

**An Investigation into the Management of
Knowledge in a Historic Building Conservation
Organisation in Tripoli, Libya**

By: Salem Mokhtar Tarhuni

**Thesis submitted to the School of Architecture, Planning and
Landscape of Humanities and Social Science in partial fulfilment the
Degree of Doctor of Philosophy**

University of Newcastle upon Tyne

November, 2013

Acknowledgements

First of all I give thanks to Allah. Then thanks to my country, Libya, to my family, and special thanks to my brother; the martyr Mohammed Tarhuni who helped and supported me until his death in 16/10/2011, for the liberation of Libya from the dictatorial regime.

The author would also like to express special thanks to all those who helped me throughout this research.

Abstract

In recent years, knowledge has been recognised as a core organisational resource. Scholars and charters in the field of historic buildings conservation stress the development of the knowledge of staff and organisations in this field. Because of the value of HBs, their conservation work should use all the knowledge available and this work should only be undertaken by those with the appropriate knowledge and skills. This research is concerned with studying the management of knowledge in historic building (HB) conservation organisations.

The research aimed to investigate the concept of knowledge management (KM), and to develop a theoretical framework for studying and understanding KM in HB conservation organisations. To achieve this aim, the following objectives were pursued: (a) investigate the concept of KM in organisations; (b) study HBs and identify the key issues involved in their conservation; (c) investigate the extent of knowledge importance and availability in the HB organisations such as Management of Historic Cities Bureau (MHCB); (d) study the factors that affect managing knowledge in the MHCB; (e) analyse the current conditions for dealing with knowledge in the MHCB; (f) draw out key findings and identify the strengths, opportunities, weaknesses and threats in managing the MHCB's knowledge and, finally, develop a framework for studying KM in HB conservation organisations and suggest recommendations for effective KM in the MHCB and similar organisations.

A mixed approach of qualitative and quantitative research for collecting and analysing data and information was adopted. Multi-methods were used for collecting data: literature reviews, interviews, questionnaires, observation and analysing organisational documents. Validation was undertaken by cross-checking the fieldwork findings against the wider literature.

The findings demonstrated that the factors affected KM in organisations include: organisational structure, ICT, the culture of collaboration, regulations and policies, changes in the organisation's accountability which lead to a change in its role and the need for different knowledge, and cultural/religious reasons regarding the separation of genders in the work place, which affects informal knowledge sharing activities.

However, the main factors which differentiate KM in HB conservation organisations from other organisations are: type of knowledge, which includes the cultural value of HBs; dealing with external experts and organisations for acquiring and exchanging knowledge regarding HBs and their conservation, and the role of the proximity of the organisation's headquarters to HBs in acquiring knowledge through monitoring HBs.

Furthermore, the findings demonstrated that the balance between people-based and explicit knowledge-based KM approaches is required to effectively manage knowledge in organisations. This research presents a framework for studying and understanding KM in organisations when used in HBs conservation organisations. It considered both approaches and demonstrated several factors that influence the management of knowledge in the MHCB context.

Finally, the research provides a base reference for studying and understanding KM in organisations and provides recommendations to enable decision makers in the MHCB and similar institutions to apply effective KM to improve their organisations' performance.

List of Abbreviations

The following are the abbreviations which are used in this thesis

APQC	the American Productivity and Quality Centre
BIFM	the British Institute of Facilities Management
BS	British Standard
BSI	British Standard Institution
CBR	Case Based Reasoning
CMC	Computer-mediated-communication
DCLG	Department of Communities and Local Government
DIP	Document image processing
GPC	General People's Committee
GPCT	General People's Committee for Tourism
HB	Historic Building
HELM	Historic Environment Local Management
ICCROM	International Centre for the Study of Preservation and Restoration of Culture Property
ICDL	International Computer Driving Licence
ICOMOS	International Council on Monuments and Sites
ICT	Information Communication Technology
INTBAU	International Network for Traditional Building, Architecture & Urbanism
IOMOCT	Institution of Organization and Management of the Old City of Tripoli
IT	Information Technology
KBS	Knowledge Based Systems
LNCSM	Libyan National Centre for Standardization and Metrology
MHCB	Management of Historic Cities Bureau
MHU	Ministry of Housing and Utilities
NGPLAH	National Group for Protecting Libyan Architectural Heritage
QS	Quantity Surveying
RIBA	The Royal Institute of British Architects
SAH	The Society of Architectural Historians
SCTA	Saudi Commission for Tourism and Antiquities
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNESCO	United Nation for Education, Science and Cultural Organization

Table of Contents

Acknowledgements.....	i
Abstract	ii
List of Abbreviations	iii
Table of Contents	iv
List of Tables	xi
List of Figures	xiii
Chapter 1: Introduction	1
1.1 Background of the study	1
1.2 The Key Areas of Research	2
1.2.1 Knowledge Management (KM).....	2
1.2.2 Historic Buildings (HBs) and their Conservation.....	3
1.2.3 Research Context	5
1.3 Problem Statement, Research Questions Objectives and Methodology	5
1.3.1 Problem Statement	5
1.3.2 Research Questions.....	7
1.3.3 Research Aim / Objectives	7
1.3.4 Research Methodology.....	8
1.4 The Scope and Significance of the Research	8
1.4.1 Research Scope	8
1.4.2 Research Significance	8
1.5 The Organisation of the Thesis	9
Chapter 2: the Concept of Knowledge Management in Organisations.....	12
2.1 Introduction.....	12
2.2 Knowledge Management Objectives and Definition	12
2.2.1 The Organisational Management Activities Associated with KM Objectives.....	12
2.2.2 The Objectives of Knowledge Management	13
2.2.3 Knowledge Management Definition.....	14
2.3 Knowledge Definition, Types and Sources.....	15
2.3.1 Data, Information and Knowledge.....	15
2.3.2 Tacit Versus Explicit Knowledge	18
2.3.3 Organisational Knowledge Sources.....	20
2.4 The Main Theories and Schools of Thoughts in Knowledge Management	22
2.4.1 Knowledge Creation Theory	24
2.4.2 Knowledge Management Models	25
2.5 The Main Approaches for Managing Knowledge in Organisations	28

2.5.1 Viewpoints on KM Implications	28
2.5.2 People (Tacit)-based KM Approach	29
2.5.3 Explicit-based KM Approach.....	31
2.6 Knowledge Management Processes.....	33
2.6.1 Knowledge Developing (Identifying, Creating, Acquisition)	35
2.6.2 Knowledge Capturing (Articulating, Organizing and Storing)	36
2.6.3 Knowledge Retrieving/Accessing and Updating /Refining	37
2.6.4 Knowledge Sharing, Transferring and, Disseminating	38
2.6.5 Knowledge Use, Revision and Learning	39
2.7 KM Techniques.....	40
2.7.1 Face-to-Face Interaction	40
2.7.2 Training.....	41
2.7.3 Lectures and Presentations	41
2.7.4. Team Work and Communities of Practice (CoP).....	42
2.7.5 Rotation Work System	42
2.7.6 Trial and Error Policy	43
2.7.7 Apprenticeship and Monitoring	43
2.7.8 Self-reading	43
2.7.9 Recruitment	44
2.8 KM Technologies.....	44
2.8.1 The Objectives of Applying ICT for KM in Organisations.....	45
2.8.2 Knowledge Management Systems	48
2.8.3 Constraints in Using KM Technology in Organisations.....	49
2.9 The Factors that Affect KM in Organizations.....	49
2.9.1 Culture of Organisations	50
2.9.2 The Organizational Structure	51
2.9.3 Local Regulations and Organisational Policies	51
2.9.4 Working Place.....	52
2.9.5 The Role of Leadership	52
2.9.6 Individuals' Role in KM.....	53
2.9.7 A Proposed Model for Studying and Understanding KM in Organisations	54
2.10 Summary	55
Chapter 3: The Nature of HBs and the Key Issues in their Conservation at the Organisational Level.....	58
3.1 Introduction.....	58
3.2 The Concept of Historic Buildings	58
3.2.1 Vernacular and Sophisticated Historic Buildings.....	58

3.2.2 <i>Historic Buildings: Definition</i>	59
3.3 The Values of Historic Buildings.....	61
3.3.1 <i>The Historic Value of HBs</i>	62
3.3.2 <i>The Architectural Value of HBs</i>	62
3.3.3 <i>The Economic Values of HBs</i>	63
3.3.4 <i>The Environmental Value of HBs</i>	65
3.3.5 <i>The Social Value of HBs</i>	66
3.4 Threats against Historic Buildings	66
3.4.1 <i>Natural Factors that Decay HBs</i>	66
3.4.2 <i>Human Factors that Decay HBs</i>	67
3.5 Management of Architectural Conservation	69
3.5.1 <i>The History of Architectural Conservation</i>	69
3.5.2 <i>The Need for Architectural Conservation Management</i>	69
3.5.2 <i>The Types of Organisations that Care for Historic Buildings</i>	70
3.5.3 <i>Individuals in the Field of HBs Conservation</i>	73
3.6 The Regulations and Principles in Historic Buildings Conservation.....	75
3.6.1 <i>The Legal Aspects of Protecting HBs</i>	75
3.6.2 <i>Historic Buildings Conservation Principles</i>	76
3.7 Historic Building Conservation Processes.....	79
3.7.1 <i>Assessing and Documenting Historic Buildings' Value and Condition</i>	80
3.7.2 <i>Deciding the Level of Intervention in Historic Buildings (a Conservation Plan)</i>	83
3.7.3 <i>Contracting for HBs' Restoration Work</i>	87
3.7.4 <i>Supervision of Conservation Work</i>	88
3.8 Knowledge Aspects for Conserving HBs in Responsible Organisations.....	89
3.9 Chapter Summary	91
Chapter 4: Research Methodology and Processes	94
4.1 Introduction.....	94
4.2 The Philosophical Position of the Research.....	94
4.3 Development of the Research Methodology and Methods	95
4.3.1 <i>Proposed Model for Studying and Understanding KM in Organisations</i>	95
4.3.2 <i>The Research Context (the Case Study)</i>	96
4.3.3 <i>The Connection of the Research Questions to the Research Methods</i>	97
4.4 Questionnaires.....	99
4.4.1 <i>Questionnaire Sample and Respondent Categories</i>	99
4.4.2 <i>The Pilot Study</i>	102
4.4.3 <i>Process for Delivering and Receiving the Questionnaire</i>	102
4.4.4 <i>Structure and Content of the Questionnaire</i>	102

4.5 Interviews.....	103
4.5.1 <i>Choosing the Correct Type of Interview</i>	103
4.5.2 <i>The Research Interviewees</i>	104
4.5.3 <i>Semi-structured Pro-forma Interview</i>	106
4.6 Other Data Collection Methods	106
4.6.1 <i>The Organisation’s Documents Review (Archival Research)</i>	106
4.6.2 <i>Observation, Field Notes and Visual Survey</i>	106
4.7 Analysing the Research Data	107
4.7.1 <i>The Techniques Used in Quantitative Data Analysis</i>	107
4.7.2 <i>The Techniques Used in Qualitative Data Analysis</i>	109
4.7.3 <i>Triangulated Aspects</i>	110
4.8 Discussing Ethical and Practical Issues	111
4.9 Discussing Validity and Reliability Issues.....	111
4.10 Chapter Summary	112
Chapter 5: the Research Context and the Responsible Institution for Conserving HBs in Tripoli –Libya.....	114
5.1 Introduction.....	114
5.2 Research Context	114
5.3 The Responsible Institution for Conserving HBs in Libya.....	117
5.3.1 <i>The MHCb’s Accountability</i>	117
5.3.2 <i>The Main MHCb Headquarters’ Location and Design</i>	119
5.3.3 <i>Financial Resources in the MHCb</i>	121
5.3.4 <i>The Organisational Structure and the Interaction within the MHCb’s Departments</i>	121
5.3.5 <i>Awareness Regarding KM in the MHCb Context</i>	127
5.3.6 <i>The Effect of Current Leadership on KM</i>	128
5.4 Regulations and Policies that Affect KM in the MHCb	129
5.5 Chapter Summary	131
Chapter 6: Analysing Qualitative Data/ Essential Knowledge Aspects	134
6.1 Introduction.....	134
6.2 Essential Knowledge for Conducting HB Conservation Work in the MHCb.....	134
6.2.1 <i>Knowledge Regarding Assessing and Documenting HBs</i>	134
6.2.2 <i>Knowledge on Deciding the Level of Intervention (Action Plan)</i>	138
6.2.3 <i>Knowledge of Contract Management</i>	143
6.2.4 <i>Knowledge Regarding HBs Restoration Processes</i>	148
6.3 Chapter Summary	154

Chapter 7: Analysing Qualitative Information / Knowledge Sources, and KM Techniques and Technology in the MHCB	157
7.1 Introduction.....	157
7.2 Individuals in the MHCB Context	158
7.2.1 <i>Individuals as a Source of Knowledge in the MHCB</i>	158
7.2.2 <i>Employee Movement in the MHCB</i>	158
7.3 Documents in the MHCB Context	160
7.3.1 <i>Knowledge Repositories in the MHCB</i>	160
7.3.2 <i>The processes and Content of the MHCB's documents</i>	164
7.3.3 <i>Constraints of the Documenting and Dissemination Process</i>	174
7.4 HBs and their Restoration Process as a Source of Knowledge	176
7.5 Dealing with External Knowledge Sources	177
7.5.1 <i>External Local Experts</i>	178
7.5.2 <i>Relevant Local Organisations</i>	179
7.5.3 <i>Foreign Similar Restoration Projects and Relevant International Institutions</i>	181
7.6 Knowledge Management Techniques in the MHCB	183
7.6.1 <i>Discussion, Asking for Help and Meetings</i>	183
7.6.2 <i>Training Courses and Workshops</i>	184
7.6.3 <i>Presentations and Lectures</i>	186
7.6.4 <i>Symposiums and Conferences</i>	188
7.6.5 <i>Rotation Work System</i>	189
7.6.6 <i>Trial and Error</i>	189
7.6.7 <i>Recruitment</i>	190
7.6.8 <i>Team work</i>	191
7.6.9 <i>Monitoring</i>	192
7.6.10 <i>Reading (Private Study)</i>	192
7.7 Information Communication Technology (ICT) in the MHCB	192
7.7.1 <i>Computer Training Courses</i>	194
7.7.2 <i>The Website and Data Base of the MHCB</i>	194
7.7.3 <i>IT in Knowledge Processes</i>	195
7.7.4 <i>Constraints that Face Use IT in the MHCB</i>	196
7.8 Chapter Summary	197
Chapter 8: Analyzing Quantitative Data	201
8.1 Introduction.....	201
8.2 Respondents' Details	201
8.3: The Importance of Conservation Knowledge and its Availability in the MHCB	202
8.3.1: <i>The Importance of Conservation Knowledge</i>	202

8.3.2: <i>The Availability of HBs Conservation Knowledge in the MHCB</i>	207
8.4: KM Techniques and the Extent of their Application in the MHCB	211
8.4.1: <i>The Extent of Applying KM Techniques in the MHCB</i>	211
8.4.2: <i>The Employees' Absorption Abilities from Learning Tools</i>	212
8.4.3: <i>The Role of the MHCB's Library in Providing Useful Knowledge in the MHCB</i> ..	213
8.5: Information technologies (IT) and their application in the MHCB	213
8.5.1: <i>the Importance of IT in HBs Conservation Institution</i>	213
8.5.2: <i>Type of Storing Work Documents in the MHCB</i>	214
8.5.3 <i>The Extent of the Use of Internet Services in the MHCB</i>	215
8.5.4: <i>Obstacles to the Use of IT in the MHCB</i>	216
8.6: The MHCB's Circumstances and the Effective Factors in Developing KM	217
8.6.1: <i>Responsibility for Knowledge Development</i>	217
8.6.2: <i>The Extent of Satisfaction with the Content of Knowledge Shared in the MHCB</i> .	217
8.6.3: <i>The Extent that Relevant Employees Have HB Conservation Knowledge</i>	218
8.6.4: <i>Constraints of Contact with Employees in Other Departments in the MHCB</i>	219
8.6.5: <i>Difficulties in Requesting Documents between Departments in the MHCB</i>	219
8.6.6: <i>Culture of Collaboration in the MHCB (daily work in same place)</i>	221
8.6.7: <i>The Effect of Senior Employees Leaving the MHCB</i>	223
8.6.8 <i>The Preferred Source of Knowledge for Solving Daily Work Problems</i>	224
8.6.9: <i>The Extent of Interest on Whether KM is Needed Formally in the MHCB</i>	224
8.6.10: <i>The Effect of Influenced Factors on Developing KM in MHCB</i>	225
8.7 Technical Staff and their Movement in the MHCB	231
8.7.1 <i>Competence and Experience of the MHCB's Technical Staff</i>	231
8.7.2 <i>The Movement of the MHCB's Technical Employees</i>	232
8.8 Chapter Summary	234
Chapter 9: Discussion of the Key Findings	239
9.1 Introduction.....	239
9.2 The Concept of Knowledge Management in Organisations	239
9.3 The Nature of Historic Buildings and the Key Issues in their Conservation	240
9.4 The Essential Knowledge and the Extent of its Availability in the MHCB.....	240
9.4.1 <i>Knowledge Regarding Assessing and Documenting HBs' Value and Condition</i>	240
9.4.2 <i>Knowledge Regarding Deciding the Level of Intervention in HBs (action plan)</i>	241
9.4.3 <i>Knowledge Regarding Contract Management</i>	242
9.4.4 <i>Knowledge Regarding Supervision of HB Maintenance and Restoration Work</i>	243
9.5 The Factors Affecting KM in the MHCB's Context.....	244
9.5.1 <i>The Accountability and the Organisational Structure of the MHCB</i>	244

9.5.2	<i>The Effect of the MHCB's Policies and Governmental Regulations on KM</i>	246
9.5.3	<i>The Effect of Headquarters Location and Working Places in KM</i>	247
9.5.4	<i>The Effect of Information Technologies in KM</i>	247
9.5.5	<i>Culture of Collaboration in the MHCB</i>	248
9.5.6	<i>Awareness Regarding KM in the MHCB Context</i>	250
9.5.7	<i>The Role of the MHCB's Leadership in Managing Knowledge</i>	250
9.5.8	<i>Individuals in the MHCB and their Movement</i>	251
9.6	The Current Condition of Dealing with Knowledge at the MHCB	253
9.6.1	<i>Dealing with Documents in the MHCB's Context</i>	253
9.6.2	<i>KM Techniques and the Extent of their Application in the MHCB</i>	255
9.6.3	<i>Dealing with the External Knowledge in the MHCB</i>	261
9.7	The Effect of Current KM on the MHCB's Performance	263
9.8	The Strengths, Opportunities, Weaknesses and Threats in Managing the MHCB's Knowledge	264
9.8.1	<i>The Strengths and Opportunities for Managing Knowledge in the MHCB</i>	264
9.8.2	<i>The Weaknesses and Threats to Managing Knowledge in the MHCB</i>	267
9.9	Developing the Theoretical Model for Studying KM in Organisations	269
	Chapter 10: the Key Conclusions and Recommendations	272
10.1	Summary of Research's Chapters	272
10.2	Limitations of the Study	273
10.3	Research Conclusions	274
10.3.1	<i>The Essential Knowledge and its Availability in the MHCB</i>	274
10.3.2	<i>The Factors that Affect KM in Organisations</i>	275
10.3.3	<i>The Current Condition of Dealing with Knowledge</i>	276
10.4	Research Recommendations and Further Research	280
10.4.1	<i>Recommendations and Suggestions for Practising KM in the MHCB</i>	280
10.4.2	<i>Future Research</i>	281
10.5	Contribution to Knowledge	281
10.5.1	<i>Contribution to Managing Knowledge in HBs and their Conservation</i>	281
10.5.2	<i>Contribution to Theory/Practice of KM in Organisations</i>	281
10.6	Author's Final Statements	282
	List of References	283
	Appendices	301

List of Tables

Table 2.1: Structured and unstructured explicit knowledge)	19
Table 2.2: Viewpoints on knowledge and implications	28
Table 2.3: Activities (stages) of knowledge process in organisations	34
Table 3.1: Principles of age and rarity for registering HBs in England.....	59
Table 3.2: The Conservation Movement: A History of Architecture Preservation	69
Table 3.3: A comparison between heritage and non-heritage focused organisations	71
Table 3.4: The priority of work ranking for HBs.....	82
Table 3.5: The levels of intervention in HBs	87
Table 3.6: Essential HB conservation knowledge aspects	91
Table 4.1: A connection of research questions into research methods	98
Table 4.2: Research respondents' category (place of work and percentage of response).....	101
Table 5.1: The sequence of the MHCB's accountability since its establishment	118
Table 5.2: Responsibilities of the technical affairs section.....	123
Table 5.3: Responsibilities of the planning and studies department	125
Table 7.1: Technical, historic documents in Dar al-Naeb for documents.....	162
Table 7.2: Articles relevant to HB conservation that was published in Atar Alarab journal....	172
Table 7.3: Books and booklets that were authored in the MHCB	173
Table 7.4: Papers authored by local specialists and others in symposiums organised by the MHCB.....	174
Table 7.5: Courses relevant to HB conservation in the Architecture school, Tripoli University	180
Table 7.6: Training courses in the MHCB (1990-2010).....	185
Table 8.1: The ranking of HB conservation knowledge importance in the MHCB.....	203
Table 8.2: The rank of assessing and documenting HB knowledge importance	204
Table 8.3: The ranking of intervention plan knowledge importance	205
Table 8.4: Chi-square test of intervention plan in HBs knowledge	205
Table 8.5: Ranking of the importance of contract management knowledge.....	205
Table 8.6: Chi-square test for contract management knowledge	206
Table 8.7: Ranking of the importance of restoration process knowledge	206
Table 8.8: Chi-square test for restoration process knowledge	206
Table 8.9: The ranking of the availability of HB conservation knowledge in the MHCB	207
Table 8.10: Rank of availability of knowledge regarding assessing and documenting HBs	208
Table 8.11: Ranking the availability of knowledge regarding HB conservation plans.....	209
Table 8.12: Ranking of knowledge availability regarding contract management.....	209
Table 8.13: Ranking the availability of knowledge regarding the restoration process in HBs .	209
Table 8.14: The ranking of applying KM techniques in the MHCB	211
Table 8.15: The rank of respondents' absorption abilities from some learning tools.....	212
Table 8.16: The role of the MHCB's library in providing useful knowledge.....	213
Table 8.17: Correlation test of respondents' answers regarding library role and absorption abilities from reading	213
Table 8.18: Rank of importance of IT Contributions in HB Conservation Work in the MHCB	214
Table 8.19: Type of Storing Work Documents in the MHCB	215
Table 8.20: The extent of the use of internet services in the MHCB	215
Table 8.21: the obstacles which respondents faced when using IT in the MHCB.....	216
Table 8.22: Correlation between method of document storage and constraints in the use of IT	217
Table 8.23: Responsibility for knowledge development.....	217

Table 8.24: The Extent of Satisfaction with the Content of Knowledge within the MHCB.....	218
Table 8.25: The extent of obtaining HB conservation knowledge in the MHCB	218
Table 8.26: Constraints of Contact with Employees in Other Departments in the MHCB	219
Table 8.27: Difficulties in Requesting Documents between Departments in the MHCB.....	220
Table 8.28: The extent of accepting the need to ask for help in the MHCB.....	221
Table 8.29: The extent of accepting making mistakes in the MHCB	221
Table 8.30: Possibility of sharing lessons in a culture of continuous improvement	222
Table 8.31: Seeking and applying new learning in the MHCB	222
Table 8.32: The extent of transferring knowledge from seniors to juniors in the MHCB	223
Table 8.33: The extent of the effect of senior employees who left the MHCB	224
Table 8.34: Priority of acts for obtaining knowledge to solve a problem in daily work.....	224
Table 8.35: The extent of interest that KM is needed formally in the MHCB.....	225
Table 8.36: The rank (positive to negative) of factors in developing knowledge in the MHCB	231
Table 8.37: Levels of built environment education's certificates in Libya.....	231
Table 8.38: The number of technical staff and the mean of work experience in 2010	232
Table 8.39: The number of MHCB's technical employees between 1986 and 2010.....	233
Table 10.1: Summary of research objectives and findings	279

List of Figures

Figure 1.1: The organisation of the thesis.....	9
Figure 2.1: From Data to Knowledge	16
Figure 2.2: Sources of knowledge in organisations	20
Figure 2.3: The theory of knowledge creation in organisations.....	24
Figure 2.4: KM Transactions model	26
Figure 2.5: Migration knowledge path in organisations	26
Figure 2.6: Social constructed model.....	27
Figure 2.7: KM using case-based reasoning	46
Figure 2.8: A time/place framework for sharing knowledge	48
Figure 2.9: Framework for Knowledge Management.....	49
Figure 2.10: A proposed theoretical model for studying KM in organisations.....	55
Figure 3.1 Marcus Aurelius arch in the old city of Tripoli	60
Figure 3.2: Cathedral of Santa Maria Del Fiore in Florence.....	63
Figure 3.3: The key processes in HB conservation at the level of responsible organisation	80
Figure 3.4: Types of knowledge in the field of HB conservation	89
Figure 4.1: Multiple methods for gathering data to investigate the case of research.....	97
Figure 4.2: The targeted population for the research questionnaire.....	99
Figure 4.3: The representativeness of research population and questionnaire respondents.....	101
Figure 4.4: The selected interviewees.....	105
Figure 5.1: the location of the research context, Tripoli – Libya.....	114
Figure 5.2: The Madi Hassan Hotel in the old city of Tripoli.....	115
Figure 5.3: The former British consulate in the old city of Tripoli.....	116
Figure 5.4: The former Bank of Rome in the old city of Tripoli	117
Figure 5.5: the MHCb’s headquarters location map	119
Figure 5.6: The MHCb’s headquarters in the old city of Tripoli	120
Figure 5.7: Technical affairs department in the MHCb’s headquarters	120
Figure 5.8: The structure of the MHCb	122
Figure 5.9: The plans of the MHCb’s headquarters	126
Figure 6.1: Bank of Rome in the old city of Tripoli	135
Figure 6.2: Abdul-Wahab Mosque in the old city of Tripoli	136
Figure 6.3: The Gurji Mosque Tripoli, details of the main entrance	137
Figure 6.4: Humidity in walls, the former British consulate in Tripoli	138
Figure 6.5: removing layers of old paint in the Islamic museum, Tripoli.....	139
Figure 6.6: Conservation wood work in the former French consulate, Tripoli.....	139
Figure 6.7: underground services in the Islamic museum in Tripoli	141
Figure 6.8: Distinguishing the old and new ceramics in the old French consulate, Tripoli.....	142
Figure 6.9: Paint grades that were adopted in the Islamic museum project, Tripoli.....	146
Figure 6.10: Jama al-Mushat Tripoli, showing the risk of falling during work.....	148
Figure 6.11: Monitoring the wall cracks in the Islamic museum project.....	149
Figure 6.12: Supporting the foundations of the arts and crafts school, Tripoli.....	149
Figure 6.13: Concrete keys used to repair wall cracks, Tripoli	150
Figure 6.14: Pre-stressed metals to prevent horizontal force in the Islamic museum’s arches.	152
Figure 6.15: The wrong type of metal was used in the former British consulate in Tripoli	153
Figure 6.16: Recent repair material used in the Islamic museum project Tripoli.....	154
Figure 7.1: Internal and external HB conservation knowledge sources in the MHCb	157
Figure 7.2: Dar Ahmed Al-Naeb for Documents and Manuscripts	160
Figure 7.3: Dar al-Naeb for documents in the old city of Tripoli	161
Figure 7.4: Drawings and maps in Dar al-Naeb for documents in the old city of Tripoli	161

Figure 7.5: The MHCB audio/video records in dar-Naeb for documents Tripoli.....	162
Figure 7.6: Part of the MHCB’s archive in dar-Naeb	162
Figure 7.7: Drawings of proposal alteration in Former bank of Rome.....	167
Figure 7.8: Conditional survey drawing: Hosh Mohssen in the old city of Tripoli	169
Figure 7.9: The MHCB’s publications.....	171
Figure 7.10: External knowledge sources	177
Figure 7.11: Durghut Mosque in the old city of Tripoli, Libya	179
Figure 7.12: Use of IT for preparing HB drawings in the MHCB	193
Figure 7.13: Use IT for preparing reports in the MHCB	193
Figure 7.14: Drawings that were prepared manually in the MHCB transformed into digital form.	194
Figure 7.15: Database system under construction in the MHCB.....	195
Figure 8.1: Experience of questionnaire’s respondents	202
Figure 8.2: The importance of HB conservation knowledge in the MHCB	204
Figure 8.3: Percentage of HB conservation knowledge availability in the MHCB	208
Figure 8.4: The importance of HB conservation knowledge and its availability in the MHCB	210
Figure 8.5: The means of applying KM techniques in the MHCB / 5	212
Figure 8.6: The mean of the importance of IT in the field of HB conservation	214
Figure 8.7: The extent of the use internet services in the MHCB	215
Figure 8.8: Frequency of facing IT constraints among respondents in the MHCB	216
Figure 8.9: The extent of employee satisfaction with the content of knowledge shared in the MHCB.....	218
Figure 8.10: the extent of obtaining HB conservation knowledge in the MHCB	218
Figure 8.11: Frequency of facing difficulties when contacting other departments’ employees in the MHCB	219
Figure 8.12: The frequency of difficulties faced when requesting documents from other departments in the MHCB	220
Figure 8.13: Frequency of accepting the need to ask for help in the MHCB working environment	221
Figure 8.14: Frequency of accepting making mistakes in the work environment	222
Figure 8.15: Frequency of the possibility of sharing lessons in the work environment.....	222
Figure 8.16: Frequency of opinions that individuals seek and apply new learning in the work environment	223
Figure 8.17: Frequency of opinions regarding transferring knowledge from seniors into juniors	223
Figure 8.18: The negative effect of senior employees’ leaving	224
Figure 8.19: The interest of employees regarding the need for formal KM in the MHCB.....	225
Figure 8.20: The effect of suitable places in the MHCB on developing KM	225
Figure 8.21: The effect of MHCB employees’ competence on developing KM	226
Figure 8.22: The effect of the personal experience of MHCB employees on developing KM.	226
Figure 8.23: The effect of the MHCB employees’ absorption abilities on developing KM.....	227
Figure 8.24: The effect of the MHCB organisational policy regarding paying for knowledge on developing KM	227
Figure 8.25: The effect of the MHCB collaboration culture on developing KM.....	228
Figure 8.26: The effect of the MHCB’s policy regarding staff motivation on developing KM	228
Figure 8.27: The effect of ICT on developing KM in the MHCB	229
Figure 8.28: The effect of the leadership’s vision on developing KM in the MHCB.....	229
Figure 8.29: The effect of the MHCB’s organisational structure on developing KM	230
Figure 8.30: Number of technical employees in the MHCB between 1986 and 2010	232
Figure 8.31: Number of technical employees that left the MHCB between 1986 and 2010	233

Figure 8.32: Comparison between the number of existing technical employees (2010) and total number of technical employees who worked in the MHCB between 1986 and 2010.....	233
Figure 9.1: A theoretical model for studying and understanding KM in organisations.....	271

Chapter 1: Introduction

This chapter provides an introduction to the thesis. It includes a background to the study and introduces the key areas of research: knowledge management (KM), historic buildings (HBs) and their conservation and the context of the research in Libya and the responsible institution in the city of Tripoli. Furthermore, it presents the statement of the research problem, the research questions and the objectives. Moreover, this chapter discusses the scope and significance of the research. Finally, it demonstrates the organisation of the thesis.

1.1 Background of the study

The motivation for choosing a research area that is relevant to knowledge management (KM) in the field of historic building (HBs) conservation in Libya is on Hall (2011):

- An area that the researcher is interested in
- Links with the researcher's personal or professional experience
- An area where the researcher already has some knowledge
- Building on previous courses or learning
- An area of interest that the researcher has access to (or can obtain access to).

The author has knowledge and interest in HBs and their conservation, in addition to professional experience, as he had worked and witnessed the work done in the organisation responsible for conserving HBs 'Management of Historical Cities Bureau (MHCB)' in Tripoli, Libya. Observations of the conservation processes of HBs in Tripoli showed a repetition of mistakes in conservation work. Furthermore, visits to the MHCB and an informal meeting with employees made the author aware of what occurs in this institution regarding HB conservation processes and management. Finally, the flexibility of having access to this institution is the other reason which encouraged the choice of research area.

A problem in dealing with information in the MHCB was the first impression, gained in the early stages of preparing the research proposal. However, the author tended to consider the problem as including knowledge and information aspects according to a literature review regarding KM and HB conservation (more is given on the research problem in section 1.3.1).

1.2 The Key Areas of Research

The key areas of the research are: knowledge management (KM), historic buildings (HBs) and their conservation, and the research context; Libya and the responsible institution for HBs conservation in Tripoli.

1.2.1 Knowledge Management (KM)

Managing knowledge provides advantages for an organisation, particularly in terms of addressing problems and adding value. It improves the capabilities of the organization's human resources and is helpful in solving problems (Bock et al, 2005). Also, it helps in enhancing the performance of organisations (Vijay, 2007; Vector, 2008). Furthermore, KM efforts usually focus on the sharing of lessons learned, and continuous improvement of the organisation (Vector, 2008). However, knowledge management could be defined as:

“Strategies and processes designed to identify, capture, structure, value, leverage and share an organization's intellectual assets to enhance its performance and competitiveness” (Vijay, 2007).

The concept of KM in organisations has been influenced by the theory of Nonaka et al (1995), which contains four distinct modes of interaction between tacit (personal) knowledge and explicit (organisational) knowledge. The main approaches in the field of knowledge management are: people-based and explicit KM approaches.

The people-based KM approach concentrates more on socialisation in terms of the transfer of tacit to tacit knowledge between individuals, and internalisation in terms of the transfer of explicit to tacit knowledge. Furthermore, the people-based KM approach focuses on people who deal with knowledge in their work, and how people within organisations capture and share the knowledge based on a concept that there is a risk that tacit knowledge is lost in organisations if knowledge is not managed. As Rowley (2001: 228) emphasized, tacit knowledge which resides in individuals' minds should be managed, as he stated that “Opportunities for the exchange of tacit knowledge cannot be left to chance and need to be supported and facilitated”. Furthermore, people-based KM addresses organization's human resources issues. Davenport (2000) stated that people-based KM is relevant to organisations' employees, when these employees have a need to create, share, look for and use knowledge in their daily work. However, such employees are different according to their background, culture and, abilities, and this makes a strategy for studying KM context specific.

The other main approach is the explicit-based KM approach, which concentrates on capturing and transferring knowledge; as Sheehan et al (2005) mentioned, this is “an explicit approach focusing on capturing knowledge in documents, database, intranets, etc.”. This approach tends “to be heavily technology focused and is concerned with the management of explicit knowledge” (Snowden, 1999).

Explicit and people-based KM approaches are important for organisations as they add value and address their problems. Also, KM is contextual in terms of the fact that the strategies have to be context specific. As Quintas (2005: 24) stated, knowledge and its context may have “value and meaning in one context [and...] little or no meaning in another”. Also, knowledge as something possessed must be practised in a specific context to be meaningful (Newell et al, 2006: 169).

