of doing things. Majority of our new projects came up as a result of partnering with other organisations. Community development, water and sanitation, schools. Since 2 years now we have been involved in community development, water and sanitation and sometimes we fail, get up and keep moving. We have also witnessed significant changes in the way we do things. We change things, bring in new ideas, and move ahead.
Staff capacity and quality: I think my staff is doing fine. We have had people come in to evaluate our programmes. We have seen people come in to evaluate what we do.

Completion time: We do complete our programmes. We have a project schedule and we follow the projects strictly.

Project success; Would you consider your projects successful. I would say about 75% success has been recorded. One of our basic motives is to get people aware of their situation, sensitize them in the area of social development. We have been able to do this in all the communities we worked in. However, we have always had problems of funding. All our donors evaluations have always given a pass mark but also noted that we need to have more capacity to touch more lives and this requires more funding.

Technology; We use a host of technologies to do our work.
Interview 3: AGM Coordination

I relate with international donors, internal coordination of reports from different departments, monitoring and reporting, timeliness of projects in line with our calendar, statutory duties, secretary to the board, convene meetings, do reporting, networking.

Informal networks: I don't often write memos when I want to get information from people. It helps me a great deal solve problems in the workplace. Best practices and solutions are often obtained from informal settings. People relax and tell you what's on their minds when in an informal setting. I do this a great deal. I hardly write memos. I do this only when it is very necessary and requires everybody's attention. I can walk into someone's office to find out how to resolve issues. It plays a very important role. When I started this job, informal communication and talking to people helped me get to know my job very well. I wont say it is entirely dependent on it. It has made a lot of input on my job.

Knowledge base: We cannot be an island. I won't say we have all it takes. At one point or the other we need to get additional information. It's not as if working on what we currently know or have is sufficient. We need to continue to expand on what we have. So we have need of sharing with others.

Community: I'm responsible for two staff and we have a sense of community.

Innovation: I have brought in new ideas and ways of doing things. LAPO has had impact on me since I joined and I have also made a great deal of impact here. I have learnt one key thing. Being able to do things in detail. Working with the executive director has taught me a great deal. Ability to use my initiative a great deal has contributed to the director giving me free hand in handling things. I am always on top of what I do and being able to do it in detail. I have always brought in recommendations to the job and ideas flow freely in our unit. This has developed me personally and I see things in a much more focused manner. Time lining issues. I have instituted a few things.
We have changed all the processes of documenting information in the organisation. We have introduced better and efficient methods of doing this. We have made it possible to document meetings minutes and make them available to people as soon as possible. I have changed the format of the meetings in terms of documentation. We send out notices and memos to people in terms of the way things are organised. It's a lot easier and smoother now. Even if I leave tomorrow I know someone else would build on what I have achieved.

**Staff competence and motivation:** I think generally it's ok, however there are always rooms for improvement. People have to try to push themselves further than where they are. There is the need not to relax just because the job is there. We need to wake up to motivate ourselves, probably have mentors we can look up to. In terms of doing the work currently here, people are good and work well, but I think they need to pay attention to details and push themselves to the frontiers of knowledge.

**Project completion time:** It's not usually like that. In most cases projects complete on time but in some other cases they spill over. Certain times when there are too many projects running, some projects would have a knock on effect. We often work on many projects and have the same staff working on a number of projects.

**Project success:** I would consider our projects normally successful. We always follow through to completion. Even when projects get stuck a bit, the main issue is getting it done. However we think we can get it done, the idea is to always complete the project even if it means co-opting more staff to get the work done. Our director is not disposed to abandoning a project. There are always alternatives to issues no matter how you look at it.
Interview 4: Finance Manager

Community: Yes we do have a sense of community here. Our principles here emphasise the need to hold occasional meetings here. I always summon people and give them tips on how to do things and we all discuss and see ways of doing things and helping each other. We don’t just sit on our tables and do our jobs because we have our job schedule. Sometimes we switch roles to enable us do jobs.

Capacity building: We currently have trainings that would take place and our staff often attend. Every year we always have trainings to attend. I have attended trainings in Colorado state, USA. We even attend trainings in Central Bank and other places.

Informal communication: This is part of the way I would tell you that I handle my job personally as the finance manager. I was not taught formally how to be a finance manager. I pick up my phone some of the times to discuss with friends and ask them how to solve problems.

Knowledge base: Yes we have the capacity to execute our jobs. In our department we collaborate and everyone often knows how to do each others jobs and this has given people competence in switching roles. So if anyone leaves at the moment, we would always have a way of coping with staff filling that role until someone is employed to do the job full time. We make sure that people handle every aspect of the job to get familiar with it.

Innovation: There is an improvement in the way things are done here since I became the finance manager. Sometimes we work extra hours to be able to meet deadlines. Ideas often flow from here and there and we are open to new things. At times we sit together and discuss things and we often arrive at decisions with consensus. We discuss matters and I don’t really force through my views because I am the manager, rather we have to deliberate.
Staff Capacity: Their qualification is ok. We have a chartered accountant, HND, PGD, BSC. We have a strong professional leaning in the department. Staff are qualified. The quality of what they do and their performance is excellent. I would put their performance at about 70%. I am very conservative with giving marks, I know they are doing great.

Completion times: We do complete our projects on time. Most of the things we do is dependent on the operations department and if we do not have information from the operations we cannot carry out activities.

Project Success: I consider our projects very successful. We have learnt over the years and we have improved very much. There is an abundance of knowledge within the organisation. We are often ready to provide whatever information donors or partners need. So there is an abundance of knowledge within the organisation.
Interview 5: Information Systems Manager

Community: There is a sense of community within the department. We have informal discussions here both at the head office and the branches.

Capacity building: There are external courses which people undertake here to improve themselves. We have on the job training. We just conducted one which ran through from January through April. What we did was to go to the branches to teach them on how to improve on the use of the computer. We look for ways to fashion out solutions to problems.

Informal discussions: We find informal discussions very useful in helping solve problems. I normally have someone to turn to when I need information. I benefit from the knowledge of colleagues on the job.

Knowledge base: Our department is quite knowledgeable in the things it does. Our department has sufficient knowledge base to execute our programmes. We carry out consolidation of our data. In the course of the month branch staff are normally expected to post their entries. We came into LAPO for the sole purpose of implementing the software of the MIS department.

Innovation: We have ways of doing things before but due to problems that come up during implementation we come back to the drawing table, discuss, share ideas and knowledge and at the end of the day we find new ways of doing things since the old ways have not been helping. In time past we have been depending on manual systems to do things. Right now we have performed automation systems to perform our functions. I would say if we used to take 7 days to carry out a project, the time has been reduced and we take about a day and half or so. Using software help us shorten project times.

Staff competence: Staff still need more IT training. We are doing our best to improve this.
Completion times: We've cut down the completion times. Previously we used to take more time to complete programmes. We currently work to schedule. Our project cycle for very short projects used to be 15 days but we have cut this to half (7 days). Factors responsible include automation of the systems. As a result of frequent usage of the systems, staff are able to perform their tasks faster than before.

Project Success; I consider our projects as successful. There has not been any project that was cancelled under my supervision. We have had a few projects overshoot the target most probably due to other concurrent projects running. We sometimes keep it aside and come back to it later.
Interview 6: Programme Director

Community: I think there is a very strong sense of community within the institution. It did not come by accident. It was planned. We have what we call commitment (a newsletter) published every other month. It is always distributed among the staff in various branches and head office. We are able to share information and knowledge, exchange ideas. We ensure that everyone is at the same level in terms of developments within the institution. We have a staff welfare committee meaning if any staff needs the support of other members of the institution with issues of things outside the boundary of official work there is a forum where such things can be discussed.

Informal communication: I think that appears to be the way a huge volume of communication is done in most institutions. We evolved from a very informal foundation and though we have evolved into a formal organisation there is still a high level of informality. We have a high level of discussions with people instead of doing memos.

Organisation capacity; Obviously, we do not have all the capacity. This is why we increase the budget for capacity building on a yearly basis. Most staff here are actually doing their first job and they are young and need a lot of capacity and support. We are developing another five year business plan. We require more capacity, we need to enhance more staff capacity.