Finally, some fields started dealing with KM before others, as Vector (2008) stated. The first fields were business administration, information systems, management, and library and information sciences, and other fields have recently followed them. For instance, the concept of KM was mostly studied in the construction industry in the 2000s. However, KM has not yet been studied in the field of historic building conservation, which is characterised by a special nature.

1.2.2 Historic Buildings (HBs) and their Conservation

Historic buildings (HBs) are old buildings “which have been most successfully adapted to new and changing uses over the time since their construction” (ICOMOS, 1990). These buildings mostly have certain features that have been classified by Feilden (2004:1) as “architectural, aesthetic, historic, documentary, archaeological, economic, social and even political and spiritual or symbolic values”. They are not ancient monuments as they still have a role or can perform a function. They can be classified as vernacular buildings which were built by people from local materials, and luxurious buildings, according to the quality of their construction materials and workmanship (Feilden, 2004:124). However, the effective use of HBs currently depends on successful conservation.

Conservation involves actions that are taken to avoid HB deterioration. As (ICOMOS, 1999: 7) stated, this involves “all of the processes of looking after a place so as to retain its cultural significance”. Historic buildings are already an existing product and the main issue in their conservation is the process of intervention (Glen, 2001: 2). However, compliance with the principles of HB conservation is the scale of successful

intervention. Hume (2007: 16) stated five principles for conserving HBs: conservation as found; minimal intervention; like-for-like repairs; reversibility of repairs, and the sympathy of the repair. In addition, another principle was noted by Brereton (1991) relating to the truth to materials (distinguishing old and new materials).

Because of the value of HBs, their conservation work should use all knowledge and skills both for their study and care, which should only be undertaken by those with the appropriate knowledge and skills. For example, the Australian Charter emphasized that “conservation should make use of all the knowledge, skills and disciplines which can contribute to the study and care of the place” (ICOMOS, 1999). Also, HB conservation work “should only be undertaken by those with the appropriate knowledge and skills” (Wafa, 2007: 44). However, knowledge limitation is prevalent in HB conservation organisations, and this lack, as Dann et al (2004: 146) (specialists in the field of HB conservation) indicates that there is a need for “an understanding of the limits of specialist knowledge within the organisation”.

Scholars in the field of HB conservation stress the need for the development of knowledge in the staff and organisations in this field. For instance, Dann et al (1998:145) emphasized that one of the most significant HB conservation management strategies has been to establish the required level of staff technical and management expertise. Also, to avoid the repetition of HB damage, the creation and dissemination of knowledge is essential, as Lazarus (2007: 319) stated:

“There is a need for collaborative research into appropriate methods and materials for such work, and for widespread dissemination of the findings, in order to avoid a repetition of damage to historic fabric”.

Furthermore, because HBs are under threat, knowledge about their conservation should be developed and understood more rapidly. However, employees have insufficient time to acquire knowledge and, as Macintosh (1999) stated, “knowledge takes time to experience and acquire. Employees have less and less time for this”.

For these reasons, the management of knowledge in the field of HB conservation is significant and should not be random, as the knowledge in this field is part of both a country’s heritage and the processes of its conservation. However, the concept of KM should be embraced in the field of HB conservation, by considering the nature of work in this field and any differences in its context.

1.2.3 Research Context

Libya is an Arabic Islamic Mediterranean country, located in northern Africa and the capital, Tripoli, is in the north west of the country. Libya has experienced different historic ages, such as the Phoenicians, Greeks, Romans, Muslims, and also Italian occupation. It is distinguished by a historic continuation which has enriched its historic and architectural features. For instance, the city of Tripoli is regarded as:

“...very well known for its Islamic monuments especially in the old city like mosques, schools, hotels, and the residences for the diplomatic missions, beside the unique type of its houses, baths and souks” (Unknown, 2002).

Libyan historic buildings have cultural values regarded as a national heritage for the country and should therefore be maintained for future generations, to tell the history and reflect the time periods that Libya witnessed.

Dealing with HBs is a continuing process conducted mostly by responsible governmental organisations which are not-for-profit and non-competitive. The trials for conserving HBs in Libya underwent several stages starting with the formation of a committee in 1966. Its mission was to count historic places in the old city of Tripoli. This committee was followed by the formation of several consulting committees without real executive work. However, the initial transfer to actual execution work for HBs in Libya started in 1986. According to government decision number 40 (1985), the Libyan government established the Institution of Organization and Management of the Old City of Tripoli (IOMOCT), whose mission was the conservation of HBs in the city of Tripoli. However, in 2006, the name and tasks of this institution changed, and it became the Management of Historic Cities Bureau (MHCB), with an extended mission to cover HBs all over the country. The MHCB is the only governmental institution responsible for conserving HBs in Libya. Therefore, this institution and its context is the case for studying the problems that are relevant to KM in HB conservation in Libya.

1.3 Problem Statement, Research Questions Objectives and Methodology

1.3.1 Problem Statement

Regarding research problem De Vaus (1990: 34) stated:

"The formulation of a research problem is a process involving interaction between the problem and data. The final research problem will evolve in this process as we reflect on and try to make sense of data".

However, the issues that were observed in the responsible organisation (the MHCB) include two points: a lack of required knowledge, and the loss of technical employees who leave the organisation, taking their knowledge with them.

The first point regards the acquisition, retention and reusing of the institution's knowledge. The responsible institution for conserving historic buildings in Libya started its work in 1986. This means that more than 25 years of knowledge about HB conservation work was accumulated in the MHCB. However, knowledge is often absent when it is needed. In the case of problems or work difficulties, the required knowledge often cannot be accessed in order to solve these problems, and this has led, for instance, to the repetition of mistakes in conservation work. In turn, this may have led to a loss of HB values and the waste of the time and money that were spent on repeating work. This could be attributed to the fact that the lessons which were learnt from solving problems, or from previous experiences of conservation processes, not being stored, shared or used effectively to solve other problems. Regarding the importance for an organisation to know what they know, Macintosh (1999) stated that "institutions are realising how important it is to 'know what they know' and be able to make maximum use of the knowledge". Also, Bishop (2009) noted that the knowledge of an organisation should be focused on "understanding how to make the best use of this resource".

The second point that was observed is that technical employees are leaving the organisation with knowledge gained from years of practical experience. This leads to knowledge leakage and a lack of experts within the MHCB who could conduct conservation work correctly, in addition to the extra time and money spent on training new employees. Regarding the absence of supporting data and specialists in the MHCB, El-Belazie (2004: 265) mentioned that "they face this issue every day. Also, there is not enough reference and experts working in APTOC [the MHCB]". The senior architects and engineers with work experience have left the MHCB, without transferring their knowledge to juniors. In this regard, Macintosh (1999) stated that with employee movement "there are trends for employees to retire earlier and for increasing mobility, leading to loss of knowledge". However, in comparison with other businesses, the loss of any senior technical staff member from an HB conservation organisation is an irreparable loss. This is because a lack of specialists in this field, particularly in Libya, is significant due to the MHCB being the only governmental institution responsible for conserving HBs all over the country. The departure of technical employees causes a type of knowledge leakage or loss.

The problem is diagnosed as the limitation of capturing and sharing knowledge that has in turn led to the inefficient use of the accumulated knowledge in the MHCB. This situation calls for the investigation of the current situation for managing knowledge in the MHCB and gives rise to the research questions.

1.3.2 Research Questions

According to Robertson et al, (1996: 34) a strong research question is the base on which a researcher builds their research. It helps in deciding upon the sort of required data, and the best method for collecting and analysing it. However, the questions that were drawn from the problem statement are:

1. What is the concept of KM and what is its relevance to organisations?
2. What is the nature of historic buildings and what are the key issues in their conservation at the level of responsible organisations?
3. What is essential HB conservation knowledge in the MHCB? To what extent is it available in the MHCB?
4. What factors influence the management of knowledge in the MHCB context? And what is their impact?
5. How does the MHCB deal with knowledge? How does KM affect MHCB's performance?
6. What are the key issues, strengths, weaknesses, opportunities and threats in the management of knowledge in the MHCB?

After answering these questions, it is hoped that the problem of managing knowledge in the MHCB will be understood. This will lead to developing a theoretical framework for studying and understanding KM in HB conservation organisations, in addition to recommendations that contribute to good knowledge management for the conservation of historic buildings by Libyan conservation institutions and similar institutions.

1.3.3 Research Aim / Objectives

As mentioned previously, the MHCB suffers from both the insufficient use of the accumulated knowledge, and the limitations with knowledge capturing and sharing. Therefore, the research aims to investigate the concept of knowledge management, and develop a framework for studying and understanding KM in HB organisations.

To conduct this aim, the following objectives will be pursued:

- Investigate the concept of knowledge management and its relevance to organisations

- Undertake a study of HBs and identify the key issues involved in their conservation at the level of responsible institutions
- Investigate the extent of the importance and availability of knowledge in the MHCB
- Study the factors affecting KM in the MHCB
- Explore, analyse and evaluate the current conditions for dealing with knowledge in the MHCB context and its effect on performance
- Draw out key findings, strengths, weaknesses, opportunities and threats to managing knowledge in the MHCB
- Develop a framework for studying and understanding KM in HBs conservation organisations, and suggest recommendations for effective KM in MHCB and similar organisations.

1.3.4 Research Methodology

A mixed qualitative and quantitative research approach for collecting and analysing data and information will be adopted. Multi-methods will be used for collecting data and information: literature reviews, interviews, questionnaires, observation and analysing organisational documents. Triangulation will be undertaken by cross-checking fieldwork findings against the wider literature.

1.4 The Scope and Significance of the Research

1.4.1 Research Scope

The operational definition for historic buildings (section 3.2.2) demonstrated that the research is not dealing with HBs that are ancient buildings (such as Roman or Greek monuments) or relatively new buildings, even on historic sites. Also, it does not deal with conservation planning for historic cities. This research focuses on HB conservation knowledge aspects, and the MHCB and its position as the only organisation responsible for conserving HBs in Libya. Although the focus is on the MHCB, data was collected from other sources outside the MHCB, such as previous employees and those from other organisations that have a link with the MHCB. They were used to understanding KM in this organisation.

1.4.2 Research Significance

The significance of the research comes from its contribution to the conservation of the significant cultural heritage of Libya, through investigating the current situation of dealing with the essential knowledge required for conserving HBs. Also, it develop a model for studying and understanding KM in organisation and will provide a reference base for further research regarding the management of knowledge in HB conservation

organisations. Furthermore, the study will contribute to decision making in responsible institutions in general and in Libya specifically, by making them more aware of the significance of managing the knowledge their organisations hold to improve the performance of conserving HBs.

1.5 The Organisation of the Thesis

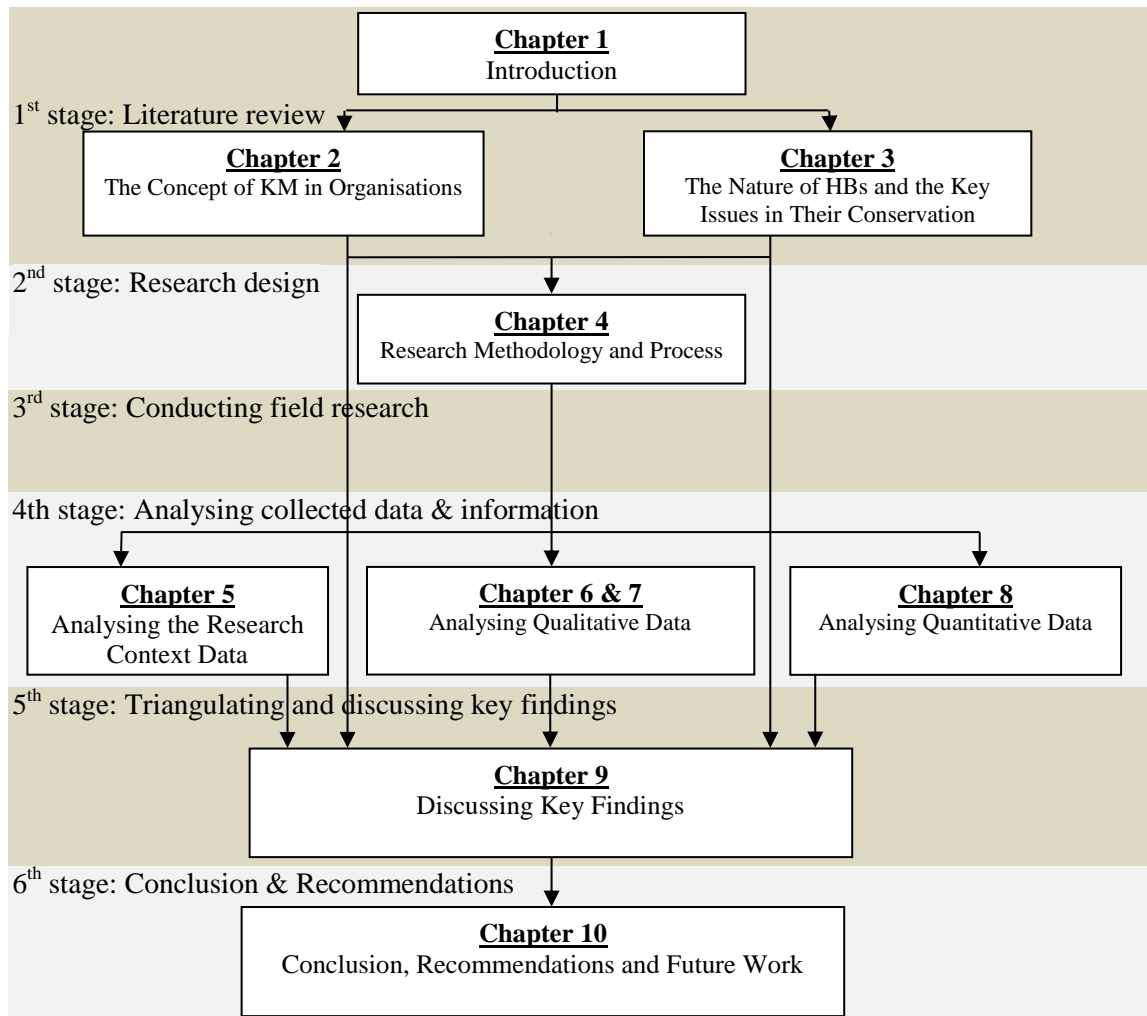


Figure 1.1: The organisation of the thesis

The thesis includes six main parts (stages) and ten chapters (figure 1.1). The first part includes the literature review. The second includes the research methodology. The third part includes conducting the field research in terms of data and information collection. The fourth part includes analysing the collected data: organisation documents and quantitative and qualitative information. The fifth part includes triangulating and discussing the key findings. The sixth part includes conclusion, recommendations, and future work. The references and appendices were included at the end of the thesis. The appendices include the questionnaires, interview pro-forma, the visual survey and

observations, data collection form for historic building, and the details of the research interviewees. However, the research chapters include the following issues.

Chapter one: This chapter provides an introduction to the thesis. It includes the background to the study and the key areas of research. Also, it includes the research problem statement, research questions, objectives and methodology. Furthermore, it includes the scope and the significance of the research, in addition to the thesis structure.

Chapter two: This chapter investigates the concept of knowledge management (KM) and its relevance to organisations. Knowledge and KM are defined. Also, KM theories, approaches and processes are investigated. Furthermore, KM tools and the factors influencing KM in organisations are demonstrated.

Chapter three: This chapter studies the nature of historic buildings (HBs) and the key organisational issues involved in their conservation. The concept of HBs, their values and the threats that face them are studied. Also, subjects regarding the need for managing HBs conservation, organisation types for HBs conservation, and individuals in the field of HBs conservation are discussed. Furthermore, the key issues in the HB conservation process at the level of responsible institutions are discussed. Finally, the knowledge aspects which could be managed in responsible organisation are demonstrated.

Chapter four: This chapter identifies and discusses the research methodology. The case study is discussed. Furthermore, the connection between the research questions and the research strategy and methods is demonstrated. Moreover, this chapter discusses the content and processes of the research collection methods that were adopted. Finally, ethical and practical issues that arose by the use of these methods within the planned research are discussed.

Chapter five: This chapter studies the research context and the institution that is responsible for conserving historic buildings in Libya. The location of the research context and the values of its architectural heritage are demonstrated. Also, the management of HB conservation in Libya, and organisational and individuals issues that are relevant or that have an influence on KM in the MHCB are explored and analysed. These issues include accountability, the main MHCB headquarters' location and design, financial resources, organisational structure, awareness regarding KM, and the effect of leadership in addition to regulations and policies.

Chapter six: in this chapter the knowledge aspects that are essential for conducting HB conservation work in the MHCB are explored and analyzed.

Chapter seven: This chapter discusses the current situation of dealing with knowledge in the MHCB context. It investigates the knowledge sources, and KM techniques and technology in the MHCB. Also, it discusses dealing with external knowledge.

Chapter eight: This chapter studies the quantitative data collected by questionnaires and organisation records. It indicates the gap in conservation knowledge in the MHCB through determining the importance of HB conservation knowledge aspects and its availability in the MHCB. Also, the extent of applying KM techniques and technologies in the MHCB are studied. Furthermore, it studies the MHCB's circumstances in terms of the opinions regarding the culture of collaboration and knowledge sharing in the MHCB, and the awareness of employees and their interest in the need for KM in their institution. Moreover, it discusses statistical results regarding technical staff and their movement in the MHCB.

Chapter nine: This chapter includes triangulation and discusses the key findings of the research. It identifies the key issues: essential knowledge and its availability, factors influencing KM, and the current condition for dealing with knowledge and the effect of KM in organisation performance. It also identified strengths, weakness, opportunities and threats regarding managing knowledge in the MHCB. Finally, the factors that affect KM in the MHCB were discussed and concluded in a model for studying and understanding KM in HB conservation organisations.

Chapter ten: This chapter includes the key conclusions, recommendations of the research, and the contribution to knowledge. Also, it includes the limitations of the study, as well as the author's final statements.

Chapter 2: the Concept of Knowledge Management in Organisations

2.1 Introduction

The objective of this chapter is to investigate the concept of knowledge management (KM) in organisations. This chapter is divided into nine sections: the first section introduces the chapter and the second studies the objective of KM and its definition. The third section deals with a definition of knowledge, and its types and sources. The fourth section discusses management theories and the fifth section studies the main approaches to managing knowledge in organisations. The sixth section highlights KM processes. The seventh section discusses KM techniques and the eighth demonstrates KM technologies. The ninth section discusses the factors that affect KM in organizations.

2.2 Knowledge Management Objectives and Definition

2.2.1 The Organisational Management Activities Associated with KM Objectives

The concept of knowledge management (KM) is associated with some organisational subjects such as: organisational learning, human resource management (HRM), research and development (RD) activities, document management and information technology (IT). Vector (2008) stated that many organisations “have resources dedicated to internal KM efforts, often as a part of their 'Business Strategy', 'Information Technology', or 'Human Resource Management' departments.”

Regarding organisational learning, Vector (2008) stated that:

“KM efforts overlap with organisational learning, and may be distinguished from [it] by a greater focus on the management of knowledge as a strategic asset and a focus on encouraging the exchange of knowledge”.

Also, Beijerse (1999: 97) stated that KM make professionals learn more efficiently and effectively.

Furthermore, KM is associated with HRM subject. Murthy et al (2011) stated that:

“The corresponding human resource practices includes acquiring (recruitment), enabling (training), evaluating (performance measurement), developing (career management), and rewarding (compensation) the knowledge workers.”

One of main reasons for the emergence and growth of KM is workforce mobility, as KM contributes to the retention of knowledge-workers in an organisation (Serban et al, 2002:7; Vector, 2008, Beijerse, 1999: 97). Furthermore, Bock (2005) stated that KM “improves the capabilities of the organization’s human resources.” All previous

activities are HRM activities associated with KM in organisations. However, KM contributes to reducing the training time for new employees (Vector, 2008).

Regarding research and development (RD) activities in an organisation, Rowley (2001: 233) stated that:

“Knowledge creation involves research and development activities that generate scientific and technical knowledge and market research that generates market knowledge. These are activities whose primary purpose is knowledge creation.”

Also, Davenport *et al* (1998) stated that there are “dedicated resources, as an organization sets aside some staff members or an entire department (usually research and development) to develop within the institution for a specific purpose.” Furthermore, KM is associated with document management, as Bacalu (2007) stated: proper document management can significantly enhance the effectiveness of a maintenance audit in organisation. Finally, KM is associated with information technology (IT), as will be discussed in section 2.8.

2.2.2 The Objectives of Knowledge Management

Knowledge management (KM) is a recent discipline which emerged in “the late 1980s as an element of managing organisations, and more recently as an academic subject area” (Cooper, 2002: 375). Knowledge management invites us to be aware of pre-existing knowledge processes and think differently about key organisational resources and processes (Quintas, 2005: 11). However, in addition to the organisational subjects associated with KM objectives, KM aims to make organisations use its available knowledge. Beijerse (1999) pointed out that approximately just 20% of the knowledge that is potentially available in companies is used. However, Davenport *et al* (2000), Rowley (1999), Macintosh (1999), Newman (1999), Tan *et al.* (2006) and Vector (2008) emphasize the role of KM in the maximization of organisations’ knowledge, avoidance of reinventing the wheel and repetition of mistakes. For instance, Davenport *et al* (2000: 14) stated that:

“Managers in large corporations know how common it is to reinvent the wheel, solving the same problems from scratch again and again, duplicating effort because knowledge of already developed solutions has not been shared within the company.”

KM provides rapid access to quality knowledge in organisations (Shin, 2001: 347). This is supported by Murthy and Panchal (2011), who stated that the goal of KM is to ensure that “people have the knowledge (right knowledge) they need, where (the right place) they

need it, when (the right time) they need it”. Also, it is “helpful in solving problems in the organisation” (Bock, 2005). Furthermore, Vector (2008), Robinson et al. (2005), Shin (2001), Newman (1999), and Beijerse (1999) mentioned numerous KM objectives, such as: facilitating the continuous improvement of performance; competitive advantage; innovation; the sharing of lessons learned, and the optimisation of the interaction between product development and marketing. Also, it helps individuals and groups to share valuable organisational insights and improve communication and synergy between employees. Finally, KM enables the organization to create, spread, and apply all aspects of knowledge to achieve its overall goals (Bano and Khan, 2010).

2.2.3 Knowledge Management Definition

Management refers to having a set of management activities directed towards dealing with an ‘object,’ which is the subject of knowledge management (Wiig et al, 1997: 15). Furthermore, Birkenshaw (2001) mentioned that “knowledge management is never zero based: to make it work you need to recognise that you are already doing it.” In this suggestion, the phrase ‘to make it work’ gives a sense that KM is something that contains activities. This opinion was supported by Vijay (2007) as he mentioned that KM “is based on two critical activities: (1) capture and documentation of individual explicit and tacit knowledge, and (2) its dissemination within the organization”. However, Scarbrough et al (1999), Macintosh (1999), Swan et al. (1999), Gupta et al (2000), Vijay (2007), Vector (2008), APQC (2012) and others agree that KM is about processes. For instance, Gupta et al (2000: 17) stated that KM is:

“A process that helps organisations find, select, organize, disseminate and transfer information and expertise necessary for activities such as problem solving, dynamic learning, strategic planning, and decision making.”

Also, Scarbrough et al (1999) defined KM as “the process of creating, acquiring, capturing, sharing and using knowledge to enhance organisational learning and performance.” Furthermore, Vijay (2007) in his business dictionary described KM as:

“Strategies and processes designed to identify, capture, structure, value, leverage, and share an organization's intellectual assets to enhance its performance and competitiveness.”

The term strategies in the previous definition means plans, as Wehmeier (1993) defined strategy as “a plan that you use in order to achieve something.” Also, the European Community (2003) defined a strategy as “a general plan for the way the company will deploy its competence and resources in order to achieve overall goals.” Otherwise,

processes mean actions, as Wehmeier (1993), in his dictionary, mentioned that process means “a serious of actions that you do for a particular purpose.” Finally, KM involves the identification and analysis of available and required knowledge assets and knowledge asset-related processes, and the subsequent planning and control of actions to develop both the assets and the processes so as to fulfil organisational objectives (Macintosh, 1999).

The definition of knowledge management has been derived from several scholars, including Swan et al. (1999), Scarbrough et al (1999), Macintosh (1999), Beijerse (1999), Gupta (2000), Serban et al (2002), Services (2008), Robinson et al. (2005), Bock (2005), Vijay (2007), Vector (2008) and APQC (2012). The definition is that management processes enable organisations to identify the available and required knowledge, capturing and sharing it for effective use to achieve organisational objectives and create new knowledge. It supports necessary activities within the organisation, such as enhancing performance, improving the capabilities of the organization’s human resources, problem solving, competitive advantage, learning, strategic planning, and decision making. However, knowledge that should be managed in organisation is the core component of KM and has many types and sources.

2.3 Knowledge Definition, Types and Sources

2.3.1 Data, Information and Knowledge

Knowledge, information and data are sometimes presented to a reader as interchangeable items. Sun and Howard (2004) noticed that “the term information is often used loosely to cover data, information and knowledge and it is necessary to distinguish between these.” However, scholars such as Sun and Howard (2004), Wehmeier (1993), Lucey (2005) and others agree that data is a sum of facts or measurements or statistics used to create information. For instance, Lucey (2005) mentioned that data are “facts, events, transactions and so on which have been recorded. They are the input raw materials from which information is produced”. Sun and Howard (2004) stated that information is “organized or processed data that is timely and accurate.”

Regarding knowledge and its relation to information, Albino et al (2000) stated that “from a structural point of view, knowledge is formed by information.” Also, Kamara et al (2002) mentioned that knowledge includes information. However, in comparison with information, knowledge is not neutral because it is related to an individual or organisational interpretation process (Albino et al, 2000; Huber, 1991; Weick, 1979).

Also, Lucey (2005) stated that “it has strong experimental and reflective elements that distinguish it from information.”

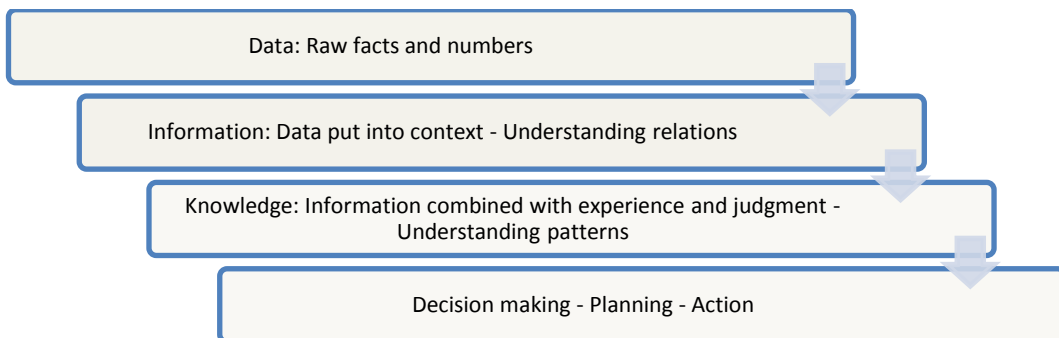


Figure 2.1: From Data to Knowledge (Serban et al, 2002)

Information is transformed into knowledge through the following processes: comparison, consequence, connection and conversation (Davenport et al, 2000). The interpretation process can concern new as well as existing information and, through its implementation, the individual or the organisation may develop new or maintain previous knowledge (McAdam and McCreedy, 1999). The hierarchical structure (figure 2.1) presumes a one way conversion process in the sense that information is converted into knowledge.

However, a flat structure, which is considered a two-way conversion process, was adopted by Ruan et al. (2012: 7), who stated that:

“Knowledge is transformed back into information before it is delivered to recipients; thus, knowledge is transferred as meaningful information rather than knowledge itself when it is recorded, stored and expressed by various means. The delivered information becomes knowledge only when the recipient has a deep understanding of the information and could use the relevant information to solve particular problems.”

Also, Orange (2000) described information as “the expression of knowledge, which is capable of being stored, accessed and communicated”. Furthermore, Vector (2008) stated that: “for knowledge to be made explicit, it must be translated into information (i.e. symbols outside of our heads).” Furthermore, Ruggles (1997), Sun and Howard (2004) and Lucey (2005) agree that knowledge is contextually relevant information which has values, experience and rules. It is considered the developed stage of information. Ruggles (1997) defined knowledge as:

“A fluid mix of contextual information, values, experience and rules. It comes in many forms, including process knowledge (how-to), catalogue knowledge (what is), and experiential knowledge (what was).”

Moreover, Bano et al (2010: 24) stated that knowledge is the sum of information, skills, personal capability, and experience. Finally, Serban et al (2002: 8) stated that:

“Knowledge combines information with individual, group, and organizational experience and judgment, and it involves making a leap from understanding relations to understanding patterns that can guide action.”

Characteristics that set knowledge apart from other resources as mentioned by (Wiig et al, 1997: 16) are:

- Intangible and difficult to measure
- Volatile, that is, it can ‘disappear’ overnight
- Most of the time, embodied in agents with wills
- Not ‘consumed’ in a process, it sometimes increases through use
- Has wide ranging impacts in organizations (e.g. ‘knowledge is power’)
- Cannot be bought on the market at any time, it often has long lead times
- ‘Non-rival’, it can be used by different processes at the same time.

However, the definition of knowledge is based on three tightly interconnected knowledge characteristics: the structural, the interpretation process and the functional characteristics (Albino et al., 2000).

The structural point of view is concerned with explicit knowledge in terms of knowledge is formed by information such as know-what knowledge (Albino et al., 2000).

Secondly, the interpretation process point of view is more concerned with tacit knowledge, which is embedded in individuals or organisations and could be transformed into explicit knowledge.

Thirdly, functional points of view are concerned with both explicit and tacit knowledge. From this view, knowledge can be divided into knowledge about facts ‘know-what’ and knowledge of procedures ‘know-how’ (Argote et al., 2011: 1126). Also, know-who is a functional knowledge. It is knowledge regarding individuals, suppliers and contractors and their abilities to conduct specific tasks (Kamara et al, 2002b).

Previous discussion introduced two types of knowledge in organisations: tacit knowledge, which is embedded in knowers’ minds, organizational routines, processes, practices and norms, and explicit knowledge, is which embedded in documents or repositories.

2.3.2 Tacit Versus Explicit Knowledge

According to Serban et al. (2002: 9), there is a need for a “systematic and organized approach of organizations to manipulate and take advantage of both explicit and tacit knowledge.” The knowledge that is managed in organisations includes both tacit (subjective knowledge) and explicit (documented knowledge) (Rowley, 1999). Newell and Galliers (2006: 1) differentiated explicit knowledge from tacit knowledge as he stated that:

“Knowledge is the product of learning. We can learn about something and so acquire explicit knowledge or we can learn to do something and so accumulate tacit knowledge.”

1. Tacit knowledge is associated with individuals, according to a psychological-cognitive approach (Nonaka and Takeuchi, 1995). Tacit knowledge is “instinctive skill, know-how, or technique of individual” (Shin et al, 2001). It is considered to be the most valuable knowledge because it provides context for people, places, ideas and experience (Murthy, 2011). Regarding tacit knowledge, Vector (2008) stated that “insights and experiences comprise knowledge, either embodied in individuals or embedded in organizational processes or practice.” However, three main characters recognize tacit knowledge: personal knowledge, context-specific and difficult to formalize.

The first characteristic of tacit knowledge is personal knowledge (Wiig et al, 1997); (Kidwell et al, 2000); (Crowley, 2000); (Serban et al, 2002), (Orange, 2000); (Egbu et al, 2005 a); (Bock, 2005). For instance, Egbu et al (2005 a) stated that tacit knowledge “is stored in individuals’ heads. It is a product of experiences, insights and intuition which could be technical (i.e. know-how of an expert) or cognitive (i.e. based on values, beliefs and perceptions).” Also, Serban et al. (2002: 9) stated that it is “individual knowledge: fluid, intangible, personalized entities that exist only in biological human brains.”

The second characteristic of tacit knowledge is context-specific (Kidwell, 2000; Crowley, 2000; Davenport et al, 2000; Egbu et al, 2005 a; Quintas, 2005; Newell and Galliers, 2006 and Murthy et al, 2011. For instance, Egbu et al (2005 a) stated of tacit knowledge that “this type of knowledge is experiential, judgemental, context-specific and therefore difficult to codify and share. Furthermore, Davenport et al. (2000) stated that it is embedded in organizational routines, processes, practices, and norms. Moreover, Quintas (2005: 23) stated that:

“Tacit organisational processes are difficult to transfer or share between contexts [...] what has value and meaning in one context may have little or no meaning in another context.”

Lastly, tacit knowledge is difficult to capture, communicate and share (Kidwell, 2000; Crowley, 2000; Egbu, 2005a inter alia. For instance, Kidwell (2000) stated that tacit knowledge is “personal in origin, job specific, related to context, difficult to fully articulate and poorly documented but highly operational in the minds of the possessor.”

Some tacit knowledge activities have been demonstrated by Rowley (2001), such as designing a building and negotiating a contract. Also, Anumba et al. (2005) outline specific examples of tacit knowledge in the context of construction firms: estimating and tendering, preparing bids, understanding the construction process, interaction with clients, customers and project team members, and understanding tender markets.

2. Explicit knowledge is “knowledge that can be captured and written down in documents or databases” (Murthy et al, 2011). Also, Egbu et al (2005a) stated that it is “stored as written documents or procedures. As this type of knowledge is codifiable, it is reusable in a consistent manner and therefore easier to share.” Furthermore, explicit knowledge, as codified knowledge, is transmittable in formal, systematic language (Crowley, 2000). Also, Edvinson (1997), stated that explicit knowledge is “what has been codified into manuals and reports, it builds on data available in databases and data warehouses.” Moreover, Newman (1999) stated that:

“Explicit knowledge that have been articulated in such a way, that they can be directly and completely transferred from one person to another. This normally means that they have been codified so it is possible to touch, see, hear, feel and manipulate them.”

However, explicit knowledge could be found as structured or unstructured forms (Table 2.1). For instance, Murthy et al (2011) considered documents, databases and spread sheets as structured explicit knowledge forms, whereas emails, images, training courses, audio and video are unstructured forms of explicit knowledge (Table 2.1). Also, Hahn et al. (2000: 304), in their KM system (Figure 2.8), considered intranets and search engines as unstructured forms of knowledge.

Table 2.1: Structured and unstructured explicit knowledge (Murthy et al, 2011)

Explicit knowledge	Structured	Documents, databases, spread sheets
	Unstructured	Emails, images, training courses, audio and video

The definition of explicit knowledge has been derived from numerous scholars: Nonaka and Takeuchi, (1995); Polanyi, (1983); Argote et al (2011) Serban et al, (2002); Egbu et al, (2005a); Murthy et al (2011) Davenport et al (2000) Albino et al (2000); Newman (1999). It is defined as knowledge which could be learned about something, found in structured or unstructured forms, which can be captured, written down (codified) and stored in organisations repositories (documents or databases). It is easily transferable, shared and reusable.

Some examples of explicit knowledge that were mentioned by Murthy et al (2011) are instruction manuals, written procedures, best practices, lessons learned and research findings. Also, Anumba et al. (2005) outlined specific examples of explicit knowledge in the context of construction firms: design codes of practice, performance specifications, drawings (in paper-based or electronic form), materials testing procedures, design sketches, images and 3D models, and text books.

2.3.3 Organisational Knowledge Sources

Knowledge sources for organisations can be classified according to their form or location. Knowledge sources according to their form (Figure 2.2) are varied: individuals, documents and an organization’s products or services (work processes).

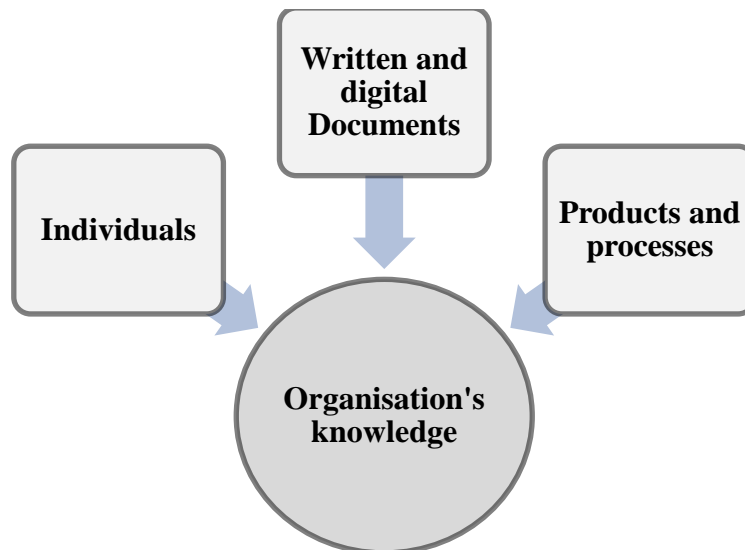


Figure 2.2: Sources of knowledge in organisations

The first type of knowledge source in the organisational context is individuals in terms of employees or specialists who are considered as a store of tacit knowledge. Tsoukas (1996) stated that “individual human agents have their own unique mental representation of the world.” Furthermore, Rowley (2001: 233) stated that:

“Knowledge resides with individuals and may largely derive from experience. This embedded knowledge will only be drawn out if those individuals reflect on, and are convinced by, the fact that they need to share their knowledge.”

The second type of knowledge sources is documents which include explicit knowledge in its written or digital forms, such as books, journals, organisational reports and databases.

The third type of knowledge source is an organization’s products or processes. As Mansfield (1985) stated, the products and services of an organisation include the organisation’s knowledge. In the field of HB conservation, a “structure can be read as historic evidence just like written documents, and can aid the understanding of past conditions and of how society changes” (Wafa, 2007: 37). Regarding the processes, Rowley (2001: 233) mentioned that “the delivery of the business activities and processes of the organisation, in addition to research and development activities, create knowledge”.

Knowledge sources, according to their location, are internal or external sources. According to Goodman (1998) and Andrews (2000), organizational learning processes include sharing internal knowledge and adopting knowledge in terms of importing knowledge from an external source. Also, Murthy et al (2011) stated that “KM architecture includes access to internal and external information sources.” However, internal and external sources of knowledge are crucial for an organisation’s continuation.

a. Internal knowledge is created and located in individuals’ minds, documents and organisational processes or products inside organisations and projects. One example of internal knowledge sources is research sections in institutions which are “good examples of dedicated resources to the extent that they generally serve specific purposes”(Davenport et al, 1998). However, internal knowledge is often under control in comparison with external one. As Al-Ghassani et al (2005: 96) stated, “Internal knowledge may be easier and less expensive to manage, whereas external knowledge is more difficult and expensive to obtain.” However, if required knowledge is not available internally KM “provides a better foundation for making decisions like make-or-buy of new knowledge and technology, alliances and mergers” (Beijerse, 1999: 97).

b. External knowledge is located outside the organisation. Regarding the acquisition of external knowledge, Rowley (2001: 233) stated that:

“Knowledge acquisition is associated with the contracting of knowledge from outside the company. This may include the appointment of people, the purchase

of reports or licences, or the strategic alliances that involve exchange of knowledge and competence.”

Moreover, Davenport *et al* (1998) stated that the knowledge that is acquired from outside the organisations could be purchased or hired from an external source such as consultants. The role of KM regarding acquiring external knowledge is to define and identify what experts should be provided and what knowledge should be carried. However, external knowledge is “more difficult and expensive to obtain” (Al-Ghassani *et al*, 2005: 96) and also requires “appropriate outsourcing policies” (Dann and Wood 2004: 146). Furthermore, according to Egbu *et al* (2005a), “external knowledge sharing poses greater risks than internal sharing-rising complex issues, such as confidentiality, reliability and copy right.” However, regarding the originality of external knowledge Davenport *et al.* (1998) noted that “originality is less important than usefulness in acquired knowledge.”

2.4 The Main Theories and Schools of Thoughts in Knowledge Management

A simple meaning of management is the process of planning, organising and controlling work. However, Beijerse (1999: 96) considers KM as the third revolution in management after the industrial (application of knowledge in tools, process and products) and productivity (application of knowledge in human labour) revolutions. Furthermore, Sun and Howard (2004: 26) stated regarding main schools of management that:

The main management effort has traditionally been put into technical-rational organisation of the many tasks to be done. Now, with people as the main asset of most companies, there is more attention given to behavioural management of people, and the growing recognition of the value of knowledge is leading to cognitive techniques being applied.

The cognitive management school is concerned with how organisations learn and apply knowledge positively (Laudon, 2000). However, many schools of thought have emerged in the field of KM.

Schumpeter’s view is relevant to innovation and entrepreneurship. Schumpeter argued that anyone seeking profit must innovate. Schumpeter believed that innovation is considered an essential driver of competitiveness and economic dynamics (Sledzik, 2013; Hanush and Pyka, 2007; Porter and Stern, 1999). Today’s knowledge-based economies are dependent on a dynamic technological progress, as Sledzik, 2013 stated:

The ability of an economy to gain competitive advantages from technical change and innovation depends on corporates ability of diffusion, adaptation and application of information and knowledge. Neo-Schumpeterian economics

assumes knowledge (in general) and knowledge dynamics, which stands behind innovation, as a priority.

Furthermore, the point of McAdam and McCreedy (1999) view is, KM combines both theory and practice in a fairly seamless and often recursive manner. Much of the existing literature on knowledge is highly theoretical and conceptual, especially in the field of cognitive psychology. In the other hand, practically, Quintas et al. (1997) defined KM as “the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities”. However, the wide range of definitions also reflect the fact that researchers working in the field of KM come from a wide range of disciplines, such as psychology, management science, sociology, strategy, production engineering etc. (Nonaka and Takeuchi, 1995). Also, Vector (2008) stated that “as the discipline matures, academic debates have increased regarding both the theory and practice of KM, to include the following perspectives:

- Ecological, with a focus on the interaction of people, identity, knowledge, and environmental factors as a complex adaptive system akin to a natural ecosystem
- Organisational, with a focus on how an organisation can be designed to facilitate knowledge processes best
- Techno-centric with a focus on technology, ideally those that enhance knowledge sharing and creation.

Moreover, Gibson (1994) distinguished two modes for knowledge Mode 1: knowledge is generated within a disciplinary, primarily cognitive, context. Also, problems are set and solved in a context governed by the largely academic interests of a specific community. By contrast to mode 1, which always occurred in research centres and universities, mode 2, knowledge is carried out in a context of application, in other terms created in broader, trans-disciplinary social and economic contexts. However, this research deals with managing knowledge in an organisation, and this calls for more interest in the context of application in organisations, and in particular in the theory of knowledge creation in organisations and relevant models.

2.4.1 Knowledge Creation Theory

The theory of knowledge creation (figure 2.3) was established by Nonaka and Takeuchi (1995). Regarding this theory, Song et al. (2005: 431) stated that:

“The knowledge-creating school distinguishes between tacit and explicit knowledge and shows how to transform one type into the other, emphasizing the role of middle management in this process.”

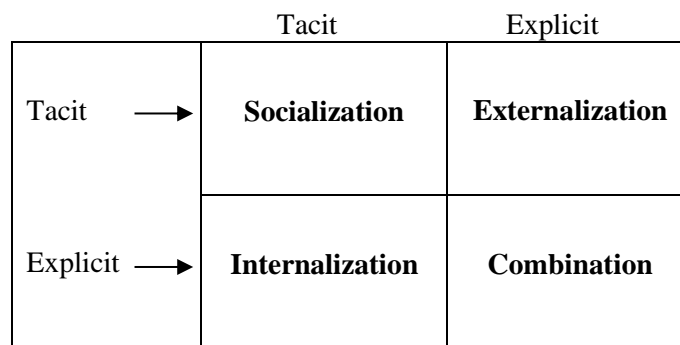


Figure 2.3: The theory of knowledge creation in organisations
- adopted from (Nonaka and Takeuchi, 1995)

This theory contains four distinct modes or processes that are used by organizations for knowledge conversion. These are:

Socialisation (sharing) in terms of the transfer of tacit to tacit knowledge; examples of socialisation are trial-and-error-policy, imitating others, constructive brainstorm sessions, practising and training, the exchanging of ideas and talking, and individuals learning by watching others (Nonaka, 1994; Nonaka and Takeuchi, 1995). Furthermore, Gupta (2000: 19) stated regarding socialization that it is the “sharing of experiences through observation, imitation and practice. It generally occurs through workshops, seminars, apprenticeships, and conferences.”

The second process is externalisation (articulation/capture) which is defined as the transformation of tacit to explicit knowledge; examples of externalisation are conversations and collective consideration used to boost a design process (Nonaka and Takeuchi, 1995). Furthermore, Gupta et al (2000: 19) stated that externalisation is a capturing process and defined it as “the conversion of tacit knowledge (e.g. what one learned at a workshop) into explicit form (e.g. written report).”

The third process is combination (dissemination) in terms of the transfer of explicit to other explicit knowledge; examples of combination are knowledge and information systems, and the exchange and dissemination of both print and electronic documents

(Nonaka and Takeuchi, 1995). Furthermore, Gupta et al (2000: 19) stated that combination is a dissemination process and defined it as “the copying and distribution of the explicit knowledge.”

Finally, there is internalisation in terms of the transformation of explicit to tacit knowledge; examples of internalisation are experienced managers giving lectures, or technicians ‘reliving’ a project by studying the archives of the project (Nonaka and Takeuchi, 1995). Furthermore, Gupta et al (2000: 19) defined internalization as a “process of experiencing knowledge through an explicit source, i.e. one can combine the experience of reading the workshop report with previous experiences.”

Regarding this theory, Albino et al (2000: 413) stated that “the development of new organisational knowledge is carried out by continuous interaction between tacit or personal knowledge and explicit or organisational knowledge.” In this citation, the author emphasizes that personal knowledge is tacit knowledge, whereas organisational knowledge is explicit knowledge. This might direct the method to deal with knowledge in organisations. Moreover, regarding knowledge-creating, Rowley (2000) stated that “since all four patterns exist in dynamic interaction, all four must be of concern to an organisation.” The strength in the previous quotation is that organisations have to consider the modes of transferring personal knowledge to organisational knowledge and vice-versa.

However, according to McAdam and McCreedy (1999) tacit knowledge does not exactly map onto knowledge gained by questioning insight, neither does explicit knowledge exactly map onto programmed knowledge. Thus, knowledge gained by questioning insight and programmed knowledge represents a different categorisation of knowledge. Therefore, from a critical standpoint, Nonaka’s categorisation of knowledge is perhaps limited or uni-dimensional. Knowledge transfer in organisations is much more complicated and convoluted than this simple matrix suggests in figure 2.3.

2.4.2 Knowledge Management Models

Based on the theory of knowledge creation in organizations, Garcia (2006) developed a KM Transactions model (figure 2.4). This model is based on people (tacit knowledge) and media-based (explicit knowledge) enablers, and includes a bridge between a problem and KM enabler to solve it.

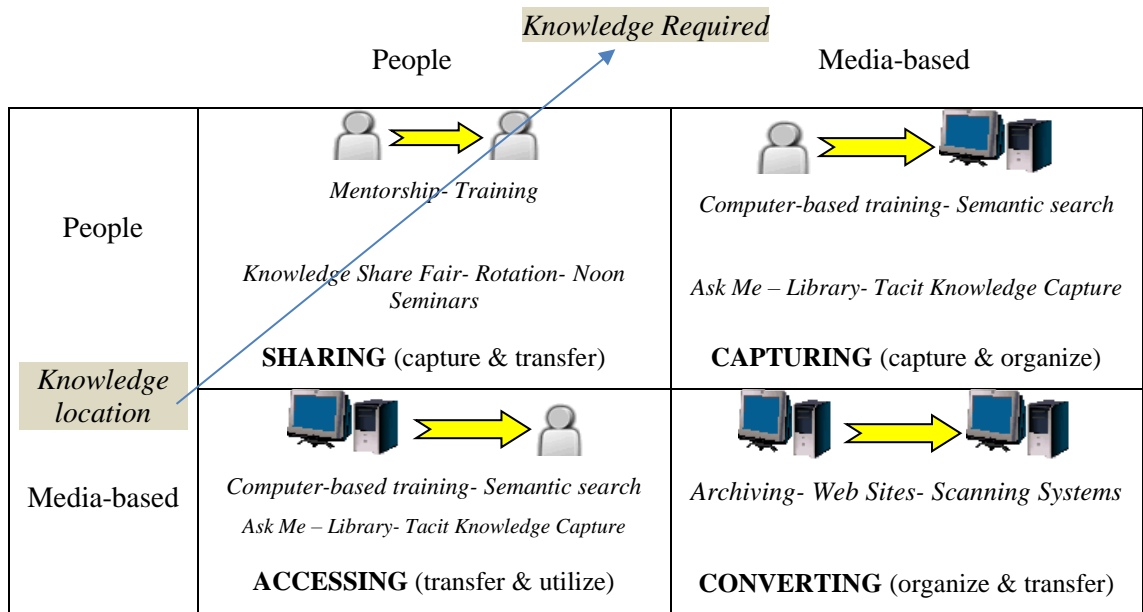


Figure 2.4: KM Transactions model (Garcia, 2006)

Furthermore, the CLEVER model for selecting a KM strategy was developed by Kamara et al. (2002a). This framework:

- Defines the KM problem
- Identifies the ‘to-be’ solution
- Identifies the critical migration paths (‘as-is’) situation to the desired (‘to-be’) position.
- Selects an appropriate KM process (es)

In addition to interactions between tacit and explicit knowledge, this model considers the location of knowledge (internal/external) and the ownership of knowledge (individual/group). This model is concentrated on the transfer of tacit individual knowledge into explicit shared internal knowledge through tacit shared internal or explicit individual (figure 2.5).

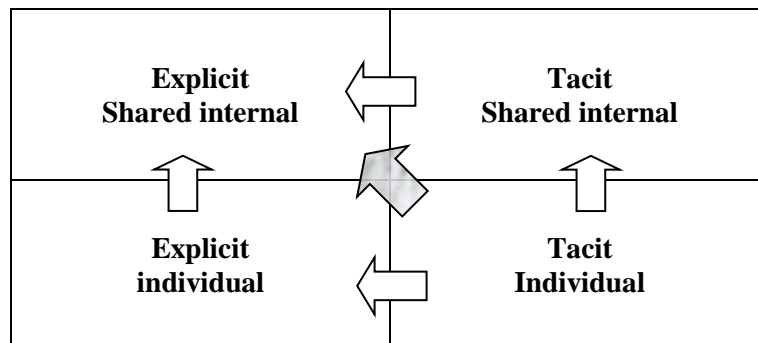


Figure 2.5: Migration knowledge path in organisations –adapted from Kamara et al (2002a)

Moreover, the Skandia intellectual capital models (IC) assume that KM can be segregated into human, customer, process and growth elements, which are contained in

two main categories of human capital and structural/organisation capital (McAdam and McCreedy, 1999). Intellectual capital models are mechanistic in nature, and assume that knowledge can be treated as an asset, similar to other assets. Such an approach is largely associated with externalization and combination, as mentioned in figure 2.3. However, this intellectual capital view of KM ignores the political and social aspects of KM. Also, it assumes that KM can be decomposed into objective elements rather than being a socio-political phenomenon (McAdam and McCreedy, 1999).

Finally, socially constructed models of KM, for instance, Demerest's model (figure 2.6), were found to give a more balanced approach between the scientific and social approaches to KM. This type of model emphasises the construction of knowledge within the organisation. This construction is not limited to scientific inputs but is seen as including the social construction of knowledge. According to McAdam and McCreedy, 1999:

The model assumes that constructed knowledge is then embodied within the organisation, not just through explicit programmes but through a process of social interchange. Following embodiment, there is a process of dissemination of the espoused knowledge throughout the organisation and its environs.

This approach is consistent with socialisation and internalisation. It also implies a simplistic procedural approach (mechanistic and hence akin to externalisation and combination, as shown in figure 2.3).

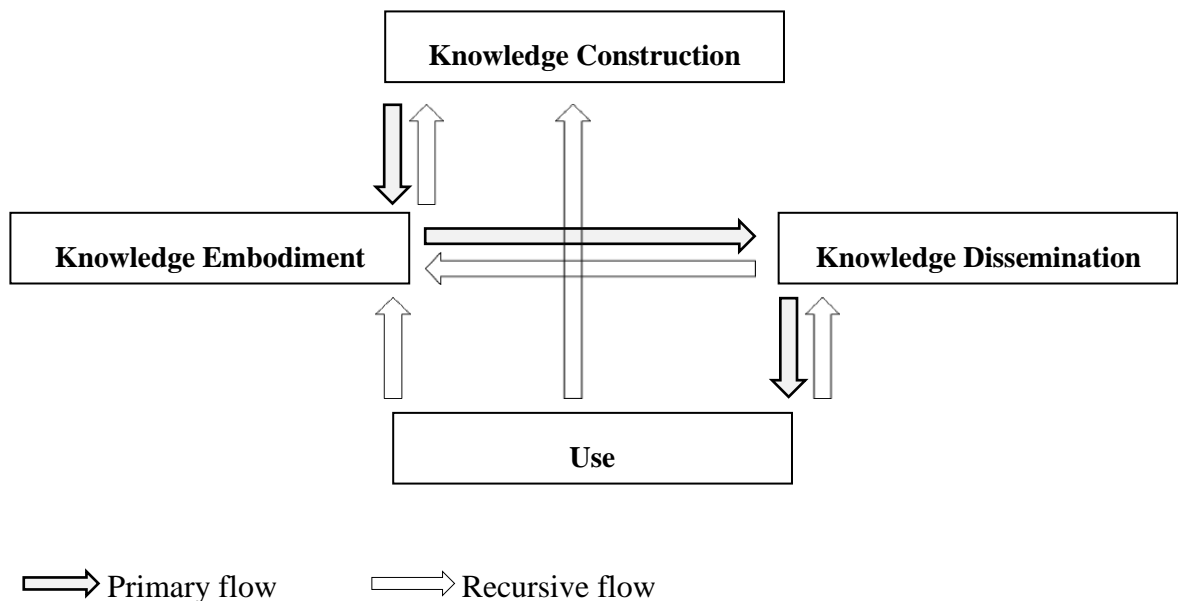


Figure 2.6: Social constructed model (Demerest, 1997)

2.5 The Main Approaches for Managing Knowledge in Organisations

2.5.1 Viewpoints on KM Implications

“Organisations are systems created by people which gain significance for their members by virtue of their perception and interpretation” (Rosentiel, 2010: 136). According to McCarthy (2009) “an organisation is an accumulation of knowledge.” Regarding organisations and managing knowledge, Newman (1999) stated that “the organization itself serves as an agent in the retention and dissemination of knowledge.” Also, Albino et al (2000: 416) stated that “while individuals generate knowledge, the organisation plays a critical role in spreading that knowledge in order to make it more accessible and applicable.” However, Shin et al (2001: 338) mentioned two schools: organizations are interpretation systems and organizations are distributed knowledge. The organizations as interpretation systems produce and test knowledge. This can further be classified into three categories: state of mind, process, and object (table 2.2).

Table 2.2: Viewpoints on knowledge and implications –adopted from (Shin et al, 2001: 339)

View points		Type	Definition	Implications for KM and implementing systems
Organizations as interpretation systems produce and test knowledge	Belief in mind	The Tacit school regards knowledge as situated in the mind	Instinctive skill, know-how, or technique of individual	Main focus is providing infrastructure (organisational culture and IT) that enables individuals to access knowledge and information (IT only supports access to existing information)
	Process	Informal views	Explicit knowledge of individual, Syntax of individual speech	-Main focus is the development of effective process of knowledge creation and distribution -A system/technology is required to link source and recipient of knowledge and support effective understanding of strategic know-how
		Collective views	Tacit knowledge of social system, corporate culture	
Object	Encoded perspective	Explicit knowledge of social system, operation manual	-Main focus is how to gather and treat knowledge -A system/technology is required to effectively codify, store, and retrieve knowledge	

The second school is that the organizations are distributed knowledge. Several scholars Cook (1999); Shin et al (2001), Brown et al (1991; 1998), Nicolini (1995); Shah (1998), Krogh (1994), Gergen (1994), Weick (1993), Walsh (1991) argue that social systems develop individuals’ knowledge, which becomes collective knowledge.

Regarding the core components of KM, Egbu et al (2004), Sheehan et al (2005), Vector (2008), Bishop (2009), and Murthy et al (2011) emphasize that the core

components of KM are people, process and, technology. For instance, Sheehan et al (2005) mentioned that many organisations have found it beneficial to explore KM in terms of people, process and, technology.” However, Robinson et al (2005), Kaplan (2002) and Bishop (2009) argued that people and process are the key aspects to consider for successful KM, due to the fact that IT is not capable of capturing some tacit knowledge without losing its context. Furthermore, KM was defined as processes for enabling capturing, sharing/disseminating and re-using knowledge. These processes occur when dealing with tacit or explicit knowledge. Also, IT is a support tool for managing knowledge. Therefore, process and IT issues exist in any KM approach, and are not approaches in themselves.

Regarding KM perspectives, Vector (2008) stated that “different KM schools of thought include various lenses through which KM can be viewed and explained.” For instance, KM combines possession (knowledge) and practice (knowing) (Blackler, 1995; Tsoukas, 1996; Cook et al, 1999; Newell et al, 2006). Also, there is the cognitive view and the community view (Swan et al., 1999), the personalization view (Hansen, 1999) and the codification view (Hansen, 1999) and (Pathirage, 2007). However, all these schools or views can be included in two main approaches: the people (tacit)-based KM approach and the explicit-based KM approach.

2.5.2 People (Tacit)-based KM Approach

The challenge in managing knowledge is that most organisational knowledge is tacit knowledge held within people minds and cannot be captured completely without losing its context (Robinson et al., 2005). Also, Sheehan et al (2005) stated that most useful knowledge is tacit and calls for addressing people aspects in any KM strategy. Furthermore, Rowley (2001: 228) stated that “opportunities for the exchange of tacit knowledge cannot be left to chance and need to be supported and facilitated.”

The people-based KM approach is interested in “managing people who create knowledge and encouraging a knowledge sharing culture within an organisation” (Sun and Howard, 2004). Also, Davenport and Prusak (1998) reported that:

“People-based KM relates to those personnel working within the firm, who share the requirement to create, share, search out, and use knowledge in their daily routines.”

However, this approach calls for “making more efficient use of the human knowledge that exists within an organization” (Services, 2008). Furthermore, Gupta (2000) stated that:

“There is a need to develop accounting procedures for valuing intangible assets of organization as well as incorporating models of intellectual capital that in some way quantify the speed of innovation and the development of core competencies”.

Moreover, as knowledge is bound to humans and exchanged in a social setting, KM defines the role of human beings, cultural issues, trust, etc. for sharing knowledge (Weber et al, 2002).

Many authors, including McAdam and MacCreedy (1999), Sheehan et al (2005), Kamara et al (2005a), and Bishop (2009), have identified the importance of people-based KM and the dependence of KM solutions on the staff and managers within an organisation, as well as the importance of their willingness and ability to share their knowledge. For instance, Kamara et al (2005) highlighted the role of individuals as an important link in the transfer of knowledge across projects of the same organisation. This presents the relationship between ‘individual knowledge’ and ‘shared organisational knowledge.’

The people-based KM approach is associated with the modes of socialisation and internalisation (section 2.4). It concentrates more on socialisation in terms of the transfer of tacit to tacit knowledge among individuals. Also, it includes internalisation in terms of the transfer of explicit to tacit knowledge. As Beijerse (1999: 100) stated, that internalisation is:

“A process in which explicit knowledge becomes part of tacit knowledge, this can happen through learning by-doing, and ... when experienced managers or technicians give lectures.”

Furthermore, Vector (2008) stated that efforts in organisations must “permit individuals to internalise and make personally meaningful any codified knowledge retrieved from the KM effort.”

Furthermore, the people-based KM approach is associated with numerous knowledge schools, for instance: the core-competence school, practice perspective and community view.

The core-competence school studies how competences can contribute to organisational performance (Hamel and Prahalad, 1994; Song et al, 2005). Furthermore, the practice perspective, assumes that most knowledge is tacit and requires informal systems: social events, communities of practice, person-to-person contacts (Murthy et al, 2011). Knowledge is situated in social and organizational practices and relationships (Blackler, 1995; Tsoukas, 1996). From this perspective “knowledge (or rather knowing) is not so

much possessed as embedded in practice” (Newell et al., 2006: 168). Also, the nature of knowing is social and controversial (Lave, 1991). However, KM includes practices used in organizations such as “enable adoption of insights and experiences” (Vector, 2008). Moreover, the community view sees knowledge as constructed through joint experiences in social networks and groups (Swan et al., 1999).

A strategy relevant to the knowledge as practice view is personalization which “encourages participation in networks where people can learn through dialogue” (Hansen et al., 1999). Furthermore, Pathirage (2007) argues that “personalisation strategies supporting the process-based view of knowledge, to enhance generation and utilisation of employees’ tacit knowledge.” Other strategies in people-based KM approach is “measuring the intellectual capital of an organization: developing measurement ratios/indexes and benchmarks” (Gupta, 2000). Also, it involves “creating and maintaining the conditions required for the production of knowing” (Newell et al, 2006: 169).

However, the strategies within the people-based approach should include support on-going learning, reward systems and ways of encouraging knowledge sharing (Snowden, 1999; Murthy et al, 2011). Also, Beijerse (1999: 102) stated that:

“Knowledge management should be aimed at motivating and facilitating (knowledge-) workers in their dealing with knowledge (to develop, enhance and use their capability to interpret data and information by using available sources of information, experience, skills, culture, character etc.). It is something which cannot be extorted. Motivation is the responsibility of management, facilitating is the responsibility of the (technological) staff.”

2.5.3 Explicit-based KM Approach

This approach is described as the knowledge-based school which “promotes the storage of knowledge in a base (expert system) from which non experts may retrieve it by means of a reasoning engine and thereby may solve problems beyond their expertise” (Song et al., 2005: 431). Furthermore, Snowden (1999) described it as “mechanistic approaches which tend to be heavily technology focused and are concerned with the management of explicit knowledge.”

Explicit KM-based approach is associated with supply-driven initiatives, the possession perspective and the cognitive view. According to Shariq (1998), Marakas (2000) and Newell et al (2006), the first-generation of KM focused on the supply of knowledge; that is, the dissemination, imitation and exploitation of knowledge. However, supply-driven initiatives assume that:

“The fundamental problem of KM is concerned with the flow of knowledge and information within the organization. The aim is to increase that flow by capturing, codifying and transmitting knowledge.” (Scarborough et al, 1999)

Furthermore, from the perspective of possession, knowledge is seen as an entity that can be made explicit and transferred from one person or group to another (Newell et al., 2006: 168). This dominant view of knowledge then sees knowledge as a resource that is possessed by individuals, project teams, organizations or even societies (Alavi, 1999). Also, Newell et al (2006: 169) stated that “knowledge as something possessed must be practised in a specific context to be meaningful.” One KM strategy relevant to ‘knowledge as possession’ view is codification, which focuses on making knowledge explicit so that others can acquire this knowledge rather than having to develop it for themselves (Hansen et al., 1999).

Moreover, the cognitive view equates knowledge to objectively defined concepts and facts that can be transferred through text, using ICT (Swan et al, 1999). Moreover, Gupta et al. (2000: 18) stated that one major trend in KM is knowledge mapping in terms of “capturing knowledge gained by individual and disseminating it throughout the organization, mainly via information technology.”

However, explicit KM approach goals to establish organizational memory (Moorman, 1997, 1998). Also, Services (2008) stated that:

“The major focus of knowledge management is to identify and gather content from documents, reports and other sources and to be able to search that content for meaningful relationships.”

Furthermore, Murthy et al (2011) call to make better use of the old knowledge that already exists within the organisation through:

- Finding out what organization knew
- Taking steps to make knowledge accessible across organization
- Specific approaches to knowledge audit
- Mapping the organization’s knowledge resources and flows
- Making tacit knowledge more explicit
- Making the movement cycle faster and speedy.

Explicit KM approach includes externalisation and combination (section 2.4.1).

Regarding externalisation, Beijerse (1999: 100) stated that:

“Personal or tacit knowledge is made explicit in the form of metaphors, analogies, hypotheses and models, for example in language. One usually finds externalization in the design process when conversations and collective consideration are used to boost this design process.”

Explicit KM approach concentrates on capturing knowledge in documents, databases, and intranets etc. (Sheehan et al, 2005). As explicit knowledge allows better control, Government (2007) suggests that organisations should be willing to improve their performance to transform tacit knowledge into explicit. Furthermore, the explicit KM-based approach also includes the combination in terms of transferring explicit to other explicit knowledge. According to Nonaka and Toyoma (2003), the combination includes gathering, integrating, transferring, diffusing and editing knowledge. Furthermore, Beijerse (1999: 100) stated that “new knowledge can also be created through the restructuring of existing information by sorting, adding, combining and categorizing explicit knowledge.”

Finally, KM activities are not entirely discrete, but they cause a different focus on processes, tools, techniques, and the individuals or groups to whom they are addressed (Hayward, 2000).

2.6 Knowledge Management Processes

According to Swan (1999), KM is a process and practice concerned with the creation, acquisition, capture, sharing and use of knowledge, skills and expertise. Ruggles (1997) stated that “knowledge management covers three main knowledge activities; generation, codification and transfer.” Furthermore, Patel (1999) mentioned that the major knowledge processes are: gathering, organizing, refining and disseminating. However, in more detail, Macintosh et al (1999b: 560) mentioned these eight activities which include sub activities:

- Developing the knowledge asset for or within the organization: acquiring, building, capturing, collecting, compiling, creating, discovering, eliciting, identifying, importing, learning
- Preserving the knowledge asset within the organization: conserving, consolidating, holding, retaining, safeguarding, securing, storing, pooling
- Updating the knowledge asset within the organization: evolving, growing, improving, maintaining, modifying, refining, refreshing
- Using the knowledge asset within or for the benefit of the organization: applying, enacting, executing, exploiting, utilising
- Transferring the knowledge asset between the members of the organization or between organizations: communicating, deploying, disseminating, distributing, exchanging, sharing

- Transforming the knowledge asset into a “better” format: compiling, explicating, formalizing, standardizing
- Assessing the knowledge asset: appraising, evaluating, validating, verifying
- Performing other functions on the knowledge asset: classifying, exploring, locating, monitoring, organizing, and retrieving.

However, Robinson et al. (2005) stated that: KM processes relate to technical and management systems that are used by an organisation in performing its work. These systems can be relevant to employees (tacit knowledge) or IT-based (explicit knowledge). Numerous KM scholars mentioned different processes with different sequences, as shown in table 2.3, which concludes five main processes, each including sub activities.

Table 2.3: Activities (stages) of knowledge process in organisations

Authors	Knowledge Processes (stages)					
	Developing	Capturing		Accessing	Transferring	Using,
Hardcastle (1982)	Acquisition Generation	Preparation, Organizing			Disseminating	
Ruggles (1997)	Generation	Capturing, Representation			Transfer	
Demerest (1997)	Construction				dissemination	Use
Patel (1999)		Gathering, Organizing		Refining	Disseminating	
Scarborough et al. (1999)		Capturing, Codifying			Transmitting	
Newman, (1999)	Creation Development, discovery	Retention			Transfer communicate translate converse filter, render	Utilizing
Macintosh et al (1999)	Developing	Transforming, Preserving, Updating			Transferring	using sharing assessing
Rowley (2001)	Acquisition, creation and construction	Articulation and sharing, repository updating		Diffusion, access	dissemination	Use, revision
Serban et al (2002)	Create Discover Realize Conclude Articulate Discuss	Capture Digitize Document Extract Represent Store	Organize structure Catalogue Abstract Analyse Categorize	Access Present Display Notify Profile Find		Use Make Improve Perform Service Learn
Lee et al. (2013)	Creation	Storing			Sharing	Usage
Sun and Howard (2004)	Creation	Capturing, Storing		Refining	Disseminating	
Fruchter (2005)	Creation	Capturing, Index, Storing		Find, Understand, Refining		Reuse
Vijay (2007)		Capture, Documentation, structure,		value	Disseminating sharing	leverage
PRG, (2009)	Creation	Storing		Find, Acquiring		Use, Learn
Murthy et al (2011)	Creating				Sharing	Using

2.6.1 Knowledge Developing (Identifying, Creating, Acquisition)

Knowledge developing is the first stage of the knowledge management process. It includes the creation and acquisition of established knowledge. Vector (2008) distinguished between the creation of new knowledge and the exploitation of established knowledge. On this subject, PRG (2009) stated that:

“Knowledge must be created either within or outside the organization. This is typically comprised of iterative tacit and explicit loops until the knowledge is ready for distribution to those outside the creating group.”

Numerous KM scholars (table 2.3) consider creation as an activity or stage in the knowledge process. For instance, Newman (1999: 4) used the term creation to cover activities associated with the entry of new knowledge into the system. Also, Serban et al (2002: 11) stated that the “creation of knowledge can occur through a variety of means, such as scientific discovery or discussions.” Furthermore, Rowley (2001: 233) stated that “knowledge creation involves research and development activities that generate scientific and technical knowledge and market research that generates market knowledge.” Moreover, knowledge could be created by solving problem. However, Ruggles (1997) used the term knowledge generation, which includes “all activities which bring to light knowledge which is ‘new’ whether to an individual, to the group, or to the world. It includes activities such as creation, acquisition, synthesis, fusion, and adaptation.”