Staff performance; If we look around. LAPO is obviously on a higher pedestal regarding other organisations, this gives a lot of confidence. On the other hand, realising that we have mainly new projects, I wish we had a higher capacity.

Completion time; Our projects complete on time. We ensure that our projects absolutely complete on schedule. We are serious about meeting targets. We have various calendars and charts we use to track progress. Factors include first of all ensuring we have realistic time plans. We have series of review programmes on a quarterly basis. We properly review the projects, highlight
and identify possible constraints that would hinder the project and address them.

**Project Success:** Generally I would say that going by the evaluation reports of most external evaluators, the general conclusion is that we have done so well not just in terms of meeting targets but in terms of the quality of outcome but maybe one or two could have failed but we have been able to meet our own expectations and that of others in the form of timeliness and quality.
Appendix 4: JEWEL interview transcript

Interview 1

What are your roles on the project?
I manage the project from inception to completion. I am responsible for coordinating the human and material resources of the project and using the balanced mix to achieve project objectives. My brief here in Nigeria is to ensure that projects run smoothly. Given that one of the crucial focus of this programme is to manage conflicts within the community-----I must say this is a sensitive assignment...reason being that I take utmost care to ensure that my staff are not caught in the cross-fire of conflicts among target communities. Their safety is one of my duties.

Did you consider a KM process before commencing this project ?
Obviously. The DFID has a policy document which makes it explicit that we use all forms of strategies that work, to ensure our objectives are met. KM is one of our instruments of project design and execution. At the commencement of the JEWEL project, we identified and mapped various knowledge areas which require our attention. You can consult our project document to get information on our knowledge areas for the JEWEL project. ....We plan for the project based on these areas and our activities are built around the knowledge areas.

Informal discussions:
Informal discussions is part of our project strategy. We do have discussions as a team ---many of us work informally and have a pretty informal and relaxed schedule around the project, however, we are always aware of the project schedule, the work breakdown structure and we also use technology such as workflow to manage different components of the project and assign tasks. Informal discussions play a very prominent role in our activities. We also have communities of practice evolving during the project. This helped
people have a sense of belonging and also motivated junior staff who were having their first roles on such a project as this.

**Sense of community:**

Obviously there is a sense of community among project staff. One of the uniqueness of this project is the multicultural mix of the project staff. We have project staff join us from Egypt, India and other countries where this project has been executed similarly. They brought their expertise with them. We also have local staff from Nigeria here who are more or less indigenes of this place. Some of them are having their first roles working with an organisation such as ours. Then talk about our institutional actors like the state governments. A multi-stakeholder project like JEWEL requires a sense of community to succeed. One of the things we have done is to build into our KM policy the need to facilitate communities even among stakeholders. As you would have read from the project documents, conflict management is part of the aim of this project due to the increased conflict in our target areas over common property resources. Our project spans about four states of the Nigerian federation and this involves building a community of stakeholders. It also involves having to manage multiple number of project staff across the states—both DFID staff and the staff of institutional partners. We therefore create consciously a sense of community through facilitation. We also encourage the emergence of communities within project groups and stakeholder groups.

**External sources of personal improvement:**

Our project members always have external links and sources of information. We have opportunities to attend conferences and symposia which enable us to network, share information and also learn from what others are doing in the field. We network with a number of projects in Nigeria and other African countries and outside Africa. We partner with the European Union on a number of projects and this represents an opportunity to learn. We also do have some projects in common with the United Nations, UNEP and other world agencies. We are often seeking for ways to increase our capacity through learning and sharing.
At the individual level, our project members are well connected. There is a peer professional network of PM professionals which quite a number of them belong to. We encourage them to link up with others and communicate.

**Access to people with information;**
Our project often provides access to people with relevant information. At the beginning of the project, we have a knowledge audit of the project. It includes who knows what and where they reside, their contact and other relevant information.

**Organisational knowledge capacity:**
I think our project possess the capacity to execute the JEWEL project. Due to our presence in Nigeria, a number of other similar projects we have carried out, we were ready to carry out the JEWEL project when the need arose. Our staff had been involved with a number of wetlands conservation projects and some of our collaborative work with the EU was on similar areas. So we had the organisational and project capacity to embark on the project. On this current project, we have learnt a lot and we do have increased capacity and can do it again in a better way. This results from the new knowledge and learning we have acquired in the process.