In organisations, KM processes started with identifying knowledge (Macintosh, 1999; Serban et al, 2002: 5), Service (2008), Vijay (2007), Vector (2008), APQC (2012). For instance, the American Productivity and Quality Centre summarized that KM is “the systematic process of identifying, capturing, and transferring information and knowledge” (APQC, 2012). Once the knowledge source is identified, “the user will then go through the act of actually acquiring it. This will involve gaining personal knowledge from other humans or documented sources” (PRG, 2009). Furthermore, Weggeman (1997) and Beijerse (1999: 101) distinguished these processes:

- The strategic need for knowledge/ needs to be determined
- The knowledge gap needs to be determined. This is the quantitative and qualitative difference between the knowledge needed and that available in the organization
- This knowledge gap needs to be narrowed by developing new knowledge, by buying knowledge, by improving existing knowledge.

2.6.2 Knowledge Capturing (Articulating, Organizing and Storing)

According to Serban et al (2002: 12) “knowledge can be easily lost or not used if it is not captured.” The term capture means “any method of collecting information and then changing it into a form which can be processed by a computer” (Cambridge, 2009). Also, Wehmeier (1993) in his dictionary mentioned that the term capture means “to succeed in presenting something in words, picture, etc.” However, capture in this research includes articulating, organising, and storing knowledge.

The first process in knowledge capture is articulation; Gupta (2000: 20) stated that “organizations need a process of articulation and codification of tacit knowledge into explicit knowledge so that it can form a repository of corporate memory.” Rowley (2001: 233) demonstrated some knowledge articulating activities such as: data input during work processes, report writing, market research reports, business reports, documents designed to communicate with suppliers and customers, and modified policy documents. For the articulation process in organisations, providing a rich data context is essential, as Brandon et al (1995: 359) complained that:

“Since people always shuffle within and between companies, it is difficult to reach the historical report authors who understand the hidden meaning of project historical data. The historical data should provide rich data context so that it can be used with minimum or no consultation of authors.”

Moreover, regarding the periods for capturing knowledge in projects, Vector (2008) stated that:

“Knowledge may be captured and recorded before the project implementation, for example as the project team learns information and lessons during the initial project analysis. Similarly, lessons learned during the project operation may be recorded, and after-action reviews may lead to further insights and lessons being recorded for future access.”

The second process in knowledge capture is organisations, which is one of the most important KM process activities. As Lavy (2009) mentioned, “if the data stored in paper files is not organized, then retrieving particular information in a timely manner becomes almost impossible.” This process is described with many terms, such as: preparing and organizing, codifying, indexing, and cataloguing (Lavy, 2009). Also, Patel (1999) mentioned that organizing process includes these activities:

- Cataloguing
- Indexing
- Filtering
- Linking.

Furthermore, Ruggles (1997) stated that “knowledge codification is the capture and representation of knowledge so that it can be re-used either by an individual or by an organisation.” However, organized knowledge needs to be stored in an easily accessible manner, retrievable and updateable (Lavy, 2009).

The third process in knowledge capture is storing knowledge (input to knowledge repositories). Rowley (2001:234) emphasized that:

“Knowledge should be stored in proper physical knowledge repositories such as: archives, databases and filing systems, also, require guidelines for included knowledge”; furthermore, they “need guidelines on what is to be included.”

However, securing knowledge does not mean keeping secrets; rather, it means slowing the rate of knowledge leakage (Siemieniuch, 2005: 75).

Capturing knowledge from a technological perspective “can be achieved through digitization, documentation, extraction, representation, and storage” (Serban et al, 2002: 12). Furthermore, Patel (1999) used the term gathering process and mentioned that it includes: data entry, scanning, and voice input. One example of technologies for knowledge capturing is a case-based reasoning (figure 2.7).

Finally, the essential aspects of organisational knowledge capturing processes are: documenting individuals’ knowledge, organizing and storing it in a shared knowledge repository, which requires guidelines for included knowledge and what should be included. The knowledge should be stored in an easily accessible manner, and be retrievable and updateable.

2.6.3 Knowledge Retrieving/Accessing and Updating /Refining

As individuals store knowledge, they could retrieve it when they need it, or retrieve knowledge that others have placed in the repository (Vector, 2008). Furthermore, PRG (2009) mentioned that “those who need the specific knowledge must then find out where it is, when they need it, by searching in the right places and/or asking the right people.” However, knowledge may be accessed in three stages: before, during and after projects, as Vector (2008) stated that relevant individuals:

“Might access information resources to learn best practices and lessons learned for similar projects undertaken previously, access relevant information again during the project implementation to seek advice on issues encountered, and access relevant information afterwards for advice on after-project actions and review activities.”

Regarding refining, Cambridge (2009) stated that it means “to improve an idea, method, system, etc. by making small changes.” Also, in the Oxford dictionary, Wehmeier (1993) mentioned that refining means “to improve something by changing little details.” However, in this stage, knowledge which is already organised and stored is refined for improving, updating, and discarding useless knowledge. Refining and updating knowledge are essential factors which affect the quality of knowledge. According to DOCOMOMO (2013), Macintosh et al., (1999: 563), Andrews (2000), Shin et al (2001), and Siemieniuch (2005), managing knowledge requires the identification of its quality. For instance, Shin et al (2001: 342) stated that:

“The quality of information is most serious when the knowledge base is growing and knowledge seeking needs much time and efforts. If the problem deepens, it may adversely impact on knowledge sharing and ultimately on knowledge creation.”

Also, Andrews (2000: 805) stated that “the ability to judge credibility ‘accurately’ would be likely to lead to better outcomes for the individual’s knowledge-creation efforts.” The quotations emphasized the significance of refining and updating knowledge for better knowledge creation and knowledge sharing.

2.6.4 Knowledge Sharing, Transferring and, Disseminating

Knowledge sharing is defined as the exchange of explicit and tacit knowledge relevant to the team task (Lee, 2010: 474). Internal knowledge is shared in organisation. For instance, in knowledge networking “people share information with one another formally or informally. Knowledge networking often occurs within disciplines; for example, an institutional researcher communicating with another” (Davenport *et al*, 1998). However, knowledge sharing is a complex process, as “knowledge holders actively making decisions about what knowledge they would share with whom, when” (Andrews and Delahye, 2000: 803). Knowledge sharing should be encouraged and facilitated, as Bock et al. (2005: 101) stressed:

“Effective knowledge sharing cannot be forced or mandated. Firms desire to institutionalize knowledge-sharing behaviours must foster facilitative work context. By surfacing motivational drivers associated with individuals’ intentions to share personal knowledge with others.”

Minbaeva et al (2012: 388) distinguished sharing (exchange) and transferring knowledge as they stated that:

“The terms knowledge exchange and knowledge sharing used interchangeably to denote the two-way movement of knowledge on the interpersonal level. Knowledge transfer, in turn, refers to organizational-level knowledge flows.”

Regarding knowledge transferring, Ruggles (1997) stated that “knowledge transfer involves the movement of knowledge from one location to another and its subsequent absorption.” Also, Newman (1999) stated that knowledge transfer “refers to activities associated with the flow of knowledge from one party to another. This includes communication, translation, conversion, filtering and rendering.” Furthermore, Minbaeva et al (2012: 388) stated that “studies collectively suggest that firm-level phenomena such as intra organizational knowledge transfer emerge from individual action and interaction.” However, “organizations can realize the full value of their knowledge assets only when they can be effectively transferred between individuals” (Gupta, 2000: 19).

Finally, the term dissemination means “to spread or give out something, especially news, information, ideas, etc., to a lot of people” (Cambridge, 2009). Also, Patel (1999) mentioned that “disseminating process includes these activities: flow, sharing, alert and, push.” However, the KM processes in organisation have the goal of using or re-using knowledge and learning.

2.6.5 Knowledge Use, Revision and Learning

Using knowledge “includes the activities and events connected with the application of knowledge to business processes” (Newman, 1999). Also, Rowley (2001: 234) stated regarding using knowledge that:

“This part of the cycle is significant in terms of measurable outputs. Knowledge may be used as the basis for developing new knowledge through integration, creation, innovation and extension of existing knowledge and/or it may be used as the basis for actions or decisions. These actions or decisions impact on business performance.”

Furthermore, organisations can use knowledge in problem solving which in turn create new knowledge (Sun and Howard, 2004). Regarding the relation between knowledge use and learning, which is considered as the final link in the knowledge process, PRG (2009) stated that:

“Having been used, perhaps repeatedly, the user will learn what worked well and not so well as a result of applying the knowledge gained. This can then be taken as significant input into further iterations of the knowledge creation and distribution process.”

In practice, “learning, at least in the applied sense of gaining expertise to be able to do something that one could not do previously, involves both learning about (mental processing or cognitive learning) and learning to do (practice-based or behavioural

learning)” (Newell and Galliers, 2006: 1). However, Rowley (2001: 235) considered revision as the medium process between knowledge use and learning or creating new knowledge, as he stated that:

“Knowledge revision will take place as a result of knowledge use and of reflection on the experience of actions and decisions. Such reflection drives individual learning that can form the basis of the creation of new knowledge, which may supplement or substitute for existing knowledge. Without this stage, the cycle is not completed and new knowledge is not created. Further, this stage is crucial to individual development and learning.”

Finally, Rowley (2001: 233) demonstrated some knowledge revision activities associated with tacit knowledge such as: reflection on experience, team project review and performance appraisal. Also, Rowley demonstrated some activities associated with explicit knowledge such as: project monitoring and evaluation reports, sales reports, product market trial reports, and internal and external audits.

2.7 KM Techniques

Previous portions of research regarding the people-based KM approach and KM processes showed that facilitating these processes can be achieved through several techniques. However, KM techniques have some features, such as: greater focus on tacit knowledge and more involvement of people, being affordable to most organisations, and being easy to implement and maintain (Al-Ghassani et al, 2005).

However, some KM techniques that were mentioned by Rowley (2001: 233), Beijerse (1999), Al-Ghassani et al (2005), and Murthy et al (2011) include face-to-face interaction, brainstorming, training, lectures and presentations, team work or community of practice, rotation work system, trial and error policy, apprenticeship and monitoring, in addition to recruitment as techniques applied for managing knowledge in organizations.

2.7.1 Face-to-Face Interaction

According to Al-Ghassani et al (2005), face-to-face interaction is a technique which achieves socialization in terms of converting tacit knowledge to other tacit knowledge. It is applied informally/formally among individuals in organizations. As Bishop (2009: 18) stated,

“Face-to-face interaction is informal approach to sharing tacit knowledge, encouraging strong social ties and tacit shared understanding leading to collective sense-making. This can take a formal approach in the form of meetings.”

Asking questions and discussions in daily work are informal activities, whereas meetings are formal events for solving problems or discussing future plans. In brainstorming meetings, “a problem is presented to a group of employees, who are encouraged to suggest as many solutions as possible, [and] ideas are then evaluated after the brainstorming session” (Bishop, 2009: 18).

2.7.2 Training

Training could be defined as technique which helps to improve staff skills and therefore increase knowledge (Bishop, 2009: 18). Al-Ghassani et al (2005: 86) stated regarding training that:

“Its implementation depends on plans and strategies developed by the organisation to ensure that employees’ knowledge is continuously updated. Training usually takes a formal format and can be internal, where senior staff train junior employees within the organisation, or external, where employees attend courses managed by professional organisations.”

In the field of HB conservation, training is the complement of education, undertaken by architect and/or structural engineer to become a professional and lead to the acquisition of conservation theory and practice knowledge, skills and competences (Consortium, 2007).

2.7.3 Lectures and Presentations

Lectures and presentations are techniques for transferring knowledge into attendants. ICA (2005) stated that, “a lecture is delivered to a large number of learners by a teacher usually in person ... Presentations might be shorter and would definitely include visual aids.” They provide chances for discussing cases and specific subjects in addition to lessons learned. Furthermore, knowledge could be transferred from seniors to others through storytelling (type of lectures), which “can be used to create a good knowledge and judgment of personnel descriptive capability to do things effectively and skillfully in organizations” (Snowden, 1999).

Furthermore, post project review is a type of presentation technique which contributes to increasing the effectiveness of learning through lessons learnt, and transferring knowledge to subsequent projects. As Al-Ghassani et al (2005: 85) identified, a post project review is:

“Debriefing sessions used to highlight lessons learnt during the course of a project. These reviews are important to capture knowledge about causes of failures, how they were addressed, and the best practices identified in a project.”

Also, Bishop (2009: 18) stated that post project review is:

“Conducted close to or after project completion, these are designed to enable an open, blame free environment in which a forum can discuss project successes and failures in order to understand them better. In some cases these are linked to quality control procedures.”

2.7.4. Team Work and Communities of Practice (CoP)

Team work could be defined as “groups of individuals with a common interest, although they may work for different business units” (Bishop, 2009: 18). Furthermore, Brown (1995) stated that CoPs are:

“A small group of people who’ve worked together over a period of time . . . not a team, not a task force, not necessarily an authorized or identified group. . . perform the same tasks . . . or collaborate on a shared task . . . or work together on a product. . . They are peers in the execution of ‘real work.’ What holds them together is a common sense of purpose and a real need to know what the other knows.”

It “helps combine existing knowledge and creates new knowledge” (Siemieniuch C., 2005: 68). Team work techniques are organised by organisations whereas communities of practice (CoP) are an informal activity. Malone (2002: 119) stated regarding CoP that:

“Unlike knowledge communities, however, which are organized by the firm for the purpose of filtering knowledge for potential value, CoP are organic in nature; that is, they form spontaneously in response to professional interests that lie within the firm.”

Furthermore, Hildreth (2000) stated that within communities of practice “newcomers learn from old timers by being allowed to participate in certain tasks relating to the practice of the community.” Also, Egbu et al (2005a) mentioned regarding shared practices that it is “vital for developing knowledge as they enable the flow of knowledge within the group.”

2.7.5 Rotation Work System

Rotation of work is a system for exchanging knowledge without limitation of place and is achieved by the movement of persons among many places. As Egbu et al (2005a) stated, “The movement of personnel could be seen as mechanism for distributing tacit knowledge and skills, or human capital, across space and time.” This quotation could be applied to employees’ movement between organizations or between sections in the same organization that achieve transferring/acquiring knowledge. An employee works for a period of time in one section, and then transfers into another to learn the work in

all sections. Another example of the rotation of work system is succession planning, which is defined by Bishop (2009: 18) as the “formal process of grooming specific employees for a role once the incumbent leave the organisation.”

2.7.6 Trial and Error Policy

Trial and error is a technique for acquiring experiences and creating knowledge from problems that were faced and treated in previous projects. One of the prime benefits of experience is that it provides a historical perspective from which to view and understand new situations and events. Knowledge born of experience recognizes familiar patterns and can make connections between what is happening now and what happened then (Davenport et al, 2000: 6). As a specialist in the field of HB conservation, Feilden (2004: 6) stated that “it must be recognized that some problems are unique and have to be solved from first principals on a trial and error basis.” However, “repairs to traditional buildings should always be carried out with care. Once part of the historic fabric is lost it cannot be replaced” (Director, 2000).

2.7.7 Apprenticeship and Monitoring

Apprenticeship and monitoring are techniques for transferring knowledge, as Gamble (2002) and Teerajetgul et al (2006) stated. They are the most common on-site tools leading to transfer of knowledge to juniors. Also, Al-Ghassani et al (2005:86) stated regarding apprenticeship and mentoring that:

“Apprenticeship is a form of training in a particular trade carried out mainly by practical experience or learning by doing (not through formal instruction)[...] mentoring is a process where a trainee or junior member of staff is attached or assigned to a senior member of an organisation for advice related to career development.”

Furthermore, Bishop (2009: 18) stated that mentoring is a process where a junior employee or trainee is assigned to a senior member of staff for advice relating to career development. However, often a retired employee or external consultant with knowledge of the internal operations of the company is employed to this task.

2.7.8 Self-reading

Studying documents is one technique for internalization, as “a process in which explicit knowledge becomes part of tacit knowledge” (Beijerse, 1999: 100). KM supports access to existing information for reading, as Shin (2001: 242) claims that:

“It is not sufficient to provide codified knowledge and to ask individuals to understand it. Another line of concern is to do with the potential negative consequences of the possible blind application of existing organizational memory. If an individual uses existing knowledge without any modification acceptable to a new situation, it may provoke disaster. The issue is how to support the individual's choices to adapt knowledge to a given situation.”

2.7.9 Recruitment

Recruitment is a “method for acquiring external tacit knowledge, especially of experts, other employees can learn from the new recruits” (Bishop, 2009: 18). One KM recruitment strategy is:

“Making knowledge requests of experts associated with a particular subject on an ad-hoc basis. In such an instance, expert individual(s) can provide their insights to the particular person or people needing this” (Vector, 2008).

2.8 KM Technologies

Information technology (IT) could be defined as “the use of electronic machines and programs for the processing, storage, transfer and presentation of information” (Bjork, 1999). On the other hand, telecommunications are tools that enable people to communicate and exchange knowledge (Bishop, 2009). However, information communication technology (ICT) is the proper term for describing KM technology that could be used in the field of KM. It is considered as an enabler of knowledge sharing (Murthy et al, 2011c), and its spread is attributed to the decrease of its prices. As Davenport et al (1998: 14) stated:

“The low cost of computers and networks has created a potential infrastructure for knowledge exchange and opened up important knowledge management opportunities.”

Scarborough et al (1999), Gyampoh (2003), Snowden (1999), Sun and Howard (2004) and Lucey (2005) agree that ICT is the main tool for managing explicit knowledge. However, Davenport et al. (1998) partly disagree, as they stated that:

“Information technology is only the pipeline and storage system for knowledge exchange. It does not create knowledge and cannot guarantee or even promote knowledge generation or knowledge sharing in a corporate culture that doesn't favour those activities.”

According to WEBER et al (2002), KM helps organisations to make the right decision regarding which technology for which purpose. The selection of most suitable KM technology depends on the type of knowledge. For instance, “data mining technologies are suitable for searching within explicit knowledge, whilst expert system technologies

are used for converting tacit knowledge to explicit” (Al-Ghassani et al, 2005: 97). Also, Anantatmula (2008: 457) emphasized that KM technology should:

“Promote efficient capture of explicit knowledge and support knowledge sharing within and outside the organization by developing processes and systems that are easy to use.”

Furthermore, IT requires infrastructure and IT skills (Al-Ghassani et al, 2005), and KM facilitates their management. However, Davenport and Prusak (1998) identified KM to have four objectives related to organisations:

- The creation of knowledge repositories
- The improvement of knowledge access
- The enhancement of the knowledge environment
- The management of knowledge as an asset.

2.8.1 The Objectives of Applying ICT for KM in Organisations

The main objectives that could be achieved from applying ICT for managing knowledge in organisations are:

- Facilitating KM processes in organisations, and offering data/knowledge base
- Searching within explicit knowledge (supporting access to existing information)
- Supporting people-based KM activities (linking of source and recipient of knowledge).

The first objective is that ICT facilitates KM processes in organisations, and offering a database. Shin (2001: 339) stated that ICT “is required for effectively codifying, storing, and retrieving knowledge.” Also, Sun (2004) mentioned that:

“The process of knowledge management can be viewed from IT perspective which concerned with the tools and techniques for capturing and distributing information and knowledge (data warehousing, Case Based Reasoning, Group Ware, Intranets, etc.).”

Furthermore, Alavi (2000) stated that:

“The repository approach involves building and implementing knowledge repositories and retrieval technologies, including relational databases and document management systems.”

Regarding knowledge bases, Bishop (2009: 18) stated that they are “repositories, which store knowledge in a structured manner.” One example of KM activity for storing knowledge is document image processing (DIP) “paper documents converted into electronic form” (Lucey, 2005) . Furthermore, a data warehouse is:

“A central repository for all or significant parts of the data that an enterprise’s various business systems collect. It enables the management to access the available data in an efficient way, learn about trends and make informed decisions” (Murthy et al, 2011).

Moreover, case-based reasoning (CBR) is one KM technology for facilitating KM processes in organisations, particularly with capturing knowledge. Sun and Howard (2004) presented a CBR technology which is widely used to develop knowledge based systems (KBS). It is a method of solving new problems by adapting solutions that were used to solve old problems. Its principle is based on the assumption that similar problems have similar solutions. Figure 2.7 shows the problem solving process using CBR, which involves a four stage cycle:

1. Retrieve the most similar case(s) from stored previous cases
2. Reuse the retrieved case(s) to attempt to solve the problem
3. Revise the proposed solution if necessary
4. Retain the new solution as a part of a new case.

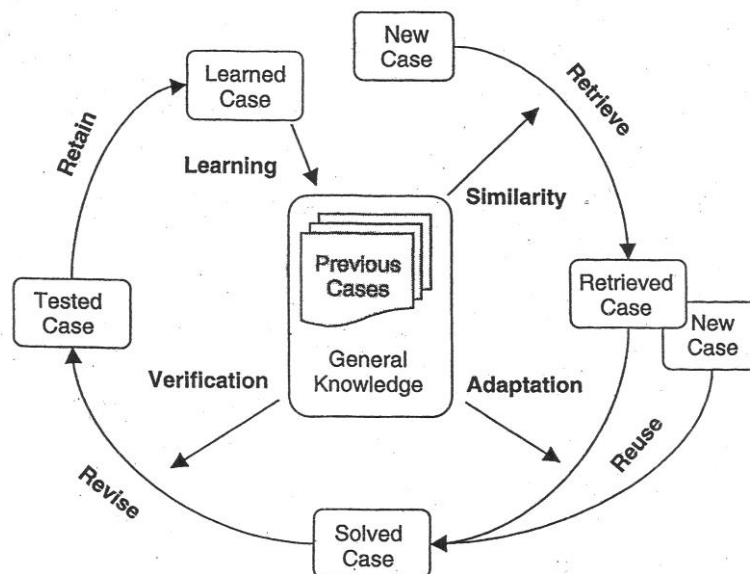


Figure 2.7: KM using case-based reasoning, as presented in (Sun and Howard, 2004)

IT offering a database related to staff or individuals and the field of their expertise. As Sun and Howard (2004) mentioned, IT is used in “recording who has what experience...offering databases of projects and the people who worked on them or CVs for staff that indicate their special knowledge.” Furthermore, Alavi (2000) stated that:

“The network approach of KM system uses technology to connect people, for example through having a corporate ‘yellow pages’ directory or ‘knowledge map’ that depicts the location of different types of expertise.”

Moreover, Bishop (2009: 18) stated that an expertise/skills database is “used to source individuals, encouraging communication.”

The second objective of ICT is supporting searching (locating and accessing) within existing explicit knowledge. Knowledge management involves data mining and some method of operation to push information to users” (Patel, 1999). Data mining means “the exploration and analysis, by automatic or semi-automatic means, of large quantities of data to discover meaningful patterns and rules” (Murthy, 2011). Furthermore, Bishop (2009: 18) stated that “Electronic Document Management Systems / Data and Text Mining: allow extraction of meaningful knowledge from a large amount of data or text”. Also, Shin (2001: 339) stated that ICT supporting access to existing information. It connects or directs a user who has a problem or question to a document repository (structured source) or intranets and search engine (unstructured source) (Hahn et al, 2000: 304). An example of KM technology for locating and accessing knowledge is taxonomies: ‘collections of the terms commonly used within the company’ and ontologies: ‘present definitions of the terms and their relationships’ (Bishop, 2009: 18). Moreover, intranet is “an organisational internet, guarded from outside access by security systems” and extranet is “an intranet with limited access to outsiders, allowing them to collect and deliver knowledge on the intranet”, they are KM technologies support knowledge sharing in organisations (Bishop, 2009: 18). Lucey (2005) mentioned some examples of KM activity which use ICT facilities such as gathering corporate or competitive intelligence.

The third objective of ICT is supporting people-based KM activities, and the linking of source and recipient of knowledge. According to Bishop (2009: ii):

“Supporting people-based KM activities with the right technology is an important factor, particularly as organisations expand and become more geographically dispersed.”

Furthermore, Shin (2001: 339) stated that ICT links the source and recipient of knowledge. It connects or directs a user who has a problem or question to a person through expertise profiles and databases (structured source) or electronic discussion forums (unstructured source) (Hahn et al., 2000: 304). Regarding the relation between computer networks and knowledge exchange, Davenport and Prusak (1998: 14) stated that:

“The communication and storage capabilities of networked computers make them knowledge enablers. Through e-mail, groupware, the Internet, and

intranets, computers and networks can point to people with knowledge and connect people who need to share knowledge over a distance. Desktop video conferencing and multimedia computing that transmits sound and video as well as text make it possible to communicate some of the richness and subtlety of one person's knowledge to another.”

Examples of people-based KM supporting technology that were mentioned by Bishop (2009: 18) are:

- Video-conferencing, which allows geographically dispersed employees to communicate and facilitates socialisation through IT support
- Groupware: a software product enables employees to communicate, share information, increase their work performance, and to collaborate through group decision-making using IT.

Furthermore, a framework (figure 2.8) regarding contact and share knowledge among individuals who are located in the same/different place at same/different time was developed by Desanctis (1987). However, the same place and time allows face to face contact and the need for IT is just for presentation.

	Different place	Same place
Different time	Email, newsgroups, forum	Office bulletin board
Same time	Chat, Instant messaging (IM), Voice over internet protocol (VOIP), vVOIP [Video-Conferencing]	Classroom, face-to-face meeting [power point presentation]

Figure 2.8: A time/place framework for sharing knowledge –adopted from (Desanctis, 1987)

2.8.2 Knowledge Management Systems

Knowledge management systems (KMS) are often used in KM literature to describe an IT-approach to KM (Bishop, 2009: 76). KMS was developed to enhance dealing with knowledge in organizations. It “encompasses both human and automated activities and their associated artefacts” (Newman, 1999). One example of KMS is a framework for KM support (Figure 2.9) that was prepared by Hahn et al. (2000: 304) and included two important considerations:

- (1) Where the knowledge resides in terms of individual and artefact (e.g. a document)
- (2) The extent to which the knowledge is structured.

The place of the knowledge determines whether the KMS connects a user who has a problem or question to a document or directs the user to a person. The level of structure

determines the extent to which KMS use imposes the burden of a translation or transformation of the problem or question to a form that corresponds to the implicit logic underlying the a priori structure.

Place of Knowledge		
	Artefact	Individual
Structured Level of Structure	Document Repository Data Warehousing	Yellow Pages of Experts Expertise Profiles and Databases
Unstructured	Collaborative Filtering Intranets and Search Engine	Electronic Discussion Forums

Figure 2.9: Framework for Knowledge Management Support - adopted from (Hahn and Subramani, 2000: 304)

2.8.3 Constraints in Using KM Technology in Organisations

Using ICT faces some constraints or threats. Sun and Howard (2004) mentioned the main potential threats which can cause system failures:

- Hardware failure
- Software failure
- Personnel actions
- Terminal access penetration
- Theft of data and equipment
- Fire and electrical problems
- User errors
- Program changes
- Telecommunication problems.

However, other type of constrain is IT does not create or even promote “knowledge sharing in a corporate culture that does not favour those activities” (Davenport and Prusak, 2000).

2.9 The Factors that Affect KM in Organizations

In addition to knowledge sources, KM theories and approaches, KM processes, KM techniques and technologies, there are many factors influencing KM in organisations. They can be classified into two groups: those related to the institution itself, and those related to individuals. The influencing factors include: the culture of organisations, the organizational structure, local regulations and organisational policies, working place and the role of leadership and individuals.

2.9.1 Culture of Organisations

Regarding organizational culture (Davenport and Prusak, 2000) stated that:

“Many people assume that organizations are objective and neutral; their purpose is to create a product or provide a service, and that goal may seem unrelated to values. In fact, people's values and beliefs have a powerful impact on organizational knowledge. Organizations are, after all, made up of people whose values and beliefs inescapably influence their thoughts and actions. The organizations themselves have histories, derived from people's actions and words that also express corporate values and beliefs.”

Organizational culture is an “important aspect for facilitating sharing, learning, and knowledge creation” (Gupta, 2000: 19). Furthermore, Sheehan et al (2005: 54) stated that “culture has been widely recognised as a key factor in successful knowledge sharing initiative.” Beijerse (1999: 107) mentioned that numerous factors influence organisational culture, such as the products or services, the location of the company, the size of the company, the legal form of the organization, the history of the company and the structure and the strategy of the company.

However, “the lack of common knowledge leads to a loss of the essence in the term ‘organization.’ To organize is to assemble in order to work towards a common goal” (Bano et al, 2010). The hard task that organizations have to do is reaching the point where employees willingly share their knowledge (Bukowitz and Williams, 1999). It is also “how to convince, coerce, direct or otherwise get people within organizations to share their information” (Gupta, 2000). Furthermore, Bock et al. (2005: 89) stated that:

“It comes as no surprise that changing people’s behaviours is generally considered to be the most severe challenge facing firms desiring to increase their members’ knowledge-sharing behaviours.”

One KM aim is to establish an environment that benefits the organisation through encouraging individuals to create, share, and use knowledge (Murthy, 2011). Regarding organisational culture, Anantatmula (2008: 457) suggested that:

“Organization culture that encourages open and transparent communication among the employees of the organization would lead to increased collaboration and knowledge sharing at hierarchical levels of the organization, which leads to knowledge sharing. Increased communication with the aid of standard processes, and technology infrastructure make it easy and enhance collaboration.”

Also, Gupta (2000: 19) stated that “an open culture with incentives built around integrating individual skills and experiences into organizational knowledge will be more successful”. Finally, to create a culture of knowledge sharing and encourage recipients

of knowledge, (Sheehan et al, 2005) listed four points should be provided in organisations:

- It is acceptable to ask for help
- It is reasonable to make mistakes
- It is possible to share lessons in a culture of continuous improvement
- People actively seek and apply new learning.

2.9.2 The Organizational Structure

Organisational structure is one of the factors influencing support and facilitates the learning process within the organization (Beijerse, 1999: 103). It affects KM and the transfer of knowledge (Jelavic, 2011: 6). Regarding organisational structure, Mullins (1986: 72) stated that:

“Structure is the pattern of relationships among positions in the organisation and among members of the organisations. The structure defines tasks and responsibilities, work roles and relationships, and channel of communication. The purpose of structure is the division of work among members of the organisations, and the co-ordination of their activities so they are directed towards achieving the goals and objectives of the organisations. Structure makes possible the application of the process of management and creates a framework of order and command through which the activities of the organisation can be planned, organised, directed and controlled.”

In addition to showing reporting lines, hierarchies and workflows in organisations, organisational structure identifies formal organisational relationship. Therefore, it supports/ contradicts personal interactions for capturing knowledge in organizations. As Anantatmula (2008: 457) stated,

“The organization should have a structure, which facilitates personal interactions and supports communities of practice to capture tacit and explicit knowledge within the organization.”

However, according to Bishop (2009), an inflexible organizational structure is a reason for KM failure.

2.9.3 Local Regulations and Organisational Policies

According to Murthy and Panchal (2011), KM architecture includes organisational incentives and management roles to support KM activities. Regarding organisation policies, these can affect the development of knowledge. Rowley (1999) and Murthy and Panchal (2011) stated that developing organisational norms and values, which support the creation and sharing of knowledge, is essential for successful KM in

organisations. Some of the norms or policies have been mentioned by Vector (2008), such as:

- Making content submission mandatory
- Incorporating rewards into performance measurement plans.

Furthermore, KM is associated with organisation learning as the knowledge policy in organisations “determines what is to be learned, where learning will take place, who will learn and when learning will take place” (Beijerse, 1999: 102).

However, Bishop (2009: 87) stated that KM activities should be seen as a useful aspect of work rather than something that is required, and therefore, the policies and procedures approach should be minimised. Also, Snowden (1999) mentioned that “strategies within this category usually include reward systems and ways of encouraging knowledge sharing.”

Regarding required policies for dealing with external knowledge in HB conservation organisations, Dann and Wood (2004: 146) stated that:

“There should be an understanding of the limits of specialist knowledge within the organisation and appropriate outsourcing policies to ensure that the organisation has the required skills available.”

2.9.4 Working Place

According to Shin et al (2001: 339), knowledge is transferable when individuals or organizations share the context. Co-location implies common language (verbal and non-verbal) and achieves high levels of understanding (Brown and Duguid, 1991; Dougherty, 1992). Also, sharing of working place provides face-to-face contact and offers common language that enables individuals to understand each other’s actions and the background (Shin et al, 2001: 345).

2.9.5 The Role of Leadership

Regarding the leadership and its effect on KM, Anantatmula (2008: 457) stated that:

“The leader plays a critical role in securing funds and building technology infrastructure to accomplish KM goals and objectives. Capable leaders garner the support of the top management and influence the collaborative culture.”

Also, Bano and Khan (2010: 16) stated that:

“Organizational executives are concerned about developing strategies for knowledge creation, sharing, dissemination, and adaptation within the

organization by using the ability of employees to achieve the knowledge enrichment.”

The leader/s should guide a group of knowledge workers who “facilitate, curate, and disseminate knowledge within the organisation” (Murthy and Puanchal, 2011). Furthermore, “decision-makers play the critical role within core, stable processes as they relate to acquisition and deployment of information and knowledge (Malone, 2002: 117). Also, they can secure funds and provide ICT for achieving KM objectives in addition to guiding a group of knowledge workers to facilitate KM processes within the organisation. Furthermore, a selection of competent and committed leaders is required for KM before a detailed plan is developed and implemented, in order to achieve the best results (Anantatmula, 2008).

On the other hand, leadership could be contradictory for KM. As Macintosh et al (1999: 563) stated, organizations are not using the best available knowledge because “the top decision makers are resistant to change.”

2.9.6 Individuals' Role in KM

According to Murthy et al (2011), an organization’s most valuable resource is the knowledge of its people who facilitate, curate and disseminate knowledge within the organisation. KM recognizes that all jobs involve ‘knowledge work’ and so all staff are ‘knowledge workers.’ The individuals who have knowledge are the most important tools not only for achieving the scope of work but also for developing their organisations. “Knowledge is embedded in such individuals and transferred among team members while in one project team. It is typically transferred from seniors to juniors and disseminated only within the group” (Teerajetgul and Charoenngam, 2006). According to Andrews and Delahye (2000), assessments of knowledge credibility are based on the evaluation of the knower, rather than of knowledge.

As employees staying in the same organisation, they obtain knowledge from practice and experiences (Beijerse, 1999). Also, Fielden (1982) stated that staff retention is an important factor in developing their knowledge. However, “senior staff retire or leave organisations regularly, potentially taking tacit knowledge and a potential source of competitive advantage with them” (Sheehan et al, 2005). Also, “there are trends for employees to retire earlier and for increasing mobility, leading to loss of knowledge” (Macintosh, 1999). Furthermore, Serban et al (2002:7) stated regarding the employees who retire or change jobs that “they take with them valuable experiences and skills for

which the institution has paid a premium to search and train.” As a result of this situation, tacit knowledge (might be) lost if knowledge is not managed.

However, one of knowledge aspects that should be managed in the construction context is people factors (Egbu et al, 2005a). KM efforts can help retain intellectual capital as employees’ turnover in an organisation (Vector, 2008). Serban et al (2002:7) stated that:

“Organizations are increasingly recognizing that capturing and sharing these experiences and skills save them money, prevent or reduce interruptions in activities, and enhance their overall ability to cope with changes in personnel.”

Also, Beijerse (1999: 97) stated that KM attempts to ensure that knowledge-workers stay with the company. This could be achieved through staff motivation that contributes with keeping organisational knowledge and developing staff knowledge.

2.9.7 A Proposed Model for Studying and Understanding KM in Organisations

Following the review and discussions throughout this chapter, which investigated the concept of KM in organisations, a proposed theoretical model for studying and understanding KM in organisations was proposed. The factors that were included in the proposed model (figure 2.10) were identified according to their relation to KM in an organisation, as mentioned in the wider literature. Furthermore, for managing knowledge in organisations, modes of transferring personal knowledge to organisational knowledge and vice versa must be considered through a balance between people-based and explicit-based KM approaches (section 2.5.2 and 2.5.3). However, one of the key findings from the KM literature review was that knowledge is created in a specific context and what has value in one context may not be the same in another (Quintas, 2005).

The proposed theoretical model included three items (divided into sub items) derived from discussing different aspects of KM in organisations (sections 2.6, 2.7, 2.8 and 2.9) that should be investigated in organisations:

- The essential knowledge, and its sources and availability
 - Knowledge types (technical, management...)
 - Knowledge sources: individuals, documents, and organisational product/processes
- The individuals and organisational factors that affect KM in the MHCB
 - Workforce and their mobility and turnover

- Role of leadership
 - Regulations and policies
 - Organisational structure
 - Organisational Culture
 - Working place
 - KM technologies
- The current condition of dealing with knowledge
 - KM processes
 - KM techniques

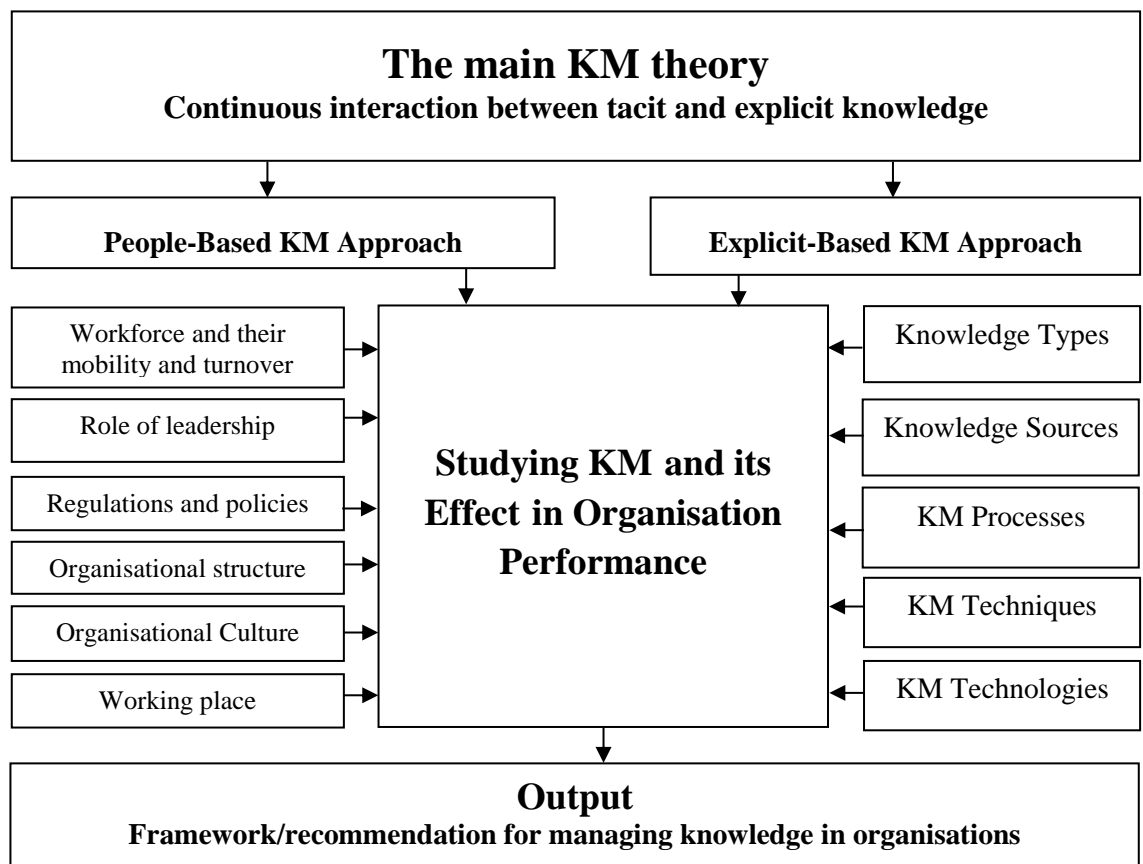


Figure 2.10: A proposed theoretical model for studying and understanding KM in organisations

2.10 Summary

The objective of this chapter was to investigate the concept of knowledge management in organisations. However, a definition of knowledge management has been derived from several scholars, and this is the management processes that enable organisations to identify both available and required knowledge, and capture and share it for effective use to achieve organisational objectives and create new knowledge. Knowledge management is not an end in itself its advantages include enhancing the performance,

improving the capabilities of the organization's human resources, problem solving, learning, strategic planning and decision making within the organisation in addition to competitive advantage.

Knowledge and information are a two way conversion process. Information (which results from data) could be transformed into knowledge after the interpretation process. On the other hand, information is one representation of knowledge in the case of transforming it into explicit form. However, knowledge covers the meaning of relevant, contextual, useful and historic (experimental) information. The most significant characteristics of knowledge are that it is volatile, it is embodied in agents with wills, it is not 'consumed' in a process, it sometimes increases through use, it has wide ranging impacts on organizations, it cannot be bought on the market at any time, it often has long lead times and it can be used by different processes at the same time.

Knowledge could be in tacit or explicit form. Tacit knowledge is experiential, judgemental and context-specific. It is personal in origin and stored in individuals' minds or embedded in organizational routines, processes, practices, and norms. It is characterized by the difficulty of formalizing, capturing, communicating and sharing it. Whereas explicit knowledge is knowledge, found as structured or unstructured forms. It can be captured, written down (codified) and stored in organisations repositories (documents or databases). It is easily transferable, shared and reusable. However, knowledge sources in organisations are varied: internal and external, each in order to be divided into documents and individuals, in addition to products or services (work processes). In comparison with internal knowledge, external knowledge is more difficult and expensive to obtain. This means internal knowledge is relatively cheaper and easier to manage.

The main components of KM are: people, processes and technology. Numerous KM schools and points of views can be summarized in two main approaches: the people-based KM approach, and the explicit-based KM approach. The people-based KM approach deals with people and tacit knowledge aspects, whereas the explicit-based KM approach deals with explicit knowledge and is supported by IT in its processes.

The main KM processes are: developing, capturing, accessing, disseminating (sharing), and using the knowledge, each of which includes sub activities. These processes are supported by techniques and technologies.

Processes that are particularly relevant to the people-based KM approach can be achieved through several techniques. These techniques have some features, such as: more focus on tacit knowledge, greater involvement of people, affordable to most

organisations, and easier to implement and maintain. However, processes that are relevant to the explicit-based approach are based more on KM technologies. KM helps organisations to make the right decision about which technology can be used for which purpose. The main objectives that could be achieved from applying ICT for managing knowledge in organisations are:

- Facilitating KM processes in organisations
- Supporting access to existing information and linking the source and recipient of knowledge
- Offering a database related to staff or individuals and the field of their expertise.

The factors influencing the management of knowledge in organisations include the culture of organisations, the organizational structure, regulations and policies, working place, workforce and their mobility and turnover, the role of leadership, and knowledge type and source, in addition to knowledge sources, KM processes, techniques and technologies.

Finally, the literature review demonstrated that knowledge is created in a specific context and what has value in one context may not be the same in another. Also, KM has been researched in different fields such as business and construction. However, KM has not been researched in the field of HB conservation. A second result balancing the explicit-based KM approach and the people-based KM approach is essential for the management of knowledge in organisations. The KM literature review and discussions throughout this chapter concluded by developing the proposed theoretical model for studying KM in organisations and its effect in organisation performance. This model includes the three main items (divided into sub-items) that should be investigated in organisation:

- Essential knowledge and its sources and availability.
- Individuals and organisational factors influencing KM
- The current condition of dealing with internal and external knowledge.

Chapter 3: The Nature of HBs and the Key Issues in their Conservation at the Organisational Level

3.1 Introduction

The main objective of this chapter is to investigate the nature of historic buildings (HBs) and the key issues involved in their conservation at the level of organisations responsible for doing so. This chapter is divided into nine sections: the first section introduces the chapter and the second looks at the concept of HBs and gives a definition. The third section deals with HB values while the fourth discusses the threats against them. The fifth section considers the need for conservation management, the types of organisation in HB conservation, and the individuals in the field. The sixth section highlights the regulations and principles of HB conservation. The seventh section discusses the key HB conservation processes at the level of responsible institutions. The eighth section identifies the required knowledge aspects for conserving HBs in responsible organisations.

3.2 The Concept of Historic Buildings

3.2.1 Vernacular and Sophisticated Historic Buildings

Feilden (2004:124) noted, there are two main classes of HBs:

- The vernacular, which has evolved using materials available locally to meet climatic conditions as efficiently as possible
- The sophisticated (for its time), with high quality workmanship and materials.

As a result of empirical development, vernacular buildings were established. However, “the ways of building varied more or less from settlement to settlement, following variations of topographical, geological, climate, social and ethnographic factors” (BS, 1998:1). These vernacular buildings were built by people for themselves by using local materials and experience. Later, the role of architects appeared and contributed to the development of construction after the expansion of vernacular building processes.

The second type of historic building (HBs) is sophisticated buildings, according to the quality of their construction materials and the workmanship used to build them.

The buildings that were built by vernacular people and/or the specialists from small houses up to huge buildings achieved the required functions for each age and led to local architectural styles. However, as a result of changes to a building’s functions and materials development, most of these buildings have not adapted to changes and have

disappeared over time. Despite this, some buildings still stand, particularly the sophisticated ones, and continue their life with difficulty. Most cities all over the world have historic buildings. These buildings present the heritage and history of those cities. Also, these buildings are evidence of past architecture that contain historic, architectural, environmental, social and economic values.

3.2.2 Historic Buildings: Definition

Many scholars have defined historic buildings (HBs) according to their function, the historic events they witnessed, age, architectural merit and location, etc. However, regarding the function, ICOMOS (1990) stated that the HBs that we can still see today “are those which have been most successfully adapted to new and changing uses over the time since their construction”. The previous citation points out that these buildings still have a role or they can perform a function. Also, it indicates that a change in use is necessary to extend a HB’s life. Historically, ICOMOS (1990:1) stated that as HBs are rare buildings, they have become unique, matchless buildings that contain historic information that cannot be obtained from any other supply.

Furthermore, regarding the age of the building, the English principles of age and rarity for registering HBs classifies the ages of a building into four groups (table 3.1).

Table 3.1: Principles of age and rarity for registering HBs in England (Council, 2007)

Buildings’ age or date of erection	General principles for registering HBs
Before 1700	Buildings that contain a significant proportion of their original fabric are listed
From 1700 to 1840	Most buildings are listed
After 1840	Because of the greatly increased number of buildings erected and the much larger numbers that have survived, progressively greater selection is necessary
Less than 30 years	Listed only if they are of outstanding quality and under threat

However, this categorization does not differentiate between modern, historic buildings and ancient monuments. Affairs (2004) stated that HBs are ancient buildings that “contain historical and cultural values, but have yet to be designated as ancient monuments”. This definition positively differentiates between ancient buildings and ancient monuments. In comparison with ancient monuments, HBs are more recent and can perform a function. The ancient monuments such as buildings belonging to the ancient Roman or Greek civilisations do not perform any function as they are antiques in themselves. One example of a Roman ancient monument is the Marcus Aurelius arch

in the old city of Tripoli, Libya (figure 3.1); this was built in the Roman period 163-164 AD (El-Belazie, 2004: 95).



Figure 3.1 Marcus Aurelius arch in the old city of Tripoli (Quryna, 2010)

Furthermore, HBs mostly have certain features, and as indicated by Feilden (2004:1), these represent values such as: “architectural, aesthetic, historic, documentary, archaeological, economic, social and even political and spiritual or symbolic values”. The availability of these features increases the significance of HBs. Indeed, the department of communities and local government (DCLG: 2007) emphasizes that:

“A building must illustrate important aspects of the nation’s social, economic, cultural, or military history and/or have close historical associations with nationally important people. There should normally be some quality of interest in the physical fabric of the building itself to justify the statutory protection afforded by listing”.

However, architectural and historic interests are the criteria for deciding that a particular building has special interest. Moreover, regarding the definition of HBs according to their architectural merit and location, Libyan law number three (GPC, 1994) defines HBs in the following way:

[each]“inherited physical component has a practical function, lies in or outside the zone of neighbourhoods or historic cities, characterised by one or more of these features: architectural and art style processions of the gradual evolution of architecture that are customary in the history of architecture. Also, style has not been repeated or, unique architectural style does not follow any period in addition to attended significant political, cultural or social events”.

The previous discussions raise numerous points regarding the definition of HBs, to include:

- Those which have been most successfully adapted to new and changing uses over the time since their construction as they still have a role or they can perform a function
- Unique buildings contain historic information that cannot be obtained from any other supply
- Located in or outside the zone of neighbourhoods or historic cities
- Ancient buildings that have yet to be chosen as ancient monuments
- Buildings mostly have some features architectural, historic, economic, environmental and social values
- Architectural and historic interests are the most significant criteria to add HBs to a statutory list.

The previous points, derived from ICOMOS (1990), GPC (1994), BSI (1998), Feilden (2004), Affairs (2004), DCLG (2007), and Council (2007), create an operational definition of HBs that includes their characters as ‘Old buildings, adopted with new and changeable function, located in or outside the zone of neighbourhoods or historic cities, that are not ancient monuments as they still have a role or they can perform a function. Mostly, have some architectural, historic, economic, environmental and/or social values.

3.3 The Values of Historic Buildings

The values of HBs are the main reason for conserving them. However, most scholars in the field of HB conservation, including Brereton (1991), Feilden (2004), and Dann and Wood (2004), in addition to official departments such as ICOMOS (1987), BS7913 (1998), English Heritage (2004), DCLG (2007), Council (2007) and HELM (2010), agree that the architectural and historic values are the most significant reasons for preserving HBs. For instance, DCLG (2007) stated that particular architecture and historic interests are the main reasons for adding buildings to the statutory list compiled by English heritage.

Furthermore, some standards and scholars, for instance, BS7913 (1998) and Feilden (2004), emphasize the significance of the economic, environmental and social values that are associated with conserving HBs. Also, Dann et al (1999: 2) highlighted that the significance of conserving HBs resides in the continuity of its function (economic and social values) and the culture that it includes. Furthermore, the identification of heritage assets according to historic and architectural values contributes “an appreciation of the

relevant sociological and economic aspects” (Seeley, 1987). However, the values which have to be analysed in order to define the significance of HBs and the importance of their conservation can be classified into five categories: historic, architectural, economic, environmental and social.

3.3.1 The Historic Value of HBs

The main reason for conserving HBs is their historic value. According to Kohler (2002: 229), “the criteria of historic significance are used to justify the need to protect individual objects or groups of buildings”. The value of HBs is increased by the past events they witnessed, the civilization they presented, the famous people who lived or dealt with these buildings, or significant events that happened in them. As (ICOMOS, 1999: 12) stated,

“A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place, the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive”.

To document a history objectively, historians should prove the events by determining where they happened. However, HBs embody evidence of facts and events that happened in the past. As BS7913 (1998:4) emphasises, earlier period facts are present in HBs. Moreover, Feilden (2004:1) mentions that HBs provide a feeling of impressiveness and encourage investigation about the people and culture that produced them. They give the feeling of re-living the past as they tell the history of a country or city and the time periods it passed out.

3.3.2 The Architectural Value of HBs

Regarding HBs’ architectural values, BS7913 (1998:4) mentioned that HBs:

“Can have strong cultural meaning for people, whether residents or visitors in an area, because of their architectural quality, character or history, also, because they are built of local materials in a local way; or simply because they are familiar and are a known and recognizable feature of a place”.

Historic buildings are often highly visible local landmarks (HELM, 2010:3). One example of a HB that is recognised as a landmark in a city is the cathedral of Santa Maria del Fiore in Florence, Italy. It was constructed between 1296 and 1436 (Origlia, 2010). No one can describe the city of Florence without mentioning this building (figure 3.2).



Figure 3.2: Cathedral of Santa Maria Del Fiore in Florence (AllPosters, 2010)

Furthermore, HBs provide an architectural diversity, as Steven (2001: 13) stated:

“The aesthetic appeal of an historic place may result from the combination or juxtaposition of many buildings rather than the individual merits of any particular building. Most cities are made up of buildings from a range of periods in a variety of styles and idioms. Thus, the past may be valued because of its juxtaposition with the present; in particular, older buildings provide a potent contrast to the interminable sterility and monotony of modernist architecture such diversity is usually viewed positively”.

However, the type of HB that is of special architectural interest for statutory listing, as DCLG (2007) emphasized, is one as described below:

“A building must be of importance in its architectural design, decoration or craftsmanship; special interest may also apply to nationally important examples of particular building types”.

Furthermore, BS7913 (1998) and Feilden (2004) consider the aesthetic aspects included in HBs, such as fine architecture and works of art or craftsmanship representing architectural value. Moreover, HBs provide a live example for the study of the history and theories of architecture, in addition to studying a space. They provide an ideal environment to study design concepts, style, the human scale, and the microclimate of the buildings. Indeed, Vellinga (2007) calls for “teaching architectural regeneration and understanding cultures and creative intervention,” as provided in HBs.

3.3.3 The Economic Values of HBs

The conservation of HBs can affect economic values, and these can be classified into direct and indirect ones. The direct ones reside in using HBs for their proper functions (BS7913, 1998) and (Feilden, 2004). However, if HBs have not been used for a period of time, a rapid decay of these buildings will occur, as (HECC, 2010) stated: “buildings that are unused and do not receive maintenance quickly become susceptible to the

elements and decay can be surprisingly rapid”. One of the direct benefits of HBs can come from tourist functions,¹ as El-Belazie (2004: 41) stated: “one of the direct benefits of tourism to urban conservation is the reuse of buildings for the tourist function”. However, Khatwa (2007) stated that one of the threats to world heritage sites comes in the form of uncontrolled tourism. This changes the economic benefit to a threat against HBs. El-Belazie (2004: 40) stated that the associated conflicts include:

- A clash of policies regarding new development and conservation
- Meeting the needs of the tourist culture and those of the local culture
- Maintaining the quality of the urban environment in the face of the quantity of tourists.

Most surviving HBs, where it is deemed appropriate for them to have an economic value and be display as a positive element, will need to be altered from time to time, and some will require a conversion of use (BS7913, 1998). This may be caused by population growth and housing pressure, in addition to business and commercial growth. However, HECC (2010) claims that “inappropriate conversion resulting in loss of character poses a threat which needs to be balanced with the benefits of losing historic buildings altogether through neglect”. Also, the interest of people who use HBs for their business toward their culture value is not often, as Milstead (2007) stated:

“Residents prioritize home improvements, partly from a functional perspective, and largely from a financial perspective often associated with home re-sale value, but rarely from a heritage perspective”.

Moreover, Earl (2003: 80) presents philosophical issues regarding investment in HBs which may cause conflict:

“Two nearly opposed philosophies are at work: one viewing the building as an inheritance to be safeguarded, the other seeing it as an opportunity to be exploited (investment)”.

On the other hand, the indirect economic values of HBs reside in their “character, quality, interest or beauty [as it] enhances the value of the immediate area in which it is set or of the wider area or country as a whole” (BS7913, 1998:6). Conserving HBs contributes to an increase in the value of their areas, improves the travel and tourism industry of the city and provides new jobs. These may be not only jobs in the field of travel and tourism but also in conservation projects.

However, conservation principles in terms of minimum intervention contradict the business of running HBs. As maintenance should be repeated from time to time, this

¹ Museums, restaurants, hotels, etc

means periodically stopping the business for a time, and this negatively affects the business in these buildings. Moreover, the refurbishment process (a high level of intervention) takes a long time and also stops the business running, despite being a process which only occurs once every 10-20 years. This type of intervention is more appropriate for certain types of business in HBs.

3.3.4 The Environmental Value of HBs

Protecting and improving the environment are the main environmental values that can be achieved from conserving HBs. Regarding protecting the environment, BS7913 (1998: 4) stated that:

“The continued use of existing building stock, whether or not of particular architectural merit or historic interest, coupled with measures to improve energy efficiency, is a global priority”.

The sustainability concept calls for careful management of the existing built environment. HELM (2010: 3) stated regarding old school buildings that:

“Demolition and replacement of existing (school) buildings involves a high carbon impact, landfill implications (and associated costs) as well as the material impact of the replacement new build and the loss of the embodied energy within the buildings demolished. The energy, waste and pollution embodied in the construction and the procurement of the materials used typically accounts for about ten years’ environmental impact of a (school) in operation”.

Also, sustainability is achieved through continued use of buildings which have environmental benefits. For instance, it “cuts waste, [and] keeping what we have got minimises requirements for new materials” (McCallum, 2009). Moreover, English Heritage (2004) stated that:

“Retaining existing elements of construction in old buildings and seeking to enhance their thermal performance in benign ways, rather than replacing them, is a heritage conservation principle in line with this concept of sustainability”.

However, work on HBs should aim to:

“improve energy efficiency where and to the extent that it is practically possible, [but] not prejudice the character of the historic building, or increase the risk of long term deterioration to the building fabric or fittings” (McCallum, 2009).

On the other hand, the improvement of the environment offers advantages for communities through quality of space. BS7913 (1998: 6) stated that:

“There is ample evidence that environment affects human happiness and that people like living, working and simply being in beautiful, established places, in which buildings, trees and landscape have had time to mature together”.

Furthermore, at the level of the micro-climate, HBs provide better ventilation and better a micro-climate in comparison with modern ones, as HELM (2010: 3) noted:

“Higher ceilings (and therefore increased volume) in older buildings provide better ventilation than modern equivalents. Together with the thermal mass of the solid walls, this can also provide night-time cooling”.

Moreover, conserving HBs has a role to play in improving the environment. As HELM (2010: 3) stated, it “can provide a cornerstone for wider regeneration projects and can restore confidence and vitality to neighbourhoods”. Also, Feilden (2004) mentioned that HBs contribute to the townscape, landscape and ecology. For instance, many HBs are “much valued local landmarks, both by their local community and for the contribution they make to local character and street scape” (HELM, 2010: 3). Finally, BS7913 (1998: 6) mentioned that “fine architecture and good buildings in sound condition can be of great important to the establishment and maintenance of good environment”.

3.3.5 The Social Value of HBs

The nature of social values embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group (ICOMOS, 1999). Some of the emotional values which HBs provide help to reinforce people’s sense of belonging and local identity, continuity, wonder, symbolism and spirituality (Feilden, 2004) and (McCallum, 2009). Furthermore, a sense of identity for the local community might be produced as a result of the continued use of HBs (Garrod, 1996: 424). Moreover, regarding school buildings, HELM (2010: 3) stated that:

“In addition to giving identity and a sense of educational purpose, retaining the existing school buildings in the same previous use can contribute with continuity of their ethos and character”.

3.4 Threats against Historic Buildings

The key reasons for conserving HBs could be attributed to their values and their vulnerability to threats (Dann and Worthing, 2005: 94). The causes of HB decay are varied; Feilden (2004: 1) identified the major causes of this decay when he stated that “the most uniform and universal is gravity, followed by the actions of man and then by diverse climatic and environmental effects”. However, the natural and human factors are the main reasons for HB decay.

3.4.1 Natural Factors that Decay HBs

The natural factors that cause HB deterioration and loss can be classified into natural disaster and climate impacts. As Lourenco (2005: 13) noted, an aggressive environment, earthquakes, settlement, vibration, pollution and micro-climate are some of the natural threats against HBs. Earthquakes, volcanic eruptions, hurricanes, floods, landslides, fires caused by lightning and so forth are natural disasters. Climate impacts, however,

include temperature, moisture in its many forms (vapour clouds, rain, ice, snow and ground water) wind and sunshine (Feilden, 2004: 3). For instance, in the old city of Tripoli one of the reasons for physical damage to HBs is “the high average humidity in the area as a result of [the] city’s location, which is very close to the sea” (El-Belazi, 2004:131). Older buildings “more frequently face age-related issues such as roof leakage, inefficient energy systems, and other cosmetic problems that can lead to an uncomfortable indoor climate and high utility bills” (Lavy and Bilbo, 2009). These factors affect owners who evacuate or destroy these buildings despite their significance.

However, when a historic site is threatened or damaged by natural causes or war, the country and/or UNESCO registers the site in the world heritage in danger list in order to attract the necessary expertise and funding to remediate the damage (Khatwa, 2007). Furthermore, as Lazarus (2007: 326) stated, this is do to:

“Improve the stability of the historic environment whatever the impact of climate change. This is a recognised area where further research is needed and where there will be important opportunities to share knowledge within the heritage community”.

3.4.2 Human Factors that Decay HBs

The main human factors that affect HBs are negligence and ignorance, in addition to economic reasons. Feilden (2004: 3) claims that “neglect and ignorance are possibly the major causes of destruction by man, coupled with vandalism and fires.” Furthermore, maintenance and the use of HBs are associated with higher costs, whether for the owners or the responsible governmental institution.

Regarding neglecting historic buildings, HECC (2010) stated that “a serious threat across such a large nominated site arises from simple neglect of historic structures, particularly those that have no economic use”. This means inefficient and insufficient maintenance. In this regard, Lourenco (2005: 13) stated that:

“Many old and ancient buildings and historic centres were no subject to continuous maintenance, now most of this patrimony is affected by structural problems which menace safety of building and people.”

However, failure to repair HBs leads to vacant buildings. As Kohler (2002: 230) warned, “if a building is not refurbished after a certain time, it becomes vacant and if it stays vacant a certain time, it is demolished”.

Another important factor is the ignorance regarding the values of HBs and the methods of conserving them, which creates a threat to these buildings. There is a “conflict of interests and lack of understanding with regards to the values of heritage

buildings between the different categories of public” (Ismail, 2005). Also, El-Belazi (2004:131) stated that the lack of knowledge regarding the maintenance of HBs by their owners is because “most of the local citizens do not have the knowledge to preserve and maintain such buildings”. Furthermore, the owners lack knowledge about what should be done and have “the greatest need for clear information as to reputable and suitably experienced consultants and specialist craftsman” (Lazarus, 2007: 325). Moreover, owners look for convenience not conservation in their HBs, as (Kindred, 2004: 22) stated:

“Owners are not driven by conservation principles. They maintain their buildings primarily to avoid the inconvenience of disrepair... Owners do not give priority to maintenance because they do not have the skills required, and see it as a low-priority activity.”

However, developing the knowledge of HB owners regarding the significance of their properties and the need to use conservation specialists is essential for maintaining HBs in good condition. As Lazarus (2007: 326) noted,

“For heritage buildings it is suggested that a log book should be created, and passed on to subsequent owners. This would include information on, for example, the history of the property, including construction materials and special features, any existing maintenance regime and contact details for specialists and maintenance contractors.”

Owners may recognise the benefits of conserving HBs but lack the resources (Lazarus, 2007). Some owners might resort to destroying their HBs because of economic reasons. In addition to lack of funds, there is an economic interest to replace HBs with new ones (Ismail, 2005). The limited availability of rare materials, combined with the high cost of traditional building materials, leads to the use of inappropriate materials that result in damage to the cultural value of the HB (HECC, 2010). Regarding the lack of support from official departments, (Kindred, 2004: 22) stated that “owners are not encouraged or helped to maintain HBs. The iniquity of VAT on maintenance and repair, not alteration, persists”.

Finally, the previous discussions have demonstrated that the owners of HBs need the know-how and know-who knowledge from some responsible institutions in addition to funding for conservation work. This calls for the availability of organisations that can provide such knowledge and services. However, because of HBs values and the threats against them, most countries have established organisations to manage their conservation.

3.5 Management of Architectural Conservation

3.5.1 *The History of Architectural Conservation*

Ancient structures have long been treated with care and reverence in many societies, including classical Rome and Greece. But only in modern Europe and America, in the last two centuries, has this care been elaborated and energised into a forceful, dynamic ideology: a ‘Conservation Movement’, infused with a sense of historical destiny and loss. Glendinning (2013) presents the entire history of this architectural conservation movement (table 3.2). The first era (pre-1789) witnessed care for old buildings or harbingers of heritage: Antiquity, Christendom, and Renaissance. The second era (1789-1914) witnessed the first modern ideologies of conservation, and the third era (1914-1945) witnessed the crisis of the movement: mass heritage, mass destruction. The fourth era (1945-1989) witnessed the heyday of the movement: Parallel Narratives of Post-war Preservation. Charters and conventions and the internationalization of heritage emerged in this era. Finally, the contemporary story has evolved since post-1989.

Table 3.2: The Conservation Movement: A History of Architecture Preservation (Glendinning, 2013)

A Conservation Movement	
Pre-1789	Foundations of the Movement: Care for Old Buildings in the Pre-Modern Age
1789-1914	Growth of the Movement: First Modern Ideologies of Conservation
1914-1945	Crisis of the Movement: Mass Heritage, Mass Destruction
1945-1989	Heyday of the Movement: Parallel Narratives of Post-war Preservation
Post-1989	The Contemporary Story – Heritage in the Age of Globalization

Regarding the contemporary story, the architectural heritage is at more risk than during any other period. DOCOMOMO (2013) stated that:

In the last decades, the architectural heritage of the modern movement appeared more at risk than during any other period. This built inheritance glorifies the dynamic spirit of the Machine Age. At the end of the 1980s, many modern masterpieces had already been demolished or had changed beyond recognition. This was mainly due to the fact that many were not considered to be elements of heritage, that their original functions have substantially changed and that their technological innovations have not always endured long-term stresses.

Because of the current situation of the architectural heritage, its management is needed.

3.5.2 *The Need for Architectural Conservation Management*

Awareness regarding the need for the management of the existing built environment has increased all over the world (PORTER, 1999: 3). Regarding this management of the built cultural heritage, Dann and Worthing (2005: 93) stated that:

“There has been a strong emphasis in recent years on the need for the built cultural heritage, whether it be individual buildings, sites or areas, to be managed more effectively... the important point about historic buildings, which should

affect the approach adopted toward maintenance management, is that the fabric is important in itself – not just because of the function it performs. That is, unlike other buildings, the fabric has cultural significance –the building itself is an artefact”.

Management systems and protection contribute to cultural sustainability (Wang et al, 2010). Moreover, according to Feilden (1982), Lazarus (2007: 321), Khatwa (2007) and Macky et al (2012), the responsibility of architectural heritage conservation extends from the top level of different national local authorities (e.g. the ministries of culture, housing, urban planning, tourism, and the environment etc.), to house owners and occupiers. For instance, Khatwa (2007) stated that “countries are responsible for maintaining the quality of world heritage sites through management and preservation efforts that incorporate local communities and national authorities”. Also, Macky et al (2012: 1923) stated that:

“Stockholders involved in the on-going care for heritage housing extend from government ministries, department and their agencies, the building industry, design and building professionals, educators to house owners and occupiers.”

However, most national authorities have established institutions to conserve their countries’ architectural heritage, not only as a national heritage but also as a part of world heritage.

3.5.2 The Types of Organisations that Care for Historic Buildings

Two types of organisations for conserving HBs were mentioned by Dann et al (1999: 3): non-heritage focused and heritage focused organisations. The non-heritage focused organisations are those where the care for HBs is not the core business activity, for instance:

- a) Museums
- b) Ecclesiastical bodies
- c) Local authorities
- d) Large urban residential estates
- e) Universities
- f) Health authorities

These large institutional owners are responsible for numerous HBs because they do their work in these buildings. For instance, religious organizations such as ecclesiastical bodies usually have a responsibility for the conservation of a significant number of HBs (churches). Also, in most Islamic countries there are religious organizations ‘al-Waqf boards’ which have the authority to conserve religious HBs. However, the heritage

focused organisations have a more co-ordinated approach than the non-heritage focused organisations regarding conservation principles. For instance, table 3.3 shows the extent of compliance with conservation principles between heritage focused and non-heritage focused organisations.

Table 3.3: A comparison between heritage and non-heritage focused organisations (Dann et al, 1999: 7)

Incorporated into conservation principles	Heritage focused organisations	Non-heritage focused organisations
Thorough and exacting recording of all details of the building	83%	31%
Maximum respect for the fabric of the building as found	83%	58%
Minimal intervention in the fabric of the building	100%	55%
Reversibility of any repairs	83%	27%
Regular maintenance is preferable to repair	83%	48%

On the other hand, the heritage focused organisations are those organisations where the care for historic buildings is the core business activity. Dann et al (1999: 3) mentioned these three organisations:

- Building preservation trusts
- Large government organisations with a stock of historic buildings –some with a degree of statutory responsibility
- Organisations with national standing in the field of heritage conservation who also manage significant portfolios of historic buildings.

Building preservation trusts could be considered as public organisations which are supported primarily through public funds and often do not have adequate resources. As Dewoolkar *et al.* (2011: 1) stated, that “often these communities or organizations do not have adequate resources (technical expertise, funding) for even preliminary engineering services.” One example of specialized societies is the Society of Architectural Historians (SAH) which “promotes the study, interpretation and conservation of architecture, design, landscapes and urbanism worldwide for the benefit of all” (SAH, 2012).

Some organisations provide training courses in the field of HB conservation. For instance, the international centre for the study of preservation and restoration of cultural property organises regular training courses, including architectural conservation courses. These courses are open to mid-career professionals and other decision makers in conservation from different disciplines, such as architects, archaeologists, engineers, planners and site managers (ICCROM, 2005). Other organisations, for instance the

Royal Institute of British Architects (RIBA, 2012), provides conservation courses specifically for architects who want to develop key practical knowledge and skills in the practice of conservation architecture.

Government institutions can be defined as governmental units exercising administrative control (Justia, 2011). However, the policies and regulations are created and general advice is offered by government institutions regarding HB conservation (Macky et al, 2012). Also, they are concerned with preserving and studying the built heritage. For instance, the National Built Heritage Centre, which is accountable to the Saudi ministry for tourism and antiquities, is a centre for technical expertise concerned with preserving and studying the built heritage. It also encourages the development of the use of local materials, traditional builders and traditional building artefacts (SCTA, 2012).

Regarding national organisations in the field of built heritage conservation who also manage significant portfolios of historic buildings, Pickard (2001: 280) stated that:

“The management of historic centres requires a political commitment both at national level, through financial support mechanisms and regulatory and legislative provisions, and at the local level, where municipal action can be directed in association or in partnership with other agencies and with the private sector through an integrated process.”

In the city of Newcastle-under-Lyme, UK, the Borough Council as a local planning authority which provides services such as consultation and inspection for HBs is responsible also, for designating conservation areas under the procedure prescribed in the Act (Council, 2007). However, the organisation also manages the city and delivers municipal services to the citizens, such as licences for restoration and re-building (Unit, 2011). In such institutions, the system of conservation service could be called facilities management. The British Institute of Facilities Management (BIFM) has adopted a definition for facilities management as “the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities” (BIFM, 2012). The facilities in the previous definition can include “the sum of physical operational functions like building and technical functions, and service-related functions” (Waheed and Fernie, 2009: 258). Furthermore, the aim of property management as mentioned by GHEU (2009: 37) is “providing efficient and effective assets in appropriate condition”.