**Innovation;**
My individual opinion is that this project is highly innovative. There are so many innovative areas which we introduced. These are quite different from what we have done in the past. We wanted to adopt new approaches to dealing with conflicts arising from struggle over common property resources. We have adopted a direct negotiation and engagement strategy whereby we engage communities directly. The process of going through certain intermediaries who imposed their own agenda on these communities sometimes exacerbated the situation. Secondly our PRA tools are novel. We had never used this format of Participatory Rural Appraisal before. This was developed specifically for this project and it is working excellently.
Faster completion times:
If you are asking if the project completed on time I would say yes, but then with an explanation. What happened was that after the project had been running for some period, we re-evaluated the timescale with the stakeholders and came to a realisation that new areas were emerging and new situations that needed to be dealt with were continually arising. This represented an opportunity to learn. We were ready and willing to explore these situations and address them appropriately. So we decided to extend the time-scale of the project. At the point we made the decision, we were ready to wrap up the project successfully if the stakeholders wanted it so, however we recommended that due to some emerging situations the project needed to continue. By that time we had met the objectives of the project and had done an evaluation and the project needed to continue. So yes, in response to your question, our project met the completion times.

Our staff strength, capacity and our institutional capacity and experience, knowledge and expertise were responsible for making this project run on time. Collaboration on this project and a sense of community is strong. This enabled us build on our collective experience.

Project success:
Our project is a success. Factors responsible include good planning, managing knowledge relevant to the project, ability to mix the right sort of people on the project, teamwork and collaboration and openness to ideas (innovation). This doesn’t mean there are no aspects of the project that failed or that we reconsidered and re-planned. There were plans that went wrong along the way and we had to restructure the system. We had to rework certain areas of the project when they went wrong. One of the things we did well was to communicate the project’s learning outcomes to everyone involved through team meetings, briefings and stakeholders' meetings. Overall, the project was a success because we learnt and were able to adapt to the environment. A number of our staff were only used to other regions like Europe—Africa represented a challenge both in dialogue with local communities and stakeholders, but with training and team work,
improvements were made and we were able to deliver this project successfully.

Operational efficiency
Do you mean the efficiency of our project process? (researcher explains this in the affirmative). Ok, our project process is very clear and unambiguous. Our process has evolved over the years and we are continually making improvements on our process. We are trying to find new ways of doing things. Our project process is often being re-evaluated and we discard what doesn’t work and adopt what works. Regarding the JEWEL project, I am satisfied that the project process is efficient. We solve problems faster as a group than as individuals. The staff competence on this project is satisfactory and professional.

New knowledge generation
The project generated new knowledge. I can confidently say that we have more knowledge about the project now than we did at the commencement. Our understanding about the processes involved has increased and I can put this down to the fact that new knowledge has been generated. There is a lot I can say about this...the documentation produced, all the reports, evaluation and appraisals and assessments are all indicative of new knowledge generated during the project. We had a system whereby we documented knowledge and stored this in our portal.

Technology;
The most important technology utilised on this project is the project portal where we documented information about the project. We made use of satellite technology to map areas of project activity. We also involved the state governments in teleconferencing...we use emails and chat to communicate with stakeholders. I must say there is a minimal knowledge of technology usage among state government staff and stakeholders. We tried to use technology that was more appropriate to the situation such as teleconferencing, email and chat. We also trained institutional actors (state govt staff) and local stakeholders on the appropriate use of chat and email.
Funding;
This project is funding collaboratively by the EU and DFID.

Staffing
Recruitment of project staff took into consideration the need for knowledge of the riparian areas of the North of Nigeria, history, and conflict resolution, community building skills, participation and local consultation. We are particularly interested in staff who know the local areas well and the ability to engage actors in meaningful dialogue. Among DFID staff, we considered staff who have worked on similar projects and probably among the northern peoples of Nigeria.
Interview 2

How do you see the team work on this project?
We have a very cohesive team. We work together on issues and provide collaborative solutions. Team members help each other to learn on the job. Our competence in executing this kind of project has been increased as a result of our experiences together. I benefit from information and knowledge from other people on the project. Without doubt I rely on my colleagues very much as sources of information because I trust them...that's it.