Finally, organisations are social and technical arrangements that include a group of people who work together under a recognizable name to achieve particular services or products (Beijerse, 1999). Such individuals, particularly architects, working in the field of HB conservation have certain characteristics which distinguish them from others, and this will be discussed in the next section.

3.5.3 Individuals in the Field of HBs Conservation

A variety of people are actually involved in the various conservation functions, such as contractors, technicians and craftsmen (Fielden 2004: 6). Furthermore, ICOMOS (1999: 8) stated that:

“Individuals with associations with a place as well as those involved in its management should be provided with opportunities to contribute to, and participate in, understanding the cultural significance of the place”.

The conditions for the supervisor or project manager of an HB restoration job are, for instance, the ability to work on “complex, high-profile, heritage projects and experience of managing a technical team working on historic, conservation or listed building projects” (Trovit, 2012). About staff expertise in the field of HB conservation, Dann and Wood (2004: 146) suggest that: “management expertise as well as technical expertise is important”. However, the charter sets a standard of practice for those who provide advice on, make decisions about, or undertake works to, places of cultural significance. For instance, ICOMOS (1999: 1) stated that:

“It cannot be assumed that any one practitioner will have the full range of skills required to assess cultural significance and prepare a statement. Sometimes in the course of the task it will be necessary to engage additional practitioners with special expertise.”

The Royal Institute of British Architects (RIBA, 2012) has three levels of membership, which also provide an incremental process of accreditation for those who are in the early phases of establishing their careers in building conservation. These levels are:

1. Specialist conservation architect (SCA), able to demonstrate authoritative knowledge of conservation practice, principles and philosophy, and to contribute to development of conservation standards.
2. Conservation architect (CA), able to demonstrate depth of understanding of conservation practice, principles and philosophy, and to guide and take responsibility for others whilst understanding when further specialist guidance is required.

3. Conservation registrant (CR), able to demonstrate good working and background knowledge of key aspects of conservation practice, principles and philosophy, and to understand when guidance or supervision is required.

Regarding the conservation team, Fielden (2004: xiii) stated that it includes “architects, archaeologists, art historians, engineers, quantity surveyors, builders and craftsmen working together.” However, the conservation team may vary according to:

“the scale and complexity of the site, and may include archaeologists, architects, museum curators and conservators, countryside and property managers, ecologists, landscape architects or architectural historian. Somebody with experience in conservation planning and heritage legislation will also be useful” (HLF, 1998: 6).

Furthermore, ICOMOS (1999), Mullins (1986), Sweetser (2002), Lazarus (2007) and others emphasize the availability of people with appropriate knowledge, skills, expertise and practical know-how who are working in this field. For instance, in the case of HB roof problems, Sweetser (2002: 4) emphasized that:

“It is important to contact a professional, either an architect, a reputable roofing contractor, or a craftsman familiar with the inherent characteristics of the particular historic roofing system involved. These professionals may be able to advise on immediate patching procedures and help plan more permanent repairs.”

Also, Lazarus (2007: 325) stated that:

“The need for skilled craftsmen and inspectors is widely recognised and has to be addressed as a matter of urgency if there is to be a serious expansion of maintenance initiatives”.

However, in HB conservation organisations, there is “a shortfall in those trained to undertake the inspections” (Lazarus, 2007: 325). In this regard, Egbu (1997: 340) stated that:

“In refurbishment operations carried out on buildings of high architectural and historical value, such as listed buildings, obtaining the skilled labour force can be fraught with difficulty”.

Furthermore, regarding the lack of knowledge among decision makers, Fielden (2004: 125) claims that:

“The greatest danger to historic buildings comes from engineers who are unaware of their unique values and apply the codes literally, or who are unwilling to accept responsibility for making judgement”.

Lack of conservation knowledge in organisations has led to damage to HBs. As Lazarus (2007) stated, due to this lack of knowledge or the employment of inadequately trained specialists, inappropriate repair work has led this damage. Furthermore, some treatment philosophies adopted by specialists may threaten HBs. For instance, they may preserve the HB as a facade and nothing else. This point was raised by Earl (2003: 82), who stated that:

“Pressure for this kind of radical treatment of old buildings is found wherever extremely high land values coincide with demand for a particular type of accommodation normally associated with new buildings. Rightly or wrongly, facade preservation has been permitted so often in such cases that some architects, engineers and contractors specialise in it.”

However, organisations have a role in developing their individuals’ knowledge. As Dann and Wood (2004) suggested, proper training should be provided for conservation staff, particularly in re-use and contract-focused activities. Also, the National Built Heritage Centre calls for qualifications and training of the national cadres in studying, documenting and preserving urban heritage, in addition to the various technical areas such as maintenance, restoration and development of materials and construction techniques associated with the urban heritage (SCTA, 2012). Furthermore, Bosmans (1986: 63) stated that:

“The flow of information to augment (increase) the knowledge of an individual will depend on the activities of the authorities’ traditional building [It] will be focused on local building materials and construction. Education can or has to be stimulated by expert of knowledge from developed countries”.

3.6 The Regulations and Principles in Historic Buildings Conservation

3.6.1 The Legal Aspects of Protecting HBs

Most countries have issued regulations to protect HBs against neglect, misuse, vandalism and other issues. These regulations are addressed to local authorities and HB owners. For instance, UK planning regulations (Law Commission, 1990) contain:

- Listing of special buildings
- Authorization of works affecting listed buildings
- The rights of owners.
- Enforcement
- Prevention of deterioration and damage.

Furthermore, in some cases international regulations are applied to protect HBs, particularly in cases of dangerous situations such as war or disaster. However, the main

task for national architectural heritage regulation is to identify and protect these properties.

The identification and listing of HBs will guide the planning authorities to consider HBs during the planning process to avoid destroying them (DCLG, 2007). Conservation regulations provide protection against any intervention or work likely to affect the essential qualities of HBs or their characters. As BS7913 (1998: 3) stated,

“provision of legal restraints or controls on the destruction or damaging of buildings or artefacts, natural features, systems, sites, areas or other things of acknowledged value, with a view to their survival or preservation for the future.”

Regarding HB owners, Lazarus (2007: 321) stated that:

“The owner is obligated to maintain the property such that it neither falls into disrepair nor sustains a threat to its conservation. If the owner fails to act accordingly there are set procedures that are followed, with the executive director holding the ultimate right to carry out the works himself and recover costs”.

However, although regulations include owners' rights, the owners consider regulations as constraints against dealing with their properties. For instance, one HB's owner told an English heritage director “you want someone to risk your building, but you do not want (them) to be able to live in the property” (Clarke, 2010). This opinion might represent the idea of some owners against these regulations.

Finally, protecting HBs in addition to the rights of owners are the main tasks for architectural heritage regulations. However, conservation principles are more interested in HB conservation processes.

3.6.2 Historic Buildings Conservation Principles

Historic buildings conservation principles were issued to guide the conservers in conserving these buildings. The Burra Charter advocates a cautious approach to change, in that we should “do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained” (ICOMOS, 1999). HB conservation principles include issues regarding the HB conservation processes to be considered during repair and maintenance works to HBs, specifically the methods and materials, in addition to research and documentation.

Regarding the method of conservation, a number of authors; Brereton, 1991; Dann et al, 1999; Designation, 2003, Dann and Wood, 2004; Feilden, 2004; English Heritage, 2004; Hume, (2007) have emphasized that any intervention must be the minimum necessary and historic evidence must not be damaged, falsified or removed. Furthermore, HBs should be conserved as found (Hume, 2007) and repair above

restoration (Dann et al, 1999). Moreover, honesty and authenticity (Dann et al, 1999) and like-for-like repairs are preferred (Dann and Wood, 2004; Hume, 2007). Finally, repairs should be reversible and sensitive (Dann et al, 1999; Designation, 2003; Hume, 2007).

However, Brereton (1991) and Lazarus (2007) call for the adoption of proven techniques, either traditional or innovative. For instance, Lazarus (2007: 327) stated that:

“Both conventional and innovative conservation techniques should be considered. The latter may provide more cost effective means of protecting buildings than those that are more familiar, and they may be able to solve problems that in previous centuries did not have a sympathetic solution. However, where they are not yet fully proven it is unlikely that they will be immediately adopted for historic buildings, but worth developing further with that intention in mind.”

Furthermore, ICOMOS (1999), CEC (2000), and Sweetser (2002) agree regarding the use of traditional (original) techniques and materials for conserving HBs, whereas appropriate modern (alternative) techniques and materials can be used when the original cannot be used. For instance, ICOMOS (1999: 3) stated that:

“Traditional techniques and materials are preferred for the conservation of significant fabric. In some circumstances modern techniques and materials which offer substantial conservation benefits may be appropriate”.

Regarding HB materials, Designation (2003) and Dann et al (1999) call for the repair of these materials rather than their removal or replacement. For instance, Designation (2003) stated that:

“Historic building materials, even if in a deteriorated condition, contribute to a building's character. Repairing this material rather than removing or replacing it, is an important conservation goal.”

Furthermore, Dann and Wood (2004) and Hume (2007) suggest the use of like-for-like materials, whereas Brereton (1991), Designation (2003) and Dann and Wood (2004) suggest the need for truth in the use of materials in terms of the new work being distinct from the old, with no attempt to disguise or artificially age the work. However, a dilemma regarding the extent to which new repairs should be visible and identifiable as new can face a restorer repairing a wall. For instance, Wilkinson (2004) stated that:

“Should one use recycled bricks or treat stone so that it looks old? Or should one use new but otherwise similar materials, so that anyone looking at the building can see at once that a repair has been made [...] the environmentally conscious often prefer recycled materials”.

Moreover, regarding repair materials, Designation (2003), Smith (2010), Lazarus (2007) and others emphasize that the materials that are used for conserving HBs should be suitably sourced and integrated with existing materials, whereas new materials should be recognised and kept under review. For instance, Designation (2003) stated that “where replacement is necessary, new material should be compatible with historic material in appearance, texture, colour and form, yet be distinguishable from historic fabric”. Also, Dann et al (1999) call for them to fit the new to the old (and not the other way round). Some proper repair materials have been specified by Lazarus (2007: 326), who stated that:

“A material often associated with heritage buildings is ‘lime’ – as mortar, render, plaster or lime wash. The benefits of lime are being more widely disseminated, not only within the context of conservation and maintenance work but also for new construction. Research continues into its use, in part to ensure compatibility of new repair mortars with the original materials. Other materials which may need to be suitably sourced and integrated with existing include stone, brick, timber, paints and coatings. The potential for the use of new materials for such applications should also be recognised and kept under review.”

However, using new materials for reconstruction HBs may be necessitated by disaster, such as fire, earthquake or war (Feilden, 2004), whereas some modern (waterproof) materials are not recommended for repairing HBs, as Council (1998) stated that:

“The use of silant and silicone treatments to weather proof stone is not recommended because serious damage can occur if condensation builds up within a stone. In traditional construction, the free movement of water vapour through the fabric of a building in both directions is essential. Knowledge of the long-term effects of these consolidates is small, and as they are non-reversible they should not be used.”

Regarding research, Brereton (1991), Dann et al (1999; 2004), Designation (2003) and Feilden (2004) suggest analysing HB values and the causes of defects for anticipating maintenance and rehabilitation needs, as a thorough knowledge of the building and site is an essential part of a rehabilitation project. Also in this regard, Lazarus (2007: 319) stated that:

“There is a need for collaborative research in to appropriate methods and materials for such work, and for widespread dissemination of the findings, in order to avoid a repetition of damage to historic fabric acknowledged to have been caused in the past.”

Finally, Dann et al (1999), Designation (2003), Feilden (2004) and Hume (2007) call for the documenting and recording of the condition of the building before any intervention, as well as having all the methods and materials used during any treatment fully documented.

3.7 Historic Building Conservation Processes

The conservation means an “action to secure the survival or preservation of buildings, cultural artefacts, natural resources, energy or any other thing of acknowledged value for the future” (BS7913, 1998: 2). Also, it is defined as “the process of managing change to a significant place (built or natural) in ways that will best sustain its heritage values” (GHEU, 2009: 35). In the field of HBs, conservation is a continuous mission and an important part of the management of significant cultural places, it means “all the processes of looking after a place so as to retain its cultural significance” (ICOMOS, 1999: 2).

HB conservation requires some processes that are not provided in processes for refurbishing non-historic buildings (Dann et al, 1999; Khairul et al, 2009). For instance, Dann et al (1999: 2) stated that:

The essential aim of refurbishment when dealing with non-historic buildings is “To retain a continuity of function (weather tightness, appearance, etc.). For HBs, in addition to the continuity of function, it is the fabric itself that is important because of its cultural significance –the building itself is an artefact”.

Furthermore, Ahuja et al. (1988) and Lim (2010) stated that conserving HBs includes a non-standard scope of works and a different approach and special project management. However, four main stages can be considered for conserving HBs (figure 3.3) in HB conservation institutions. These are:

- 1) Assessing and documenting HBs value and condition
- 2) Deciding the level of intervention
- 3) Managing HBs conservation contract
- 4) Supervision of operational processes.

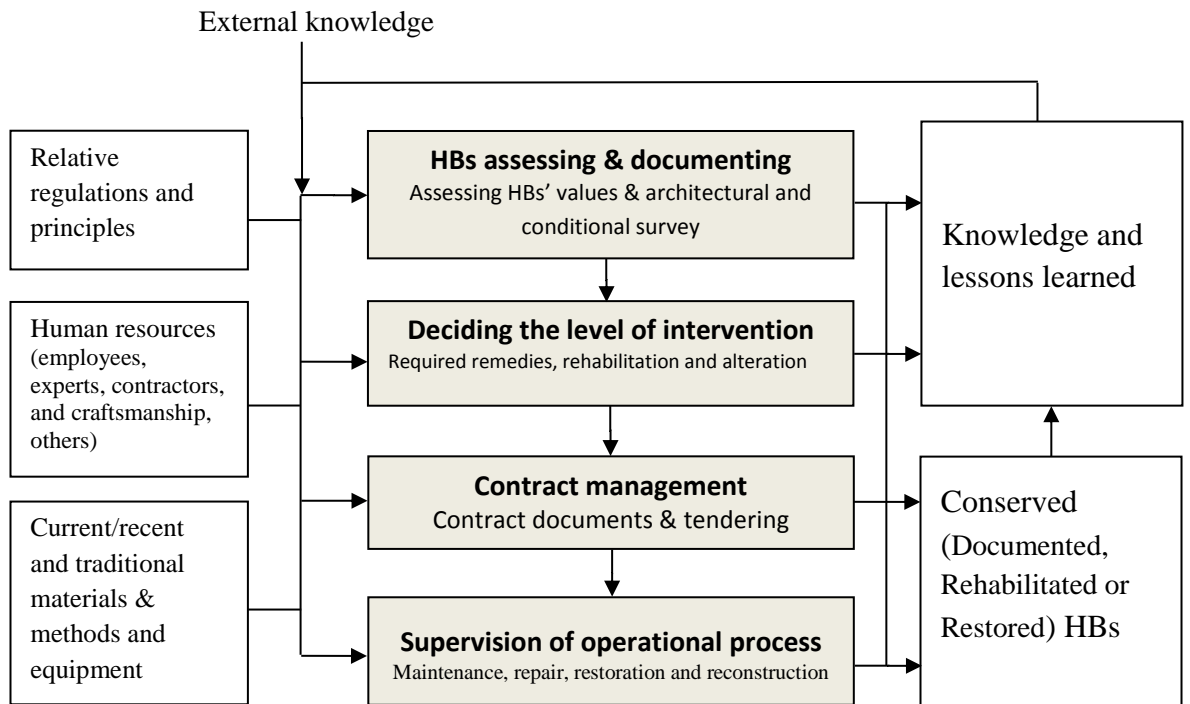


Figure 3.3: The key processes in HB conservation at the level of responsible organisation

3.7.1 Assessing and Documenting Historic Buildings' Value and Condition

The process of assessing and documenting HBs' value and condition has a significant role in conserving HBs. It is one of the important roles of the responsible organisations. For instance, documentation, classification and registering urban heritage, in addition to conducting scientific research and studies on the national urban heritage. Indeed, these are some of the Saudi National Built Heritage Centre's tasks (SCTA, 2012). Assessing and documenting HBs' value and condition has an effect on deciding on their significance, to ensure that they are listed and thus protected legally, and to decide on the level of intervention they require. As Dann and Worthing (2005: 94) stated, conservation starts with:

“Exploring and then articulating what is significant about a building, and why, and then identifying immediate and potential threats to that significance by asking how and why it is vulnerable. From this should flow management plans that can develop and implement tactics and appropriate action.”

Moreover, documenting the values and condition of HBs in drawings, photographs, reports and studies ensures that the knowledge and information is retained for the relevant individuals in responsible organisations and next generations. As ICOMOS (1990: 1) stated, “the purpose of recording is to make the interpretation of a historic building available when and where it may be needed.” Scholars have emphasized the

need to thoroughly record HBs before and during any intervention. For instance, Designation (2003) stated that:

The condition of the building and site should be thoroughly recorded prior to rehabilitation through research, drawings and photographs. Changes made during the course of the project should be properly documented. Maintaining a record of conservation work is good practice.

Furthermore, the role of the responsible institution and historians to present the historic value of HBs is “to contribute to our knowledge and understanding of our past by ensuring that opportunities to capture evidence from the historic environment” (McCallum, 2009). Jurina (2001) stated that “the building is the primary source of knowledge as a significant testimony in its full complexity.” However, assessing and documenting HBs processes could be done in responsible organisations and includes three activities:

- Assessing HBs values
- Architectural survey
- Conditional survey (diagnosing HBs situation).

Assessing HBs values could be described as studying and documenting: historic, architectural, economic, environmental and social values of HBs (see section 3.3). For instance, the historic studies include historic information about:

“[The] date of HBs construction, the designer, original owner, condition of its construction, information about the period that this building was built in (which effect on its character and design), historical events it attended, original function and any other sequences functions (Abdul-Waris and Judge, 2005).

Furthermore, an architectural survey could be described as the process of studying and documenting the architectural aspects for the HBs. Regarding the items that are considered in architectural survey, ICOMOS (1990: 30) pointed out the following issues:

- Overall form and dimensions –evidence for the original form of the building and for its evolution over time
- Materials and construction-type of foundation, wall structure, roof
- Decoration and ornament
- Plant and fitting
- Evidence for the use of the building and for changes in its use over time
- Dating evidence

- Recording should also include information about ancillary buildings, garden and estate layouts, and enclosures, and the relationship with adjoining buildings especially where this is of a formal nature.

Regarding the accuracy of existing drawings, ICOMOS (1990: 32) emphasized that they “must never be assumed; nonetheless, they are obviously of the greatest value, particularly when they show work to be carried out or an earlier stage in a building’s development.”

Moreover, a conditional survey is “a systematic survey of the fabric of a building, in order to produce accurate information of the condition, and an assessment of the extent and timing of future work maintenance/repairs/replacement” (Dann and Worthing, 2005: 92). However, the conditional survey aims to:

“Identify integrity and balance of the building and record its structure situation in all its parts: foundations, walls, arches, roofs, architectural supplements and construction and finishes materials, etc. This recording will identify the original situation of HBs and the changes which are done through different ages. This will contribute with define proper ways to maintain and repair HBs” (Abdul-Waris and Judge, 2005).

Also, it aims to evaluate the real need and proper time for intervention according to deep analysis of the materials and structural condition of HBs (Jurina, 2001). For instance, the priorities of the HB work required have been ranked by BS 7913 (1998) as immediate, urgent, necessary and desirable (table 3.4).

Table 3.4: The priority of work ranking for HBs (BS 7913, 1998)

The priority of HB work required	
Immediate	Work which should be put in hand without delay for public safety or health and safety reasons, to prevent imminent damage or to arrest rapid deterioration. This can include immediate further investigation.
Urgent	Work which should be put in hand within weeks or months, or a year and a half at most. Failure to do so would be likely to result in significant further damage or deterioration and increased cost.
Necessary	Work which should be carried out before the next five-yearly inspection, for which there is time to plan, and which can be integrated with other work. This is work which is due in order to keep the building in a state of good repair and to maintain the value and usefulness of the estate. Most repair work should come in to this category.
Desirable	Work which is desirable, if not strictly necessary, but which may improve the functioning or performance of the building or enhance its architectural or aesthetic qualities. Alternatively, work which is not due, but is likely to become so before the next five-yearly inspection and which can sensibly be incorporated with other work. Much minor restoration work, such as the reinstatement, where appropriate, of suitable windows, should come in to this category.

Diagnosing HBs' condition is an essential part of the work of conserving them. As Brereton (1991: 7) stated, "it is essential to identify causes before specifying remedies and in pursuit of this there is a need for a careful and accurate diagnosis including, where appropriate, monitoring of the structure." However, Jurina (2001) emphasized that "the work to be performed will, therefore, be determined through careful and specific observation." Furthermore, regarding assessment criteria, Watt (1996: 78) stated that:

"The inspection of building fabric is usually undertaken by looking, smelling, touching, feeling and, on occasions, listening and tasting. These natural senses may be enhanced by the use of simple or complex equipment, but ultimately it is the surveyor who will assess and record the condition of an element or component against specific criteria. The criteria used will vary according to the nature of the inspection so that the levels of decay, deterioration or disrepair expected."

As there are much greater constraints in inspecting and monitoring HBs' situation, Lazarus (2007: 327) stated that:

"Remote monitoring devices which remove the need for routine access to areas where this is difficult and/or expensive and mean that this is needed only where there is a clear indication of the need for manual intervention. Such systems can be used to monitor a number of parameters, including the moisture content of timber in vulnerable areas, gutter overflows and leaking down pipes."

However, according to Lazarus (2007: 327), "while inspection and monitoring may identify particular problems or defects they will not necessarily identify the cause. Such identification is essential in order to determine the appropriate remedy."

Finally, Dann and Worthing (2005: 98) stated that "the information that is produced by conditional survey can be used for strategic and tactical planning and to provoke some 'action,' i.e. an intervention in the building's fabric."

3.7.2 Deciding the Level of Intervention in Historic Buildings (a Conservation Plan)

In HB conservation work, the product already exists and it is the process of 'intervention' which is the central issue (Glen, 2001: 2). According to HBs' value and sensitivity, their repair should be carried out with care, as "once part of the historic fabric is lost it cannot be replaced" (CEC, 2000). Two opinions regarding conserving HBs could be considered: incorporating the old and new fabric, and stabilising HBs as memorials (Glendinning (2013). For instance, "two different generations, to the task of building a new replacement for a cathedral bombed in the World War II, incorporating fragments of the old in the new fabric. Coventry embraces the stabilised ruin of the old

cathedral as a memorial”. However, conservation charters and scholars have studied HB conservation according to these opinions in their studies regarding the level of intervention in HBs.

Intervention in HBs means any action which has a physical effect on the fabric of HBs, which could be one of the following: prevention of deterioration, preservation of existing state, consolidation of the fabric (cause something to become stronger), restoration, rehabilitation, reproduction and reconstruction (Feilden, 2004: 8). This process of deciding the intervention includes a conservation plan in terms of specifying the required work or remedies and making HBs perform a function with/without alteration. The conservation plan “provides the framework and context for the management of maintenance” (Dann and Worthing, 2005: 98). Regarding the impact of intervention, Wafa (2007: 39) emphasizes that “intervention at [a] historic place must respect its heritage value and character-defining elements. It is always better to preserve than to repair, and better to repair than replace.”

However, table 3.5 shows the levels of the conservation process. It includes preservation, rehabilitation, restoration, reconstruction or a combination of these actions.

The first level of intervention is preservation, which is defined as “to keep something as it is, especially in order to prevent it from decaying or being damaged or destroyed” (Cambridge, 2010). In the field of HB conservation, preservation is:

“The process of protecting, maintaining and/or stabilizing the existing materials, form and, integrity of historic place... It is chosen when HBs’ values related to the materials dominate, or when the materials, features and spaces are essentially intact” (Wafa, 2007: 40).

The preservation process includes protection in terms of:

“Provision of legal restraints or controls on the destruction or damaging of buildings or artefacts, natural features, systems, sites, areas or other things of acknowledged value, with a view to their survival or preservation for the future” (BS7913, 1998: 3).

Also, preservation includes maintenance, which is defined by ICOMOS (1999: 2) as “maintaining the fabric of a place in its existing state and retarding deterioration”. Also, according to Seeley (1987), BS7913 (1998), Dann et al (1999) and GHEU (2009), maintenance means the continued routine care of HBs, necessary to keep their fabric in good order and retain their cultural significance in appropriate condition. The ICOMOS

(1999: 6) goes on to state that maintenance is “fundamental to conservation and should be undertaken where fabric is of cultural significance”.

Furthermore, preservation includes consolidation in terms of enabling HBs to become stronger and more certain (BS7913, 1998). Also, according to Fielden (2004:9), consolidation is “the physical addition or application of adhesive or supportive material into the actual fabric of cultural property, in order to ensure its continued durability or structural integrity”. However, although prevention is better than cure the need for rehabilitation occurs when the HBs are already in a bad condition or an alteration is crucial to extent its life.

The second level of intervention is rehabilitation, which is defined in the field of HBs conservation as:

“The action or process makes possible continuing or compatible contemporary use of a historic place or an individual component, through repair, alteration and/or additions. It is used when character-defining elements have to be repaired or replaced or when alteration or additions are necessary for a new or continued use” (Wafa, 2007: 40).

According to ICOMOS (1999), Designation (2003) and BS7913 (1998), the rehabilitation should respect the history of the building. For instance, Designation (2003) stated that:

“All changes that have taken place in the course of a building's evolution are evidence of its history and development. Where these changes have acquired their own significance, thus contributing to a building's character, they should be retained and conserved.”

However, rehabilitation includes repair, adaptation or alteration. Repair is “something is done to fix something that is broken or damaged” (Cambridge, 2010).

In the field of HB conservation, BS7913 (1998: 2) defined repair as:

“work beyond the scope of regular maintenance to remedy defects, significant decay or damage caused deliberately or by accident, neglect normal weathering or wear and tear, the object of which is to return the building or artefact to good order.”

Also, Brereton (1991: 7) stated, regarding repair, that:

“The primary purpose of repair is to restrain the process of decay without damaging the character of buildings or monuments, altering the features which give them their historic or architectural importance or unnecessarily disturbing or destroying historic fabric.”

The other activity within rehabilitation is adaptation or alteration, in terms of changing or improving “the function of a building or artefact or to modify its

appearance” (BS7913, 1998: 2) or, “modifying a place to suit the existing use or a proposed use²” (ICOMOS, 1999: 2). Regarding new use, Designation (2003) stated that:

“The new use to which a building is put should respect the importance of the original spatial, formal and symbolic characteristics. A compatible new use will minimize the amount of destructive intervention on historic fabric. The interior spaces of a building should be thoroughly assessed for their potential use in the project, as they can contribute to the value and utility of an historic building.”

Regarding the additions to HBs, it “may be acceptable where it does not distort or obscure the cultural significance of the place, or detract from its interpretation and appreciation” (ICOMOS, 1999: 7). However, alterations that destroy historic fabric or give a false (or conjectural) impression of the building’s history should be avoided, especially changes that attempt to make a building appear older than it is (Designation, 2003). However, a special type of alteration called restoration is achieved in some cases.

The third level of intervention is restoration, which is defined as “returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material” (ICOMOS, 1999: 2). Also, BS7913 (1998: 2) stated that restoration is:

“Alteration of a building, part of building or artefact which has decayed, been lost or damaged or is thought to have been inappropriately repaired or altered in the past, the objective of which is to make it conform again to its design or appearance at a previous date”.

However, restoration is used as the primary treatment when “the significance of the place during a particular period in history significantly outweighs the potential loss of existing materials” (Wafa, 2007: 41).

Finally, the upper level of intervention in HBs is reconstruction. It means “to build something again that has been damaged or destroyed” (Cambridge, 2010). In the field of HB conservation, BS7913 (1998:2) defined it as the “re-establishment of what occurred or what existed in the past, on the basis of documentary or physical evidence”. Also, ICOMOS (1999: 2) defined reconstruction as “returning a place to a known earlier state and is distinguished from restoration by the introduction of new material into the fabric.” However, although BS7913 (1998) and ICOMOS (1999) considered reconstruction as a conservation process, it could be not considered as conservation.

² Use means “the functions of a place, as well as the activities and practices that may occur at the place” (ICOMOS, 1999: 2).

Scholars do not consider it as a conservation process because it does not deal with existing buildings but new construction, and new material.

Table 3.5: The levels of intervention in HBs

Levels of intervention	
Preservation	Protection (indirect conservation)
	Maintenance: Prevention of deterioration and Preservation of existing state.
	Consolidation: Cause something to become stronger
Rehabilitation	Repair
	Adaptation/Alteration/Additions
Restoration	Returning to a known earlier state
Reconstruction	Reconstruction

3.7.3 Contracting for HBs' Restoration Work

This process includes the preparation of contract documents and tendering. The contracting process for the state's HBs could be one of the responsibilities of a government's heritage focused organisations. For instance, Heritage Malta (2011) was responsible for the works tender for the execution of emergency conservation works at Fort St Angelo, Birgu. Regarding the tender document, Malta (2011: 41) stated that it required "the dossier [to be] compiled by the contracting authority and [to] contain [...] all the documents needed to prepare and submit a tender." The contract documents (the drawings of existing and/or proposed design and remedies for HBs, bills of quantities, estimated prices for comparing, specifications and conditions) are prepared based on the decision regarding the level of intervention in HBs. However, the contract documents of HB conservation projects have different standards in comparison with new buildings. For instance, Lim (2010: 140) stated that:

"It is insufficient for the QS [quantity surveyor] to prepare tender documents for conservation work by merely using standard documents for new building works that cannot reflect actual needs and special processes in conservation work".

Also, Holm (2000: 529) noted that certain special characteristics which affect the contract must be recognised in the refurbishment work, such as:

- Uncertainty is intensified, and due to uncertainty, delays and escalating costs are common in refurbishment projects
- It may be impossible to use modern tools, for example due to space restrictions or a vibration sensitive building.

Furthermore, the budget of such projects is not often known until the end of these projects. As Seeley (1987: 12) stated,

“Ad-hoc maintenance with an open-ended budget may seem attractive but it is unlikely to obtain full value for monies spent or an efficient maintenance system.”

Moreover, specifications and conditions are different, for instance:

“All works shall be carried out with care and sensitivity to the architectural fabric and historical value of the site and no modifications to the quality and texture of the stonework will be permitted ... The contractor shall also note that large trucks, heavy machinery and plant shall not have access to the works” (Malta, 2011: 127).

On the other hand, the tendering process includes qualifying contractors and tenders. The contractors’ qualification process in HB restoration work should include selection criteria different from normal construction projects. For instance, qualified contractors, in addition to evidence of their financial and economic standing, should include evidence of their technical capacity. For example, they should list contracts of a similar nature that contractors performed during the past five calendar years, and provide a Curriculum Vitae (C.V) of key members of staff, plant and equipment to be used on the contract (Malta, 2011).

3.7.4 Supervision of Conservation Work

The field of HB conservation requires compliance with certain principles to deal with HBs sensitively; therefore, technical staff in responsible organisations should supervise such work. For instance, one of the Saudi National Built Heritage Centre tasks is to “follow-up and supervise all projects for urban heritage and develop the necessary plans for their maintenance, operation, and work hand in hand with owners to ensure the achievement of these goals” (SCTA, 2012). However, the supervision is essential and should be maintained at all stages for the HB conservation processes (ICOMOS, 1999). The supervisors provide special instruction to raise craftsmen’s understanding of repairing HBs. For instance, Sweetser (2002: 9) stated that:

“It should never be assumed that the modern carpenter, slater, sheet metal worker, or roofer will know all the historic details. Supervision is as important as any other stage of the process.”

Supervision in the field of HB conservation in any responsible organisation could be considered as buildings controlling or inspection of HB repair work, in addition to carrying out the duties specified in conservation contracts. For instance, supervisors ensure the protection of HBs from any changes or deformation that could occur, in addition to inspecting and adopting the construction materials and methods that are used in restoration work. The role of the organisation’s supervisor in restoration projects is essential, as Malta (2011: 128) emphasized:

“All works shall be carried out strictly as directed by the project supervisor [...] the method statement shall be submitted with revisions (if necessary) to the project supervisor for approval, prior to commencement of works. In addition, the successful contractor shall be required to submit a detailed construction management plan for the approval by the supervisor [...] during the course of works, the supervisor reserves the right to take samples or carry out specialised tests on site.”

3.8 Knowledge Aspects for Conserving HBs in Responsible Organisations

Knowledge availability in the field of HBs conservation enables performance in the conservation organisation to be more correct and to save costs and time. Regarding the implications of KM in HBs conservation, ICOMOS (1999: 3) stated that “conservation should make use of all the knowledge, skills and disciplines which can contribute to the study and care of the place.” Regarding maintenance knowledge, Seeley (1987: 11) stated that:

“Effective maintenance management embraces many skills. These include the technical knowledge and experience necessary to identify maintenance needs and to specify the right remedies; an understanding of modern management techniques; knowledge of property and contract law; and an appreciation of the relevant sociological and economic aspects.”

However, HB conservation knowledge could be divided into three main types: HB knowledge of values, HB conservation technical knowledge, and HB conservation management knowledge (Figure 3.4).

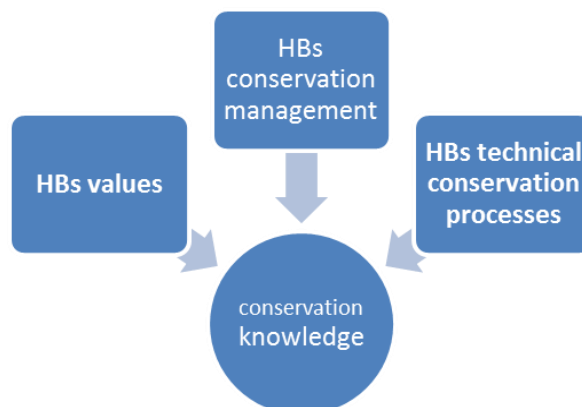


Figure 3.4: Types of knowledge in the field of HB conservation

The required knowledge regarding HB (historic, architectural, economic, environmental and social) values in responsible organisations could be the know-how (tacit or explicit form) to assess and document these values. Furthermore, the Know-what Knowledge (facts, judgements, relationships) which resides in organisational documents (ex. previous studies), and published materials, are sources of HB knowledge of values.

Furthermore, essential technical knowledge that should be managed in responsible organisations mainly regards the methods and materials for HB conservation processes. It is know-how (procedure, skills) knowledge regarding conducting an architectural survey accurately, preparing drawings, diagnosing an HB's condition, and deciding on the right treatment, while also adapting repair materials for the proper use and compliance with HBs relative principles. The know-how which resides in specialists' minds is essential for HB conservation work. For instance, regarding supervision, Mullins (1986) stated that the supervision of technical work requires knowledge, expertise, and practical know-how. Previous studies, inspection reports and project documents, that include diagnosing, specifying and applying the right materials and remedies, are sources of internal knowledge in organisations. Also, existing and rehabilitation architectural drawings of HBs and drawings of remedies of previous studied cases are sources of knowledge for new cases. For instance, regarding studies on diagnosing an HB's condition, ICOMOS (1990: 9) stated that "knowledge of the building's structural history makes it easier to come to an accurate assessment of its present state and to recognise any structural faults." Furthermore, the know-how procedures and standard specifications of operational process for conserving HBs should be provided and used for each HB (Dann, 1998). Moreover, relative regulations and principles and catalogues of repair materials are sources of knowledge to utilise when conducting any conservation task.

Thirdly, HB conservation management knowledge is essential in HB conservation work. Different standards for HB conservation contracting in comparison with new buildings requires specialist management knowledge and experience regarding proper use and compliance with HB relative regulations, the preparation of contract documents, and estimate and tendering processes. The responsible organisations need to have knowledge of previous contract documents, local and international HB regulations and references. Furthermore, know-who knowledge regarding human resources in the field of HB conservation (relevant staff, consultants and contractors) in terms of their special knowledge of HB conservation, experience, skills, abilities, competence, craftsmanship

and contact details are also essential knowledge for the responsible organisations. As (Kamara *et al*, 2002) stated, in the knowledge that needs to be managed in constructional organizations/projects is knowledge regarding individuals, suppliers and contractors and their ability to conduct specific tasks.

However, table 3.6 presents a list of the essential knowledge aspects that are required for conducting conservation work by responsible institutions. The list includes HB values knowledge, HB conservation technical knowledge and HB conservation management knowledge.

Table 3.6: Essential HB conservation knowledge aspects

knowledge regarding
Historic, architectural, economic, environmental and social values of HBs
Architectural survey and preparing drawings for HBs
Diagnosis of HB condition (conditional survey)
Relative regulation and principles regarding dealing with HBs
Deciding the level of intervention in HBs, required remedies, and Rehabilitation of HBs
Preparing HB contract documents and tendering
Old traditional construction materials
Prevalent and new HB repair materials
HB conservation work equipment
Supervising HB conservation work
CVs and details for staff, specialists, contractors and others to indicate their special knowledge in HB conservation

3.9 Chapter Summary

The main objective of this chapter is to study the nature of historic buildings (HBs) and the key issues involved in their conservation at the level of organisation responsible for doing so.

Historic buildings were defined in this chapter as ‘Old buildings, adopted with a new and changeable function, located in or outside the zone of neighbourhoods or historic cities, not ancient monuments as they still have a role or they can perform a function. Mostly HBs have an architectural, historic, economic, environmental and/or social value. Historic buildings can be classified into vernacular buildings which were developed by using local materials and built by citizens themselves, and sophisticated buildings (at that time) according to the quality of the construction materials and workmanship which were used in their construction.

The values of HBs are the main reason for conserving them. Historically, they are evidence of the history of a country or city and the time periods through which it has passed. The historic value of HBs is increased by the past events they witnessed, the civilization they represent, particularly periods of glamour, famous people who lived or dealt with these buildings, or significant events that happened in them. The architectural values of HBs reside in their architectural design style, fine architecture and decoration, construction materials and the craftsmanship which were used in past times. Furthermore, HBs provide an architectural diversity in cities. Conserving HBs can provide economic values, classified into direct values, which reside in using HBs for their proper functions. There are also indirect economic values, in terms of contributing to an increase in the value of their areas, improving the travel and tourism industry of the city and providing new jobs in the field of tourism and in restoration projects. The environmental value for conserving HBs resides in the continued use of HBs, which reduces the amount of demolition and replacement of existing buildings. It cuts waste and minimises the requirements for new materials. Furthermore, HBs contribute to townscape and landscape, in addition to maintaining a good environment. The social value resides in giving identity to a majority or minority group, while maintenance and continued use of HBs can contribute to the continuity of their ethos and character.

The threats against HBs in terms of natural and human factors are the main reasons for their decay. The natural factors that cause HB deterioration and loss can be classified into natural disasters and climate impacts in addition to human factors that affect HBs in terms of negligence and ignorance in addition to economic reasons.

Regarding HBs conservation management, most national authorities have established institutions for conserving their countries' architectural heritage. The heritage focused organisations are those organisations where the care for HBs is the core business activity, such as building preservation trusts, large government organisations with a stock of HBs and organisations with national standing who manage significant portfolios of HBs.

In the field of HB conservation, a variety of people are involved in the various conservation functions, such as contractors, technicians and craftsmen. Scholars emphasize the availability of people who are working in this field with appropriate knowledge, skills, expertise and practical know-how.

Regarding architectural heritage regulations, most countries have issued regulations to protect HBs against neglect, misuse, vandalism and other issues. They have addressed local authorities and HBs owners. Listing and protecting HBs in addition to

the rights of owners are the main tasks for these regulations. Furthermore, the principles of HB conservation were issued to guide the conservers in the right way to conserve these buildings. They include issues regarding HBs conservation processes that should be considered during HBs conservation works, particularly methods and materials in addition to researching and documenting.

The main processes in responsible institutions for conserving HBs are: assessing and documenting HBs' value and condition, deciding the level of intervention in HBs, managing HBs conservation contracts and supervising the operational process. The process of assessing and documenting HBs' value and condition is done in responsible organisations and includes three activities: assessing HBs' values, architectural surveys and conditional surveys. Furthermore, deciding the level of intervention in HBs includes: preservation, rehabilitation, restoration and reconstruction. Moreover, the contracting process for a state's HBs includes preparing contract documents which have different standards, including the drawings, bills of quantities, estimated prices (for comparing), specifications and conditions. The supervision of HB conservation is essential because this field is required to comply with principles and to deal with HBs sensitively.

Finally, this chapter concludes with a list of the essential knowledge aspects that are required for conducting conservation work in responsible institutions. The list includes HB values knowledge, HB conservation technical knowledge and HB conservation management knowledge. The literature review and discussions throughout this chapter demonstrated that HBs conservation work requires knowledge, expertise and practical know-how. However, KM has not yet been studied in the field of HB conservation. This call to the concept of KM should be embraced in the field of HB conservation, with consideration for the nature of this field.

Chapter 4: Research Methodology and Processes

4.1 Introduction

The objective of this chapter is to identify and discuss the research approach and methodology that are appropriate to answer the research questions. This chapter is divided into ten sections; the first section introduces the chapter. The second section studies the research philosophical position and the third discusses the development of the research methodology and methods. This section includes the aspects that determined the research methodology, including a proposed model for studying KM in organisations, the context of this particular research (case study), and the connection between the research questions and the research methods. The fourth section presents the questionnaires, sampling and processing. The fifth section studies the interview types and processes, while the sixth section highlights other data collection methods, the analysis of the organisational documents and the observation. The seventh deals with analysing the research data. The eighth demonstrates ethical and practical issues. The ninth discusses the reliability and validity aspects.

4.2 The Philosophical Position of the Research

In the process of doing social research, ontology (what there is to know) is the starting point of all research, after which one's epistemological (what and how to know about it) and methodological (how can we go about acquiring that knowledge) positions logically follow (Grix, 2002; Hay, 2002).

According to the nature of this research, which investigates how knowledge is managed in an organisation responsible for HB conservation, what it is that can be known is mainly the perceptions, interaction, and actions of individuals regarding managing knowledge in the organisation. Also, no known study on the kind of organisation (nothing related to this problem) that this research builds on exists. Therefore, the ontological position of this research is constructionism, which is:

An ontological position that asserts that social phenomena and their meanings are continually being accomplished by social actors. It implies that social phenomena and categories are not only produced through social interaction but that they are in a constant state of revision (Bryman, 2008: 19).

In analysing organisations, the scholars look upon organisation as a culture or a social process (Rosenstiel, 2010). In such contexts, interpreting the meaning of what arise out of social interaction is the assumption for knowing the reality. Therefore, how

reality can be known or the epistemology for this research is mainly the interpretivist approach, which is predicated upon:

The view that a strategy is required that respects the differences between people and the objects of the natural sciences and therefore requires the social scientist to grasp the subjective meaning of social action (Bryman, 2008: 16).

To conduct interpretative research, social phenomena must be directly observable in order to understand the meanings people create and the realism of the context (Bryman, 2008). The required methodology includes going to the case study and acquiring all the research evidence through questioning and observing people and their context.

However, in addition to interpreting the meaning of what arise out of social interaction, understand the meanings people create and the realism of the context, this research studies some natural aspects, such as technology and some physiological issues. These natural aspects can be used as a part of knowledge management. Therefore, some objective reality can be discovered. This requires bringing subjective and objective reality together to know what exists.

4.3 Development of the Research Methodology and Methods

The constructionism ontology, interpretivist epistemological positions, and other aspects led to the employment of a methodology that included a mainly qualitative approach, whereas a quantitative approach was employed to identify the attitudes and other statistical aspects to support the qualitative results. Rosenstiel (2010: 129) stated that “today in the social scientific treatment of organizations, quantitative and qualitative methods are found side by side”. The two approaches are typically interested in both what people do and what they think (Bryman, 2008). Therefore, they should be seen as complementary, providing different perspectives and answering different specific questions (Ewings et al, 2012).

However, the other aspects that determined the research methodology and methods for this research are the theoretical model for studying KM in organisations, the research’s location (particular context), and the connection between the research questions and the research methods.

4.3.1 Proposed Model for Studying and Understanding KM in Organisations

Regarding the theoretical framework Fellows and Liu (1997: 67) stated that:

The theoretical framework for the research project indicates the data which should be collected and further theory will denote appropriate methods and techniques of analysis.

The KM literature review and discussions throughout chapter two conclude with the development of the proposed theoretical model for studying and understanding KM in organisations (figures 2.10). This model includes the main items (divided into sub-items):

- Essential knowledge and its sources and availability
- Individuals and organisational factors influencing KM
 - The current condition (processes and techniques) of dealing with knowledge.

These items are reflected in the research questions to be investigated in the research context.

4.3.2 The Research Context (the Case Study)

As mentioned in section 1.2.3, the MHCB is the only governmental institution responsible for conserving HBs in Libya. This means that this institution and its context is the only case available for studying a real situation in its context. Although the focus is the MHCB, data could be collected from other sources such as previous employees or those from other organisations that have a link with the MHCB.

The most common use of “the term ‘case’ associates the case study with a location, such as a community or organisation” (Bryman, 2008: 53). The case study “provides the researcher [with] an in-depth analysis of a specific problem and supports the discussion about an organisation or a particular project” (Naoum, 2008: 45). Furthermore, Yin (2009: 4) stated that:

The case study method allows investigators to retain the holistic and meaningful characteristics of real-life events such as individual life cycles, small group behaviour, organizational and managerial processes, neighbourhood change, school performance, international relations, and the maturation of industries.

Moreover, it is used by researchers to “build upon theory, to produce new theory, to dispute or challenge theory, to explain a situation, to provide a basis to apply solutions to situations, to explore, or to describe an object or phenomenon” (Soy, 1997). This research seeks to acquire most of these objectives, but particularly to explain a situation, and to provide a basis to apply solutions to situations.

Generally, the data gathered for a case study approach are qualitative, particularly for exploratory and evaluative questions, but may also be quantitative, as Soy (1997) stated regarding the case study:

Data gathered is normally largely qualitative, but it may also be quantitative. Tools to collect data can include surveys, interviews, documentation review, observation, and even the collection of physical artefacts.

The case study methodology involves using multiple sources and techniques in the data gathering process; this helps to strengthen the ‘case’ (Soy, 1997; Yin, 2009; Hall, 2011). As illustrated in figure 4.1 and table 4.1, multiple methods for gathering and analysing the research information and data are required to investigate the case of research.

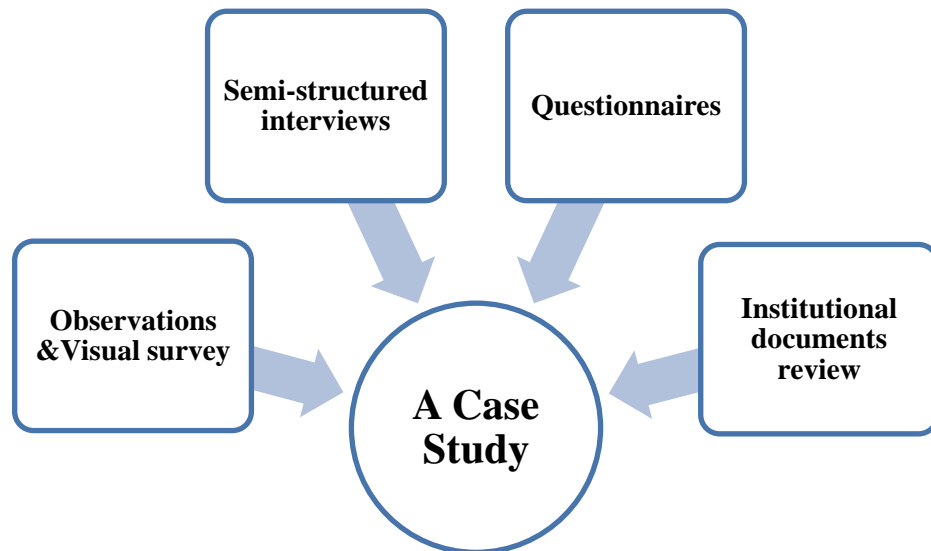


Figure 4.1: Multiple methods for gathering data to investigate the case of research

4.3.3 The Connection of the Research Questions to the Research Methods

According to Grix (2002: 179) “the method(s) chosen for a research project are inextricably linked to the research questions posed and to the sources of data collected. The research questions help in deciding the sort of data required and its collection and analysis (Robertson et al, 1996). However, in addition to questions that were answered through investigation and discussion throughout the literature review in chapters two and chapter three, the major data and information that help in answering the rest research questions are likely to be collected through field research. The research questions led to the identification of the following sources for collecting data: asking relevant individuals, reviewing relevant organisational documents and observing the research context. In this case, the relevant individuals are: employees and decision makers in the MHCB and the specialists in the field of HB conservation in Tripoli, particularly those people relevant to this organisation. Statistical data, and the facts and opinions of respondents and interviewees, in addition to observation of relevant employees’ behaviour and a review of the organisation’s documents and local regulations were all needed to conduct the research. Furthermore, information could

have been collected through observing the physical context in terms of the MHCB headquarters, the HBs, and their restoration sites. However, the research questions that should be answered for achieving the research objectives were connected to the research methods, as shown in table 4.1.

Table 4.1: A connection of research questions/sub-questions into research methods

Research questions / sub-questions	Research methods				
	Literature review	Analysing documents	Interviews	Observations & visual survey	Questionnaires
1. What is the concept of KM and what is its relevance to organisations?	✓				
2. What is the nature of HBs and what are the key issues in their conservation at the level of responsible organisations?	✓				
3. To what extent is the gap of HBs conservation knowledge in MHCB?		✓	✓	✓	✓
4. What factors influence the management of knowledge in the MHCB? And what is their impact?					
• How do accountability, organisational structure, regulations and organisational policies influence KM in the MHCB?		✓	✓		✓
• How do the conditions of physical assets (working place, knowledge repositories and, ICT) influence KM processes in the MHCB?			✓	✓	✓
• How does the employees and their movement influence managing knowledge?		✓	✓		✓
• Is there a culture of collaboration in the MHCB? To what extent is the awareness regarding KM and its need formally noticed in the MHCB?			✓	✓	✓
5. How does the MHCB deal with knowledge? How does KM affect the MHCB's performance?					
• How does the MHCB deal with knowledge sources?		✓	✓	✓	
• To what extent are KM techniques applied in the MHCB?			✓	✓	✓
• How does KM affect the MHCB's performance?			✓	✓	

Finally, this research adopted qualitative and quantitative approaches according to ontology, epistemology and methodology positions. Therefore, research questions and other considerations, as discussed throughout this section, determined the appropriate methods for data collection. These included: interviews, questionnaires, analysing organisational documents, and observation and visual survey.

4.4 Questionnaires

Postal questionnaires or questionnaires which are distributed by a researcher are called self-completion questionnaires, in which respondents answer questions and complete the questionnaire themselves (Bryman, 2008). Questionnaires “have been widely used for descriptive and analytical surveys in order to find out facts, opinions and views on what is happening, who, where, how many or how much” (Naoum, 2008: 52). Choosing the questionnaire sample and practical issues should be considered in advance to ensure successful data collection.

4.4.1 Questionnaire Sample and Respondent Categories

Regarding the sample questionnaire, Fellows and Liu (2003: 139) stated that:

“The objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out whilst ensuring that the sample provides a good presentation of the population; i.e. the sample is representative.”

According to the nature of this research and its case study of the MHCB, the targeted population for the research questionnaire (Figure 4.2) were all the technical staff and historians working in the MHCB. Also chosen were the local HB conservation specialists relevant to this institution and/or interested in such HBs and their conservation work in Tripoli.

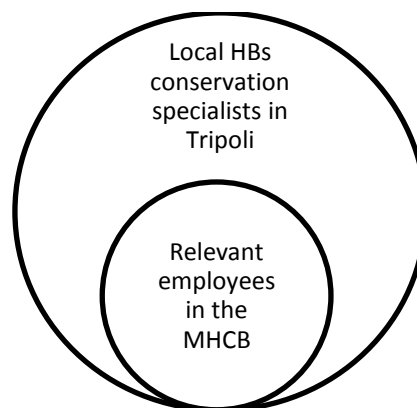


Figure 4.2: The targeted population for the research questionnaire

As the number of technical staff and historians in the responsible institution (MHCB) was relatively small (39 persons), all of them were selected to complete the questionnaire.

To determine the rest of the research sample (that is, those who were interested in HB conservation and their management in Tripoli city), three methods were considered:

a random sample, a quota sample, or a snowballing technique. However, because of having no accurate records, random sampling and the quota technique were not suitable means of finding a sample for this research. Therefore, the snowballing sampling was chosen for the following reasons.

According to Bonaccorsi et al. (2006: 1095) “many studies have proven that the snowballing sampling procedure is economical, efficient, and effective”. The snowballing method is a suitable technique for finding a rare target population, such as the specialists in the field of HB conservation in Tripoli city, as it enables a small number of the targeted population to identify others in the same target group. Bryman (2008: 184) stated that:

With this approach to sampling, the researcher makes initial contact with a small group of people who are relevant to the research topic and then uses these to establish contacts with others.

Because of these characteristics, and the constraints in using random sampling or quota sampling, the snowballing method was adopted to determine the representation of people for the questionnaire. All the technical staff and historians in the MHCB were chosen to complete the questionnaire (figure 4.2), including twenty nine technical staff and ten employees in the historic studies department. During the distribution of the questionnaires in the MHCB, they were asked to name other specialists in the field of HB conservation who could complete a questionnaire. Contact details for some previous employees who had worked in the MHCB and a group of specialists were gathered. In turn, these specialists, who received questionnaires by hand, were used to establish contacts with other HB conservation specialists in the Tripoli city context. Some respondents provided contact details for one or more specialists, whereas others did not, or repeated the same names.

The representativeness of the research population (figure 4.3) includes a sample of 122: all relevant MHCB employees (39) and a sample determined by the snowballing method (83). The snowballing method was a successful technique of obtaining respondents interested in HBs and their conservation, without having previous knowledge of them and without official records of their details in the responsible institution.

Research sample³ = 122

Questionnaires respondents = 80

³ In addition to determine the questionnaire respondents, this sample was used to determine the research interviewees as shown in section 4.5.2.

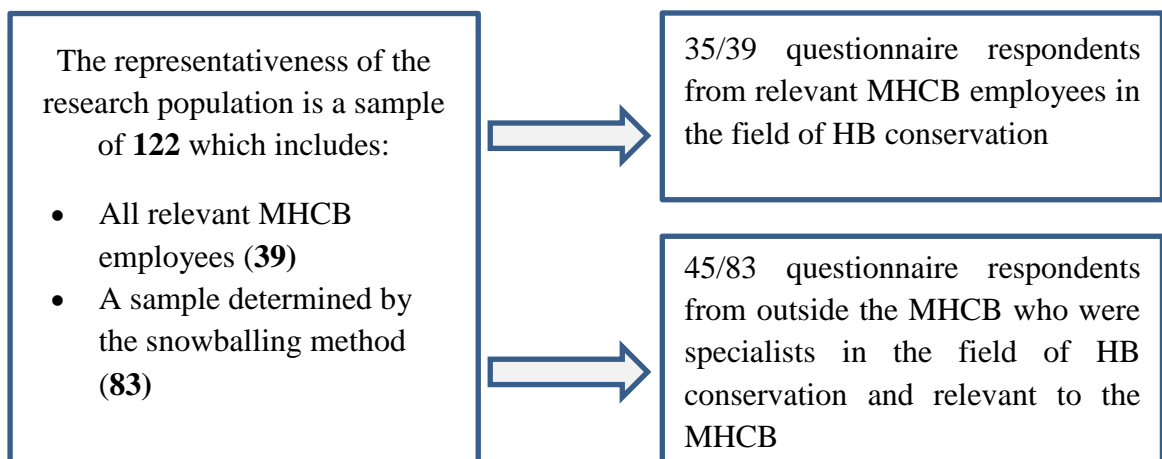


Figure 4.3: The representativeness of research population and questionnaire respondents

The response rate for questionnaires was 65.5% (80/122). The questionnaire respondents include: 35/80 MHC B employees, and 45/80 from outside the MHC B who were specialists in the field of HB conservation and relevant to the MHC B. Their responses were analysed in chapter 8. Finally, the details of questionnaire respondents and their categories were demonstrated in table 4.2.

Table 4.2: Research respondents' category (place of work and percentage of response)

Research respondents and their place of work	MHC B employees (All questions)		Specialists (outside MHC B) in the field of HB and their conservation (5 Questions: 1- 5)				
	All technical staff and all historians in MHC B		Snowballing respondents started from the MHC B				
	Technical department	Historic studies department	Previous MHC B Architects and engineers	Department of archaeology	University staff members	Architectural heritage society members	Architects and engineers in firms and consultancy offices
Received / distributed	26/29	9/10	7/9	4/9	20/42	4/5	10/17
Percentage of responding 65.5% (80/122)	35 respondents		45 respondents				

4.4.2 The Pilot Study

The pilot study was conducted in August 2010 at Newcastle University. This attributed to limited time for conducting the field research. However, the questionnaire (Arabic version) was distributed to six architects from Libya, Egypt and Saudi Arabia who are postgraduate researchers in the school of architecture, planning and landscape. During the process, the researcher asked them to complete the questionnaire, make notes, and provide feedback on questions readability. They provided helpful notes which contributed to the revision of some questions that were thought to be ambiguous. One of the most significant notes was to attach a definition of knowledge management, as it is

not a common term, particularly in Arabic countries. Also, definitions of other unusual terms were given, such as rotation system and mentoring techniques. Furthermore, the mean time period required for completing the questionnaire was identified.

4.4.3 Process for Delivering and Receiving the Questionnaire

Process for delivering and receiving the questionnaire were conducted in Tripoli between 12th September 2010 and 27th November, 2010. All questionnaires were delivered to the representative of research population in their work places. The majority of questionnaires (97/122) were handed by the researcher. On the other hand, the minority of questionnaires (25/122) were delivered formally to the respondents' institutions. The copies (after permission) were submitted to a secretary after determining the requested names and a note to return it after completion to the secretary of their departments. However, the response rate for questionnaires which were submitted by hand was 77.32% (75/97), whereas the response rate for questionnaires which were submitted formally through respondents' administration was 20% (5/25). These percentages reflect Libyan culture in that submitting the material directly by hand connotes more respect, and thus demands more interest on the part of the recipient.

4.4.4 Structure and Content of the Questionnaire

As the questionnaire sample included MHC B employees and others, two versions of the questionnaire were prepared according to the type of respondents. The first five questions for respondents who did not work in the MHC B, while the other given to MHC B employees included all 19 questions (appendix 1). However, the literature review, and the author's experience facilitated the choice and categorisation of questions. The introduction of the questionnaire contained background information to the research and a definition of both knowledge and KM, to facilitate the meaning for the respondents. The questions were divided into six sections:

- Personal details
- The importance of HB conservation knowledge and the extent of its availability in the MHC B
- The extent of applying KM techniques in the MHC B
- The contribution of IT in HB conservation work
- The obstacles against using IT in the MHC B (employees only)
- The MHC B context (employees only):
 - Culture of collaboration and knowledge sharing within the MHC B and difficulties (obstacles) against it in the MHC B

- Awareness of employees and their interest in the need for KM formally in their institution
- Influenced factors: institutional and individual's factors that affect KM in the MHCB

At the end of each ranking or multiple-choice question, there was an option permitting respondents to add other choices to the existing choices and to rate them. Also, open questions were used to make respondents explain their answers or to give opinions about something relevant to the research.

4.5 Interviews

An interview is considered the most significant method for obtaining qualitative data, as it is a helpful method of collecting both facts and opinions about the research topic (Nachmias, 1996). Furthermore, “the personal interview is most suitable for case study research and studies that require respondents with homogenous characteristics” (Naoum, 2008: 62). It helps a researcher to answer the research questions as it is the proper method “when a case study needs to be investigated in detail asking questions such as how and why things had happened the way they did” (Naoum, 2008: 55).

An interview is defined as “a face to face interpersonal role situation in which an interviewer asks a respondent questions designed to elicit answers pertinent to the research” (Nachmias, 1996). The main advantages of personal interview are “knowing the identity of a respondent, interaction between interviewer and respondent, that it allows probing, the quality of information is deep and detailed and the interviewer has a high level of control over the interview process” (Naoum, 2008: 62).

4.5.1 Choosing the Correct Type of Interview

Interviews can be categorised structurally into three forms: unstructured, semi-structured and structured interviews. The correct choice between them depends on the nature of the research. In the research of an investigation into the management of knowledge for HB conservation organisations in Libya, the semi-structured interview was chosen as the most convenient method to collect data. This is because the researcher will exploit the advantages of asking similar questions in order, to facilitate making a comparison between answers (ESDS, 2003). Furthermore, this type of interview gives the interviewees space to talk, and thus expedites the capturing of more information which may not be covered by the interview questions (CHSD, 2007:1) Moreover, new questions to elicit more information can arise as a result of the interviewee's responses during the interview. These new questions add depth and

richness to the obtained information that was previously captured. For these reasons, the semi-structured interview technique was chosen as the main method to collect data.

4.5.2 The Research Interviewees

Semi-structured interviews were conducted in Tripoli between 12th September 2010 and 27th November, 2010, with twenty interviewees (figure 4.4 and appendix 5) representing various parties in the local HB conservation field. These twenty interviewees were chosen from the one hundred and twenty two representatives of the research population. The criteria for choosing the interviewees who agreed⁴ to an interview included: the interviewee knowing about the work of the MHCB and/or local HB conservation work, and having experience of ten years or more. Also, for employees, the selection process considered the variation of management and responsibility levels to better reflect opinions regarding the existing situation in this institution.

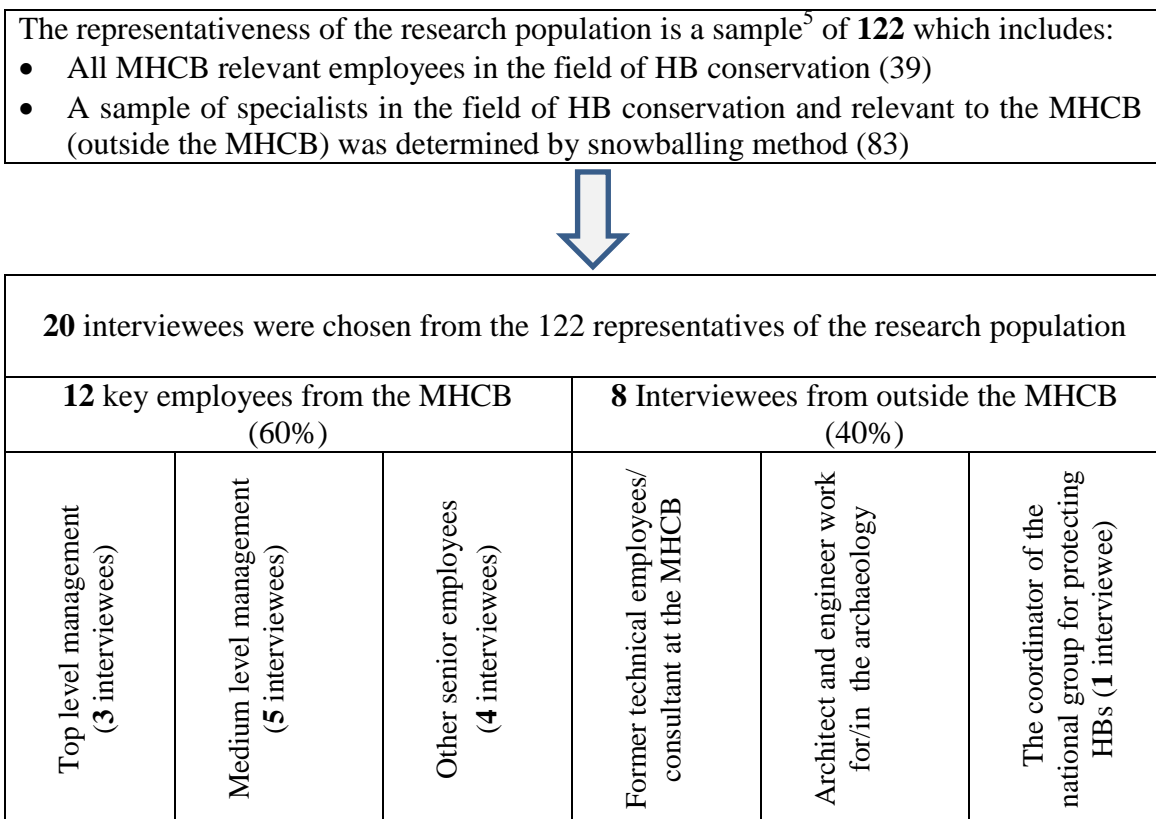


Figure 4.4: The selected interviewees

Most interviews were conducted with a sub-set of respondents to a questionnaire survey sample. This method for choosing interviewees was followed because of limited time and choice, but also because it is a method that can be used in such circumstances

⁴ The recipient of the questionnaire were asked for consent to conduct an interview

⁵ In addition to determine the research interviewees, this sample was used to determine the questionnaire respondents as shown in figure 4.3.

where the researcher considers a frame for choosing the interviewees. As Fellows and Liu (2003: 183) stated:

Sub-sets of a primary sample may be used –such as where interviews are conducted with a sub-set of respondents to a questionnaire survey sample. In such circumstances, it is important that an appropriate unbiased method is used to select the sub-set. The sub-set should be selected either by random sampling or by following the sample frame.

However, the interviewees' experience ranged between ten and 25 years, with 60% of them (12/20) being MHCB key employees (left side of figure 4.4): top level management (three interviewees), medium level management (five interviewees), and other senior technical employees (four interviewees). This variation in employee level better reflects opinion regarding the existing situation in this institution.

Furthermore, there were eight interviewees from outside the MHCB, representing 8/20 interviewees (right side of figure 4.4); four were previously technical employees at the MHCB, a faculty staff member (previous architectural consultant at the MHCB), an archaeologist from the archaeology department, the coordinator of the national group for protecting HBs, and the supervisor of the Islamic museum restoration project from the archaeology department.

The interviewee group was comprised of: eight architects, four civil engineers, four technicians, two librarians and archivists, and two historians. The majority were male (80%). The mean duration of each interview was 52 minutes. The details of the interviewees in addition to the data about the interviews are illustrated in appendix 5.

4.5.3 Semi-structured Pro-forma Interview

Reading a copy of the semi-structured pro-forma interview (appendix 2) helps the interviewees prepare and review documents if required. However, the pro-forma for this study included an introduction containing the background to the research, and key questions about knowledge and KM aspects:

1. HB conservation knowledge aspects:

- a) What is the main knowledge that is essential for you when dealing with HBs?
- b) From which **sources** have you obtained knowledge when dealing with HBs (for instance, for solving problems)?

2. Knowledge management aspects:

What are the enablers and constraints, and how they affect the process of:

- Knowledge capturing from individuals, written sources and HBs themselves
- Knowledge organising and storing

- Knowledge dissemination or sharing between individuals and reusing it in the field of HB conservation.

4.6 Other Data Collection Methods

4.6.1 The Organisation's Documents Review (Archival Research)

A multiplicity of sources allows the gathering of distinct types of information. One of these information sources is organisational documents. Wolff (2010: 284) defined documents as “written texts that serve as a record or piece of evidence of an event or fact, occupy a prominent position in modern society”. These documents include statistical or descriptive data. They save time and costs and may provide a useful comparative tool (Stewart, 1993). One example of documents that were collected and analysed is technical employees' records, relevant regulations, written procedures, HB drawings and previous studies. The documents were collected in the MHCB's context from different places in the MHCB: archive, Dar-Naeb for documents, library, computers, databases and document cabinets and bookshelves.

4.6.2 Observation, Field Notes and Visual Survey

Exploratory observations as a method for collecting qualitative information provide descriptive information of what has been observed (Naoum, 2008: 40). According to Luders (2010: 222):

“Anyone who wishes to make an empirical investigation of human beings, their everyday practices and life-worlds has, in principle, two possibilities. One can hold conversations with participants about their actions and collect appropriate documents in the hope of obtaining, in this way, rich information about the particular practice in which one is interested. Or else one looks for ways or strategies for taking part, for as long as possible, in this everyday practice and becoming familiar with it, so as to be able to observe its everyday performance.”

Furthermore, Buston (1998: 197) stated that “observation is a better method for giving the researcher access to the details of naturally occurring interactions.”

In this research, observations and visual survey occurred concurrently with conducting interviews and handing out questionnaires. Visits to the main MHCB headquarters and restoration sites were conducted about 30 times (2-3 times a week), between 8/9/2010 and 4/12/2010. Asking questions and taking photographs were helpful tools for observations and visual survey. As Plummer (2004:285) stated, “the most common use of photographs is as a documentation and descriptive tool.” Also, Harper (2010: 231) stated that:

“Photographs are the most common form of visual sociology, and they are the most peculiar because they have the dual qualities of recording the world seemingly without interpretation, and at the same time with profound subjectivity.”

Observations that were conducted in the MHCb context included observation of on-task behaviour and observation of the physical space in the MHCb, in addition to conducting a visual survey of HBs and their restoration processes in Tripoli city.

The on-task behaviour and the current situation of the activities that affect knowledge processes were observed in the MHCb. Also, the researcher observed the working places and their suitability for sharing knowledge, and the availability of a knowledge repository in the MHCb, such as a library and archive, in addition to observing information technology (IT) used in the MHCb.

Furthermore, the author visited a group of HBs in Tripoli that had been previously refurbished, and others which were being refurbished. The objective was to observe both the physical conditions of HBs and any repeated mistakes in their conservation which could be attributed to lack of knowledge (appendix 3). A further objective was to observe HB restoration work in Tripoli as a source of HB conservation information and knowledge.