Do you have informal groups on your project?
Yes. there is a lot of informal group activity going on. People meet and talk in the coffee rooms, or at lunch. Some people tend to get information from others in different project units during periods when we are at recreation or playing golf...it is almost always certain that conversations would steer towards project activities. I use some of these opportunities to even ask senior project staff of issues which I feel bother me or I need clarification on. It's tricky how this works...sometimes senior management may share more information with you than they normally would in formal office situations. So informal communication and activity serves very useful purpose. I do prefer to communicate informally than any other way.

Do you come up with new ideas and ways of doing things during discussions and team work?
There is a lot of innovative ideas flowing when we interact. My personal experience is that ideas are very important in project execution. I have 17 years of project experience in this sector in Nigeria. I often find that during team work, collaboration and discussions, real ideas emerge which enables the project to succeed. You would often wonder where these ideas are flowing from. During the JEWEL project, we had one idea from a stakeholder on how to mitigate the conflict impact in the Jos area (between 2000 and 2004) the communal conflict in Plateau state was serious. Our wetlands conservation projects which includes JEWEL also span these areas. We had this
stakeholder give us a brilliant idea on how to manage the conflict as it threatened to affect our work in the area. It worked fine.

**How would you access the competence, confidence and performance of the project group?**

Our staff is very competent. Majority have experience in conflict resolution and PM. I have 17 years experience in this area. Other senior management do have experience of up to 20 years in delivering projects in volatile regions of the work. That is what development work is all about. I have confidence on the competence and performance of our staff. I can trust their judgement with confidence, knowing that we do have set down criteria for making decisions. Staff don’t just adopt ideas and decisions without looking at them critically. Even innovative ideas have a framework for their implementation.

**Do you feel your project completes its assignments on time? Explain and give reasons. What factors do you think are responsible for your project completing on time?**

The JEWEL project completed on agreed time. There was an extension of the timescale with the understanding of the stakeholders. If they had disagreed to extend it, the project would have still achieved the objectives. There was the need to sustain the benefits of the project beyond the completion time. Of particular interest was scaling up the capacity of the state government actors to sustain the benefits of the project and to continue to manage it after DFID and EU technical partners had handed over to them.

The factors responsible for completing the project on time were staff enthusiasm and interest, good cooperation from the state governments, experience and expertise (knowledge), willingness to adopt new ideas, innovativeness, cross fertilisation of ideas (knowledge sharing) and implementing these ideas (knowledge utilisation).
Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

The project was a resounding success. We don't think in failure terms. We think success, we think ahead. We think about achievement. However, we may have some setback situations like crisis in the region slowing down our progress but...this is why we have change management plans. If plan A fails we adopt plan B and move ahead. The JEWEL project succeeded beyond our expectation. We have not completely removed the conditions that give rise to conflict over common property resources in the wetlands of Jigawa and other riparian states. What we have managed to do is to raise awareness about these conditions and we have brought stakeholders and communities to the negotiating table so they could take hold of their common destiny. We are enlightening them on the issues of poverty and trying to enable them empower themselves through equitable access to these resources.

The project succeeded mainly because there was the need for it. It was a project the community welcomed with open hands. If there was no need for the project we would have failed. Community participation and collaboration with state institutions and communities enabled the project succeed.
Interview 3:

How do you see the team work on this project?
Our team work on this project is very intensive. I can say we basically use team work as our implementation approach. No other system has proved very potent in delivering our projects. As opposed to individual work team work is very useful in enabling us work collaboratively and in harmony. We achieve results easily and also correct mistakes easily.

Do you have informal groups on your project?
Evidently we have informal groupings within the project. They just evolve because no man is an island. Regardless of formal procedures, closely knit friendships develop among the project team and this works positively for achieving project objectives.

Do you come up with new ideas and ways of doing things during discussions and team work?
New ideas and ways of doing things are a norm when we discuss in project teams. It's true we have procedures and ways of doing things, but at times due to the peculiarity of the project and the need to adapt to changing situations, new ideas are spurned during team discussions and briefings and these may be a radical change in the way of doing things. Our project leadership is not afraid of adopting these ideas and implementing them as long as they work. Sometimes they may fail or have marginal impact, we are not afraid to admit failure or say this did not work. It simply means we find other alternatives. When people make suggestions and they don't work, we do not vilify them and probably not adopt their ideas again in the future. We provide a conducive and comfortable atmosphere for everyone regardless of the quality of ideas they bring to the project.
How would you access the competence, confidence and performance of the project group?

We have highly skilled project staff. They are confident and professional in carrying out their responsibilities.

Do you feel your project completes its assignments on time? Explain and give reasons. What factors do you think are responsible for your project completing on time?

Our project completed on time. We complete on time because we have a well thought out plan and process for achieving the project objectives. Project leadership also played a very strategic role. There was proper motivation and collaboration among staff. The work scheduling was adequate and it was always clear who was to do what within the project team.

Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

The JEWEL project can be considered successful from a variety of points of view. From the impact point of view, we have made considerable impact within the stakeholder community. There is increased awareness of the need to live in mutual peace among the communities we are working with. We have also generated increased dialogue among state government and community leadership. This is a precondition for achieving lasting resolution of issues that generate the conflict. Secondly, access to common property resources would increase the likelihood of poverty reduction among target communities. We have learnt that collaboration is the commonest and most popular way of solving problems. When there is an adequate flow of information and knowledge, there will be trust and mutual understanding. This decreases misunderstandings and misinterpretation of motives.
Appendix 5: WUP Interview transcript

Interview: Managing Director.

What are your roles on the project?
I have overall responsibility for the project. I coordinate activities which include managing contact and collaboration with the partners of the project as well as managing staff directly on the project. I draw up work plans in consultation with staff and partners. Generally, I also supervise what other staff do, prepare and write reports and present these at the annual general meeting. There are a host of other activities which fall within my job description but normally there are other activities that also come up on the fly and I decide to take these on. In effect, I have responsibility to determine the direction of the project and also to ensure that objectives are met on time and to specifications.

Did you consider a KM process before commencing this project?
Yes, KM is part of our objective on this project. We have a plan to manage the knowledge generated during projects and also to learn from other projects. So there is a strategic KM plan for this project. You can look this up in the project document (Institutional Review).

How do you see the team work on this project?
Team work on the project is excellent. That's how I can describe it. We have a team which collaborates and consults each other during activities. Our focus is to build on the knowledge of each other. The team is very cohesive. We have mutual understanding and respect for each others knowledge and expertise and we try to build on that. Our staff is the most important asset for the WUP project, so we ensure we build capacity as much as possible and also people know what each other is doing on the project. Informally there is a lot going on as well
Do you have informal groups on your project?
Definitely, like I said there is a lot going on. Networks and communities have formed since the project began. These help us to bond with each other and there is trust and oneness in this. No one is afraid of sharing what he knows and no one is threatened of each other.

Do you come up with new ideas and ways of doing things during discussions and team work?
Sure we do come up with a lot of ideas which enable us do the job smoothly. The goal of our KM programme is to encourage innovative ideas and to enable people share these ideas so the project can benefit.

How would you access the competence, confidence and performance of the project group?
It is on the high side. I am satisfied with the competence of my staff and their performance. They are a high calibre staff and they work hard to achieve project objectives. Before recruiting these staff we considered so many issues such as good knowledge of the water and sanitation sector in Africa, experience in the water and sanitation sector and as well leadership roles played in the past. We draw our staff from people who have expertise in the field, so I am very confident of their abilities. They have a track record.

Do you feel your project completes its assignments on time? Explain and give reasons. What factors do you think are responsible for your project completing on time?
We complete our projects on time because we have scaled up our institutional capacity recently. We now have more partners who contribute to our work in this region. We are also expanding in many areas. Our work has also led us to just playing the role of an information disseminator rather than designing projects. What this means is that we have scaled down the type of projects we carry out. At the commencement, WUP was involved in designing a number of projects but right now what we have done is to limit our activities to just sharing information, sensitising governments, communities and the water
industry on relevant issues. We serve as a gateway to water and sanitation information. We are not competing with other NGOs for donor funds. We have tried to carve out an area where we can serve other NGOs with information and knowledge. We provide knowledge—this is where the KM angle comes in so useful. Yes our projects complete on time and one of the major reasons is because we now have a focused target—I would say a focused specialisation.

Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

We have been making a huge impact in this region. Our target groups have benefited as a result of what we are doing. The feedback we get is encouraging. The institutional review of WUP gave us an excellent mark. If you read our annual reports (I think that of 2002 is online so you can view that) you would see the impact we are making. Understandably we have undergone some changes which were brought about by the institutional review. A number of recommendations enabled us scale down from getting too involved to being umpires and information providers and this has worked excellently.
Appendix 6: NBWRP Interview transcript

Interview: Project Manager

What are your roles on the project?
I am the project coordinator. My roles are varied, and cannot be pinned down to any specific activity. However, there are clearly defined roles in my job description such as coordinating the activities of the project, planning, recruiting, staff development, networking, budgeting, facilities management, supervision and other activities that go with project leadership. To be able to play my role, you have to have negotiation and conflict management skills. Bringing different actors who hold a common claim to the resources of the Nile has implications. You have to be prepared to negotiate your way between conflicting interests.

Did you consider a KM process before commencing this project?
Yes...there is an inbuilt information management capability in this project. We have documentation and dissemination policies which enable us capture, codify and make knowledge explicit. We also pride ourselves in our people, so we try to share knowledge and create an atmosphere where our project staff would be comfortable sharing what they know.

How do you see the team work on this project?
This project by design, was made to be team-based. Doing otherwise would ensure failure. We do not have a choice but to build collaboration and ensure that all parties to this project collaborate and work together. In this way we have been able to achieve objectives.

Do you have informal groups on your project?
Informal interaction is a major part of the way we work. As the project manager, I have been able to watch informal groups grow on the project. Certain people gong well with others. Friendships develop among project
workers and this helps project execution. As management, we don't try to stop informal activities and interaction because we are aware that this enables project staff to help each other and indirectly this would contribute to the project.

**Do you come up with new ideas and ways of doing things during discussions and team work?**

When we share ideas and discuss with each other, maybe during team reviews and appraisals, or progress meetings, ideas will flow and we tap into these ideas and make improvements on the project. The reasons for meetings is to contribute to the project not just to document things. If we don't implement the things we document, then we have failed. Our meetings and discussions are aimed at helping us identify areas where we need to improve.

**How would you access the competence, confidence and performance of the project group?**

My project group has the competence required to carry out our projects successfully. I don't lose sleep over their confidence or performance. Recent performance evaluations we carried out showed they were at their optimum. We have staff sent to us by our technical partners. The Food and Agricultural Organisation has been helping us build up staff capacity. So I can say I am confident of the level of expertise we have on this project. Before we take on any staff, we ensure the staff has background knowledge of issues that relate to common resources such as the Nile. Water management is also an added advantage, conflict management, and knowledge of the political landscape of the countries we operate in is also essential.

**Do you feel your project completes its assignments on time? Explain and give reasons. What factors do you think are responsible for your project completing on time?**

Our project has been meeting objectives. We complete most of our projects on time. Sometimes one or two projects may overrun and when there is such
likelihood we ensure that we get the approval of all stakeholders involved. This is crucial to the project.

What makes us succeed is a mix of various factors. Staff expertise and the technical and organisational base of the project vis-a-vis the technical partners. We do have a lot of odds against us—the multicultural and transboundary nature of the project sometimes may appear a disadvantage and requires a lot of effort and capability to implement. However, this has worked in our favour because we are using dialogue and dissemination of information, creating awareness and involvement to execute our projects.

Would you consider your project successful? If so, why do you think it succeeded and what have you learnt from this?

Just like I have explained, our projects succeed because we carry people along. We share information about what we are doing in the relevant quarters. We involve people who have the power to make decisions, so we target policy makers and people who have influence in the countries and parastatals we work with.
### Appendix 7: Process Protocol

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