4.7 Analysing the Research Data

4.7.1 The Techniques Used in Quantitative Data Analysis

Statistically, there are three types of quantitative data: nominal, ordinal and interval. A nominal scale was used to classify the respondents, for instance, sex (male or female) and place of work (in or outside the MHCb). Regarding nominal data, Fellows and Liu (1997: 126) stated that:

Nominal or categorical scales classify members of the sample, the responses, into two or more groups without any implication of distance between the groups. Hence, nominal scales provide a mechanism of classification for responses and respondents.

Furthermore, for types of research that look for ranking, in addition to finding respondents' opinions (agree or disagree), ordinal scales are used. This is because, as Fellows and Liu (1997: 126) stated,

The ordinal scales are used to rank responses, [and] there is no indication of distance between scaled points or commonality of scale perceptions by respondents, [so] in essence, it provides a hierarchical ordering.

To measure respondents' opinions, the Likert scale with five grades was used. As Fellows and Liu (1997: 126) stated:

The most common scale for obtaining respondents' opinions is the Likert scale. Such scales are concerned with determining respondents' degree of agreement or disagreement with a statement on, usually, a 5-point or 7-point scale [...] as the Likert scale is an ordinal scale, it can be used to produce hierarchies of preferences which then can be compared across groups of respondents as per the sampling frame.

Regarding the analysis of the collected data, the statistical package for the social sciences (SPSS) was used. The procedure of analysing the data collected was arranged as follows:

- Coding each section or item of question to be a variable and obtain a code number. This step facilitates the input data process to a statistical program
- Input variables to the statistical program as coded and present attributes for variables
- Input collected data
- Analysis:
 - Describing the characters of the questionnaire's respondents: age, experience, place of work
 - Finding descriptive statistics: number of respondents, frequencies, mean, median, range and other statistical measures for each variable
 - For relevant questions, ranking the results.

Furthermore, SPSS facilitates the analysis of the data and 'inferential statistics' by various statistical tests (Chi-square test, comparison of means, and correlation)

- The Chi-square test of independence was used to:
 - Make a comparison of answers from the MHCB employees (in context) and others not working in the MHCB (without context) and to present the statistical significance of the results
 - Make a comparison of the answers according to experience, gender, type of work and age of respondents, to find any significant association between their results
- Comparison of results, for example, the importance of knowledge and its availability in the MHCB to indicate the gap of knowledge
- Correlation tests were conducted to measure the association between two variables, for instance:

- Cross-tabulation test used to test the relation between methods of storing documents and the main obstacles that respondents face when using IT
- Spearman's rho, used to compare two ordinal variables. A rank-order correlation coefficient that also measures the association at the ordinal level.

Finally, the data collected from organisational records regarding MHCB's employees and their movement were used as descriptive data showing the rate of employees' departure.

4.7.2 The Techniques Used in Qualitative Data Analysis

A large volume of qualitative data in the form of interviews, images, written notes, and documents was accumulated from: interviews, visual survey, observations, and organisational documents. To reduce data into meaningful groupings, the thematic analysis process is used. It is primarily concerned with the identification of themes within the data, and is considered as the main route in examining the themes which arise as a result of active inspections of raw data (Gomm, 2004; Grbich, 2007; Shank, 2006, Bishop, 2010).

To become familiar with the collected data, it was listened to and reviewed to create a sense of the overall data collected. However, the interviews were translated from Arabic into English. They were first transcribed, and then the sentences were improved without losing the meaning. Data collected from interviews were identified, and organised in themes as they became apparent. As themes were identified, they were collated in a thematic grid which summarised all key points raised during the research interviews. This facilitated comparisons and contrasts between the perspectives of the different respondents (Gomm, 2004; Moore, 2006).

Regarding the observations, both the required observations which were specifically targeted, and other data that emerged during the field research, were recorded as field notes and/or photos and analysed for content. Furthermore, the data collected from reviewing organisational documents were used where required.

Qualitative data collected via different methods were analysed together, and the contents were interpreted subjectively to identify the key themes that were considered in the research questions. Analysing qualitative data led to a display of the findings. However, to answer the research questions, the findings from analysing these qualitative and quantitative methods should be gathered and discussed all together, and are thus triangulated.

4.7.3 Triangulated Aspects

Triangulation in research means the use or integration of qualitative and quantitative techniques or the use of two or more methods together to study one point or investigate a topic. As Fellows (2003: 29) stated:

Triangulated studies employ two or more research techniques, qualitative and quantitative approaches may be employed to reduce or eliminate disadvantage of each individual approach whilst gaining the advantage of each, and of the combination – a multi-dimensional view of the subject, gained through synergy.

Combining different methods can often generate new insights into the results by validating each other (Chen, 2008). This view refers to the use of one source to corroborate other research findings. According to Yin (2009: 18), a case study inquiry relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result.

As shown in table 4.1, not all questions can be answered through data collected from the same method. For instance, questions regarding employees' leaving can be answered through analysing an organisation's documents (including employee records) and not through data collected from observation. However, observation can be used to collect data regarding the culture of collaboration.

However, to achieve the research objectives, the technique used in this research was to discuss the key findings by analysing the interviews, questionnaires, organisation documents and observations. Using these multiple methods to collect data and study one topic not only provided a deeper level of research, but the validity of the research was also enhanced.

4.8 Discussing Ethical and Practical Issues

In dealing with the interviewees and questionnaire sample, two ethical points were considered: one was that employees might be afraid of losing their jobs; the other was how to conduct interviews with female interviewees in a conservative society. Furthermore, the place and the time of interview, in addition to using recording devices, were further factors to consider in advance.

Some employees were reticent about answering questions related to the organisation in which they worked because they feared that there might be an impact on their career. However, this obstacle was overridden. Firstly, a formal consent letter was provided and presented. Then, to increase confidence, the provision of names was not compulsory in the questionnaires or interviewees; only their initials were used so that the interviewer could determine the respondents (for extra information or explanation).

The second expected ethical obstacle that the researcher faced was how to conduct an interview with a female employee in a conservative society, whilst respecting cultural and religious factors. In Islamic countries, men and women who are strangers to each other should not stay alone in a private place, particularly in a closed room. However, as consent for the meeting was given and the place of the meeting was open to other employees, such an obstacle was overridden in this research. Furthermore, no photographs of females were taken, and permission to do so was given from the male interviewees whose picture was.

Moreover, mainly female interviewees and some males refused to have their interviews recorded. In such situations, written notes and the headings of the main answers were taken, in addition to writing more detailed information directly at the end of the interview. However, negotiating the place and time of the interview and the use of a recording instrument were done by the researcher to fit the interviewees' demands.

4.9 Discussing Validity and Reliability Issues

Multiple sources of evidence were adopted for collection data and information. This provided protection against threats to the validity of the collected data and findings. As Fellows (2003: 105) stated, to enhance the validity and reliability of findings under the scientific approach, the case study design has to focus on “multiple sources of evidence relying on multiple measures and instruments for empirical testing.”

Furthermore, the interviewees were chosen as a sub-set based on the questionnaire responses. Although this method can be used in such circumstances (section 4.6.4), a frame for choosing the interviewees was followed to avoid any possible bias in the choice of interviewee.

Moreover, regarding reliability Yin (2009: 40) stated that “demonstrating that the operations of a study –such as the data collection procedures –can be repeated, with the same results.” It is “particularly at issue in connection with quantitative research. The quantitative research is likely to be concerned with the question of whether a measure is stable or not” (Bryman, 2008: 31). Reliability could be achieved through following the same procedure for choosing the questionnaire sample. This was achieved in this research as the sample included all relevant employees in the MHCB who mentioned other specialists in the field of HB conservation in the context of Tripoli, Libya.

Finally, the author was aware that bias could result from explaining the questionnaire's questions. Therefore, explanations were provided with care to ensure that they did not affect the respondent's answers.

4.10 Chapter Summary

The objective of this chapter was to identify and discuss the research methodology and strategies that are appropriate to answer the research questions.

The constructionism ontology, epistemological positions, and other aspects led to employ a methodology that included mixed qualitative and quantitative approach. Multi-methods were used for collecting data and information: a questionnaire, interviews and observation, in addition to reviewing organisational documents.

The target respondents for the research questionnaire were all the technical staff and historians working in the MHCBC. Also chosen were local HB conservation specialists worked with the institution in some capacity and/or interested in such HBs and their conservation work in Tripoli. The snowballing method was adopted to determine the questionnaire sample. It started with all the technical staff and historians in the MHCBC, who in turn identified other specialists from outside the MHCBC. One hundred and twenty two questionnaires were distributed and 65.5% (80/122) were returned. For analysing quantitative data, the Likert scale was used for measuring respondents' opinions and SPSS was used to analysis data and 'inferential statistics' by various statistical tests; compare means, Chi-square and correlation.

Furthermore, semi-structured interviews were conducted in Tripoli with twenty interviewees representing various parties in the local HB conservation field. Those twenty interviewees were chosen from one hundred and twenty two representatives of research population. The frame for choosing the interviewees who agreed to an interview included: the interviewee knowing about the MHCBC and/or local HB conservation work, and having experience of 10 years or more. Also, for employees, the selection process considered the variation of levels for better reflects opinion regarding the existing situation in this institution.

Moreover, archival research or institutional documents review and observations and visual surveys were conducted to collect data. The documents that were collected and analysed were employees' records, relevant regulations, written procedures, HB drawings and previous studies. The observations that were conducted in the MHCBC context included observation of on-task behaviour and the physical space in the MHCBC, in addition to conducting a visual survey of HBs and their restoration processes in Tripoli city.

For analysing qualitative data, the thematic analysis process is used. Finally, to answer the research questions, the findings from analysing these qualitative and quantitative data gathered was analysed by triangulation.

Chapter 5: the Research Context and the Responsible Institution for Conserving HBs in Tripoli –Libya

5.1 Introduction

The objective of this chapter is to provide the background to the research context and the institution that is responsible for conserving HBs in Libya. Also, it aims to explore and analyse the organisational issues that are relevant or that influence the management of knowledge in the Management of Historical Cities Bureau (MHCB). This chapter is divided into five sections. The first section introduces the chapter. The second demonstrates the location of the research context and its valuable architectural heritage. The third section discusses the organisational issues that are relevant to the management of HB conservation and their effect in KM; the accountability, financial resources, the main MHCB headquarters' location and design, organisational structure, awareness regarding KM, and the effect of leadership. The fourth section analyses regulations and policies that affect the management of knowledge in the MHCB. Finally, the chapter ends with a summary.

5.2 Research Context

Libya is in the Middle East on the Mediterranean coast (figure 5.1). It has experienced several civilisations that have left their mark on the Libyan architectural heritage. The city of Tripoli is the capital of Libya. It has witnessed several different historic ages: Phoenicians, Greeks, Romans, Muslims, and a period of Italian occupation. This history is an important factor which has enriched its historic and architectural features. Libyan HBs include vernacular buildings, such as residential buildings and commercial shops, which have their cultural significance from this varied history, and a group value with other buildings. Other Libyan HBs were built by professionals to conduct service functions, such as mosques, schools, banks and embassies in addition to residences for governors and officials.



Figure 5.1: the location of the research context, Tripoli – Libya

In the city of Tripoli, there are two main local design concepts for HBs: living accommodation open to the inside (courtyard) or open to the outside (streets). The first type includes buildings that do not have any windows overlooking the street (figure 5.2). The main idea of the design is that all the spaces of the building are open to the main courtyard in the centre and there is no front or rear garden. This style is known as Mediterranean style. In addition to climate advantages, this design reflects Arab culture and its keenness to provide privacy through the housing design, particularly for women, without being deprived of the surrounding environment of the air, sun, moon and stars. The second type is those buildings whose windows overlook the street. These HBs belong to the Europeans who lived in the city of Tripoli. However, the design of some historic public buildings is open to the outside as privacy is not necessary in such buildings.

The effect of HB design in the conservation process appears particularly in dealing with HB facades. In the first open to the inside type, while there are efforts to repair the main facade and the entrance of the building, the main conservation work is internal. However, the facades of HBs which are open to the outside require more conservation work.



Figure 5.2: The Madi Hassan Hotel in the old city of Tripoli (Oea, 2010)

Regarding the materials that were used to build the old city of Tripoli, these are mainly materials such as lime stone, red brick, wood, lime mortar. Such materials were used to build historic buildings (appendix 3). However, some imported materials, characterised by their quality, were used to build some of the more sophisticated (for that period) buildings. For instance, Maltese stone was used to build exterior decorations of buildings or some interior elements, such as columns.

Regarding the function of HBs in the research context, buildings of worship and most houses in the city of Tripoli have continued their functions since their

establishment. Other HBs have had their functions changed many times over time. For instance, the former British consulate (appendix 3-D) in the old city of Tripoli was the house of an Ottoman official before it became the British consulate. This building has witnessed numerous meetings between Libyan officials and the English ambassador and is now used as a public library (figure 5.3).



Figure 5.3: The former British consulate in the old city of Tripoli (the author, 2010)

Another example is the former Bank of Rome (figure 5.4) in the old city of Tripoli (appendix 3-F), which preceded the Italian occupation of Libya in 1911. With some interior alteration, this HB is now used as a branch of the al-Umma bank (Libyan bank), and thus historical continuity has been achieved in the use of this HB for the same function (Tarhuni, 1992).



Figure 5.4: The former Bank of Rome in the old city of Tripoli (the author, 2010)

Libyan historic buildings are evidence of the history of the country. They are regarded as a national heritage for the country and should therefore be maintained. This called for establishing a responsible institution for conserving them.

5.3 The Responsible Institution for Conserving HBs in Libya

The operational responsibility to preserve HBs in the city of Tripoli has undergone several stages, starting with the formation of a committee in 1966. Its mission was to count historic places and remains. This committee was followed by the establishment of several consulting committees without any executive mission. In 1985, the Libyan government issued decision number 40 (GPC, 1985) regarding the establishment of the project for the organisation and management of the old city of Tripoli (IOMOCT) which was the start of the transfer to actual execution work (MHCB, 2004). This organisation, then started its actual work in 1986, and has become the section responsible for refurbishment projects in the old city of Tripoli accountable to the prime ministry. However, its accountability has changed several times to different ministries.

5.3.1 The MHCB's Accountability

The accountability of the MHCB has changed four times since its establishment in 1985 (table 5.1), from the prime ministry to the ministry of culture and media in 1997, then to the ministry of facilities in 2001. According to the Libyan tourism ministry's decision number 2 (GPCT, 2006) regarding the MHCB's organisational structure, the accountability of this institution changed to the ministry of tourism and its tasks became managerial instead of implementation ones. Its most recent name is the Management of Historical Cities Bureau (MHCB) and its responsibilities cover all the historic cities and

buildings in Libya, except the Roman and Greek cities and Ghadames (the desert city), which belong to archaeology board. However, the MHCb's accountability changed in 2010 into the Archaeology department, which in turn is accountable to the ministry of tourism.

Table 5.1: The sequence of the MHCb's accountability since its establishment

Year	The accountability of the MHCb
1985	The prime ministry
1997	The ministry of culture and media
2001	The ministry of facilities
2006	The ministry of tourism and archaeology
2010	Archaeology department (accountable to the ministry of tourism)

Regarding the effects of these accountability changes, an ex-architect employee (JL) stated that because of the accountability changes “the heads of this institution had changed more than seven times since its establishment, and in turn this had caused some architects and engineers to leave.” Also, the coordinator of the MHCb library (ER) stated that:

“The cause of low level of services is the continued changes in administrations. There is no settled situation. Currently, the role of the archaeology department is just a mediator between the MHCb and the ministry of tourism. This situation caused delay of procedures.”

At the top management level, the head of the historic studies department (YK) stated that “administrational changes had negatively effects.” Furthermore, the head of the MHCb (AJ) stated of the organisation's accountability and budgets that:

“Flexibility should be available for financial flow and money should be provided because dealing with HBs can be urgent. The problem is the intervention of numerous governmental institutions. These institutions do not know exactly the role of the MHCb.”

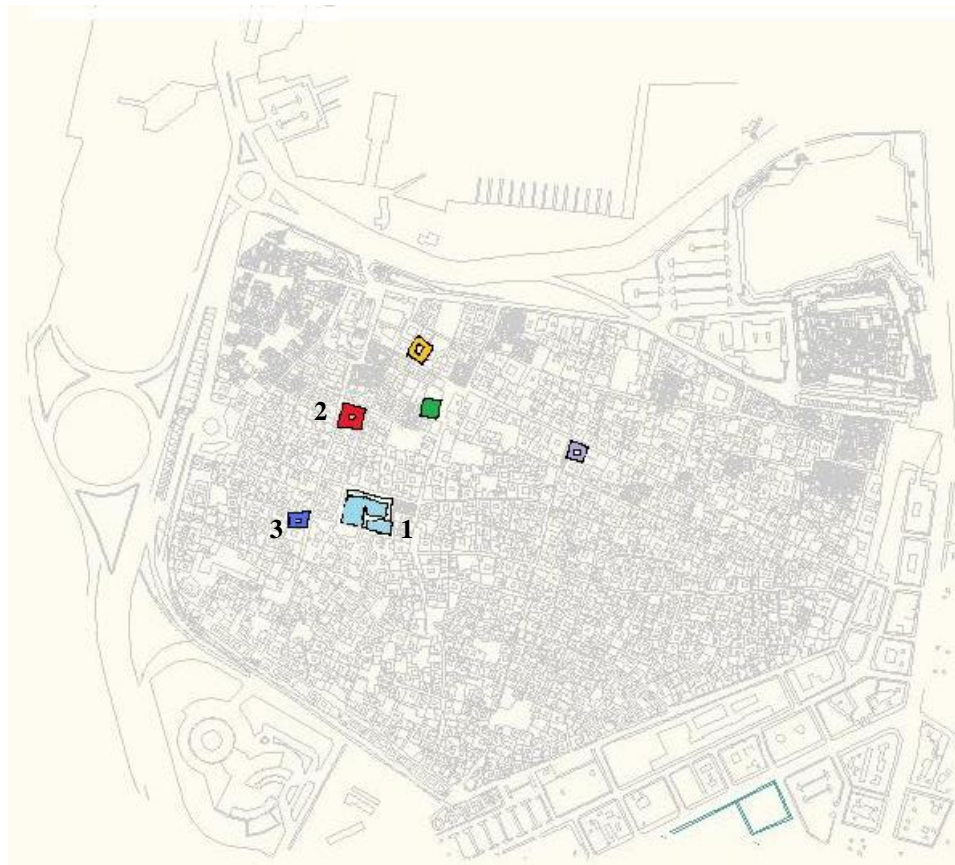
Moreover, some interviewees (3/20) claim that ministry officials do not have clear vision regarding sponsoring HB conservation projects. For instance, the coordinator of the HB protection society (HB) stated that “the government does not have clear vision or strategy for conserving historic cities and buildings; a development budget was identified and then suspended.” Also, a faculty staff member (AE) states:

“The officials do not appreciate the value of HBs. They want to see the achievement against the budget paid. However, in the restoration of HBs nothing new appears as HBs are existing buildings.”

The changes in the MHCB’s accountability have caused some instability and have had an impact on its organisational structure, according to the plan of each governmental board. Some of the responsibilities of this institution have changed. For instance, in 2006, the MHCB became management-oriented instead of an implementation organisation, and its responsibilities now cover all HBs in Libya.

5.3.2 The Main MHCB Headquarters’ Location and Design

The MHCB main headquarters is a refurbished HB located in the middle of the old city of Tripoli (Figure 5.5); this is helpful for easy contact with HBs. The work within an HB helps the employees to have a good sense of these buildings and monitoring their behavior after refurbishment. Moreover, there are two other separate HBs that belong to the MHCB: Dar Al-Naeb for documents and Dar Enoiji for culture (library).



- 1 The MHCB’s headquarters (former Jama Mahmood school)
- 2 Dar Enoiji for culture –library (former British consulate)
- 3 Dar al-Naeb for documents (former Salat Assrosi school)

Figure 5.5: the MHCB’s headquarters location map



Figure 5.6: The MHCBC's headquarters in the old city of Tripoli

During visits to the MHCBC's headquarters (figure 5.6 and 5.7), the author observed that the offices of all the technical staff were in the same area. This space contained a shared lounge surrounded by four halls and facilities. According to Islamic culture (social and religion reasons), the places were divided between male and female employees. Each hall included work places for 8-10 technical employees (Figure 5.7 and 5.9). A senior technical employee (TW) stated that the "offices' pattern in the MHCBC provides a good place for meetings and exchanging knowledge." Furthermore, a lecture room with ICT facilities was provided in the MHCBC's headquarters for meetings, lectures and presentations.



Figure 5.7: Technical affairs department in the MHCBC's headquarters (the author, 2010)

5.3.3 Financial Resources in the MHCB

The MHCB has an allocated governmental budget in addition to resources from its investments. Government decision number 125, article 8 (GPC, 2006), regarding establishing the MHCB identified the financial resources for it as follows:

- The allocation of the general budget of the state
- Fees for entering some HBs used as museums or galleries
- Property rents for HBs that belong to the MHCB
- Loans according to legislation
- Unconditional local or international (if permitted) assistants and grants.

However, legally this institution has items to pay for, such as employees' salaries, training, stationery and collectibles. Any other payments require a permit from the board that it is accountable to.

5.3.4 The Organisational Structure and the Interaction within the MHCB's Departments

According to decision number 125 (GPC, 2006) regarding changing the accountability of the MHCB to the ministry of tourism, the organisational structure of the MHCB (figure 5.8) is now comprised of four departments and numerous sub-sections:

- The technical affairs department, with three sections: design and architectural studies, implementation supervision and urgent maintenance sections, in addition to a technical inspection committee
- The planning and studies department, with four sections: historic and social studies, documentary, planning and follow-up, and training sections.
- The administration and financial department, with four sections: administration, financial, employees' affairs and services and general relations
- The marketing and investment department, in two respective sections.

The MCHB has a small branch in Benghazi city (the second city in Libya). Also, according to governmental decision number 125 (GPC, 2006), the MHCB can open other branches in other cities. However, this organisational structure did not change in 2010 when its accountability switched to the Archaeology department.

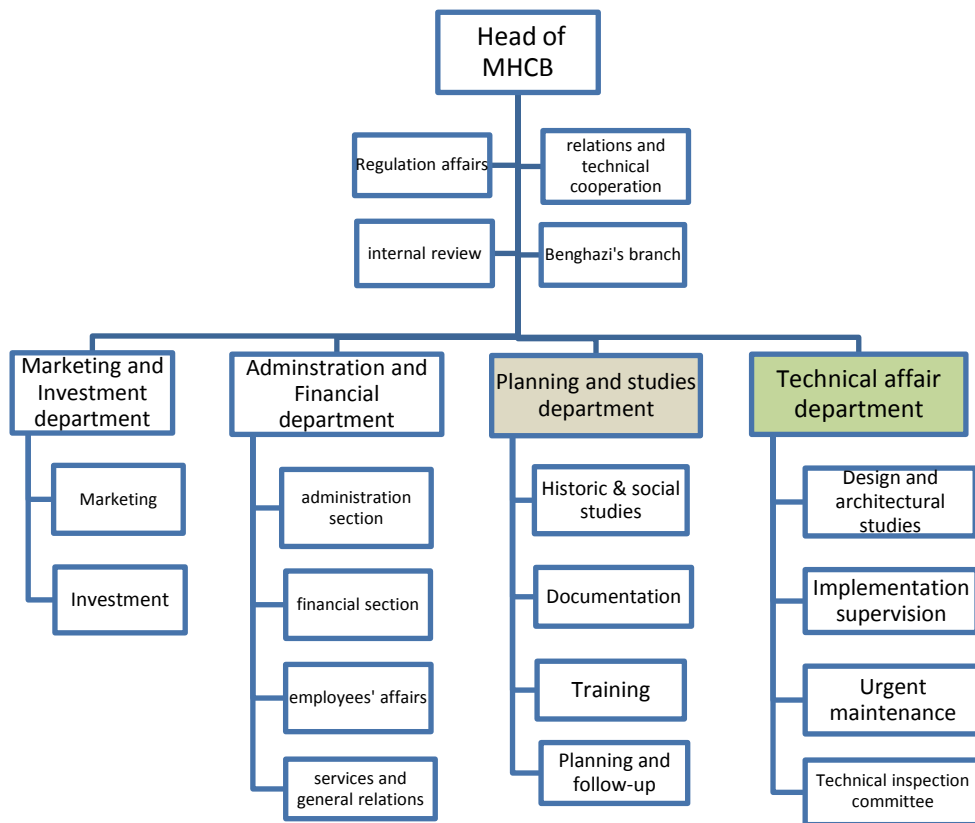


Figure 5.8: The structure of the MHC B

Regarding the responsibilities of key departments in the MHC B, two main departments are responsible for main conservation work in MHC B: The technical affairs department and planning and historic studies department.

1. The technical affairs department is responsible for: preparing studies, designs for implementing projects, maintenance works, rehabilitation, and technical supervision. Also, it is responsible for researching local architecture, and identifying and developing materials and traditional construction techniques. Furthermore, this department provides consultations and issues permits to the owners of HBs for maintenance and restoration work. It also cooperates with consultancy offices and organisations in the fields of surveying, architecture, construction, and mechanical and electrical works. The organisation's policies permit employees to contribute at conferences, symposia and workshops that are organised locally and internationally in this field. These tasks were concluded in the six items mentioned in Libyan governmental decision number 152 (GPC, 1995: article 21) regarding the tasks of the technical department in the MHC B, as below:

a) Conducting architectural surveys, and preparing the drawings and details of historic buildings and cities

- b) Preparing the technical specifications for maintenance, restoration, rehabilitation and re-construction
- c) Following-up and technically supervising the implementation work on historic sites
- d) Conducting the architectural and constructional studies for the re-construction and rehabilitation projects in the old cities and historic neighbours
- e) Preparing technical reports and architectural and constructional designs regarding restoration or rebuild in the old cities
- f) Preparing drawings for registering HBs in the institution of estate recording.

However, the responsibilities of each section in the technical affairs department were mentioned in governmental decision number 2 (GPCT, 2006), article 10, about the organisational structure and description of administrators' tasks, as shown in table 5.2.

Table 5.2: Responsibilities of the technical affairs section (GPCT, 2006)

Section	Responsibilities
Design and architectural studies	<ul style="list-style-type: none"> • Prepare technical studies and research regarding identifying historic buildings and cities according to the regulations • Architectural surveys and assessment of HB elements; preparation of drawings and details • Studies regarding economic visibility and the environmental impacts in the rehabilitation projects of HBs and cities • Prepare technical studies and research regarding a building's structure and use of the historic buildings in the historic cities. Prepare technical reports and drawings regarding rehabilitation and reuse of the buildings • Prepare procedures for studies, research and designs relevant to conservation projects and do it by themselves or in cooperation with others • Help the owners of historic buildings and provide them with technical consultation for the restoration of their buildings • Provide technical consultations regarding the re- use and rehabilitation works of historic buildings in the old cities • Prepare technical studies and research for restoration projects • Prepare drawings for registering the buildings that are owned by persons in real estate documenting institution • Issue permits for building, restoration work and reuse of HBs in historic cities • Contribute to developing the plans of the historic cities
Supervision the Implementation work	<ul style="list-style-type: none"> • Technical procedures for contracting and implementing restoration projects • Maintenance work for the MHCb headquarters and other dependent buildings • Supervision of the implementation restoration projects that are contracted and prepare technical progress reports • Identify traditional construction materials and similar materials that have the same specifications as the original for the purpose of maintenance, restoration and rebuilding • Identify the equipment, instruments and machines used in restoration work • Adopt the samples of construction materials according to contract specifications
Urgent maintenance	<ul style="list-style-type: none"> • Urgent maintenance work in terms of support buildings and arches for buildings and walls that are on the verge of collapse • Support buildings and arches to protect people • Remove failed buildings and transfer ruins. • Urgent maintenance of water supply and sewage systems • Cooperate with relevant bodies to prepare plans and procedures for emergencies such as fire

These decisions illustrate aspects of knowledge that should be provided by the MHCBS to conduct both studies and researchers regarding the technical, economic and social aspects of HB conservation. The essential knowledge aspects derived from table 5.2 that should be available for conducting HB conservation work in responsible sections could be concluded as: assessing and documenting HBs values and conditions, and deciding on the type of intervention, contracting and supervising of the conservation work. However, more precisely these can be identified for each section as follows:

- a. The section of design and architectural studies requires knowledge regarding:
 - Preparing drawings and details of HBs (architectural survey)
 - Assessing HBs architectural values
 - Assessing economic visibility
 - Assessing the environmental impact of the rehabilitation projects of HBs
 - Diagnosing the historic building's condition (conditional survey)
 - Deciding on the rehabilitation and reuse of the buildings
 - Deciding on the type of restoration.
- b. The supervising the implementation work section requires knowledge regarding:
 - implementing the maintenance work for the MHCBS headquarters and subsidiary buildings
 - Technical procedures for the contracting process
 - Supervision of the implementation restoration projects
 - Identification of traditional construction materials and similar materials
 - Identification of the equipment, instruments and machines used in restoration work
 - Adopt the samples of construction materials according to the contract's specifications.
- c. The urgent maintenance section requires knowledge regarding:
 - Urgent maintenance work in terms of support HBs that are about to fail, in order to avoid their risk
 - Urgent maintenance of the water supply and drainage systems
 - Procedures for emergencies such as fire.

2. Planning and historic studies department includes three sections: historic and social studies section, information and documentary section and training section. The responsibilities of each section in this department were mentioned in Libyan tourism ministry decision number 2 (GPCT, 2006: article 9), about the organisational structure and description of administrators' tasks, as shown in table 5.3.

Table 5.3: Responsibilities of the planning and studies department (GPCT, 2006: article 9)

Section	Responsibilities
Historic and social studies	<ul style="list-style-type: none"> • Conducting historic studies regarding establishing and developing HBs • Conducting social surveys if the subject of work is neighbourhoods • Conducting social studies regarding customs, traditions and arts in HBs and cities • Conducting economic studies about HBs
Information and documentation	<ul style="list-style-type: none"> • Establishing a database for HBs and cities in cooperation with other departments and sections in the MHCb. Collecting and store all historic and technical documents and drawings in addition to publications, pictures and visual media • Documenting studies and researches and the MHCb activities • Documenting the situation of HBs and cities • Providing a comprehensive library, providing it with books, pictures, and visual media regarding HBs and cities • Preparing comprehensive files about historic cities for the purpose of registering them in the international heritage list and relevant organisations by coordination with relevant bodies
Training section	<ul style="list-style-type: none"> • Planning for training programmes according to the needs of the MHCb, supervising their progress and evaluating the performance in cooperation with departments and relevant parts • Utilising information from international conventions and restoration project contracts in Libya to provide training courses • Organising symposia and study circles relevant to the field of training and share in it for developing the efficiency of employees in the MHCb.

The governmental decision number 125 (GPC, 2006: article 3.18) regarding establishing the MHCb, stated that the MHCb should prepare studies and researchers regarding the technical, economic and social aspects including architecture, urbanism, construction materials and buildings techniques. It should also prepare a guide for rehabilitation, use and investment in the old cities and HBs as stated in article 3.20. The research and development (R&D) section should develop knowledge of such aspects. However, there is at present no R&D section in the organisational structure of the MHCb.

Furthermore, historic and social studies provide essential information that contributes to assessing the historic value of HBs in addition to identifying historic functions and previous alterations in HBs that contribute to deciding the type of intervention in them. However, this section is located in a different block in the MHCB headquarters (figure 5.9). As it was observed, the presence of historians in the technical affairs department is very limited and vice versa. Also, there is routine when dealing between the technical affairs department and the historic studies department. A senior technical employee (TW) stated that “The coordination between departments is limited; incomplete information (for instance, about the history of HBs) is given, or given after a delay. We were forced to do it by ourselves.” The head of the MHCB (AJ) stated about some difficulties that were relevant to the organisational structure, “we do not have a job description for each task. It should include job details. For example, what should historians, architects, engineers and surveyors do?”

Moreover, the documentation section, which is responsible for documenting technical and historic documents, is in the planning and studies department (figure 5.8), and this means technical work should be submitted to the documentation section for storing. In the case of a technical staff member who wants to review documents, a permit is required from both departments, and obviously such routine procedures cause delay. The head of the technical department (RM) stated that “the documentation section includes archive and documents repository, even technical documents managed by other department, there is difficulties to get documents and information from it.” Furthermore, it was observed that this situation prevents updating of the database information because it is not easily accessible. Moreover, the training section is in the planning and historic studies department, meaning that technical training courses are organised away from the technical department.

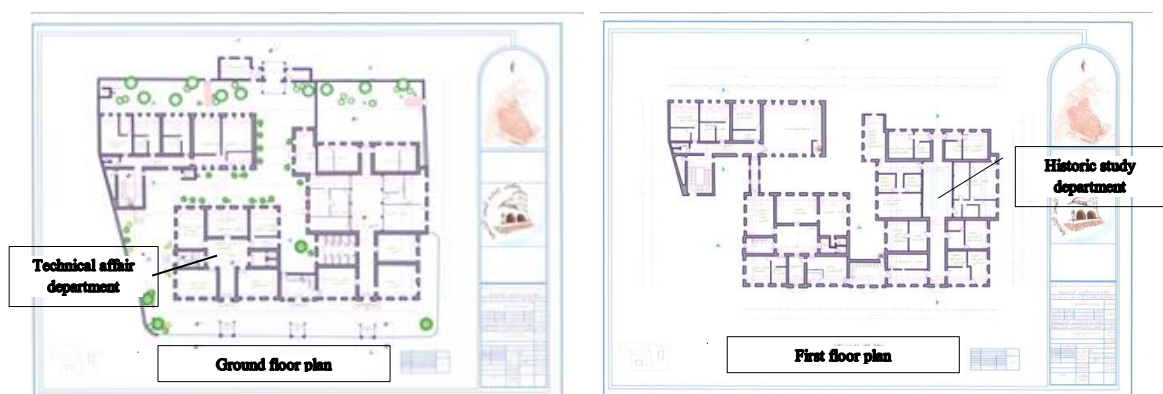


Figure 5.9: The plans of the MHCB’s headquarters

Moreover, a technical employee (SH) stated that “when we need a document from another department, if the person who has that document is absent no other employee provides the service instead of him/her.” However, the head of the historic studies department (AB) explained that “the difficulty of communication was attributed to technical staff who wanted information immediately; this is very difficult to conduct.” This situation means there are no direct contact and no sufficient knowledge sharing between the technical staff and historic researchers.

Finally, according to article 6 of decision number 2 (GPCT, 2006), regarding tasks of relations and technical cooperation in the office of the MHCBC, it is responsible for providing knowledge from external sources and supporting the technical conservation work. It receives reports, research and studies from international bodies and organisations to disseminate them into relevant departments. Also, it provides opinions regarding conventions in the field of HB and city conservation. Moreover, it connects and strengthens the link with relevant specialists, centres and organisations. Furthermore, it follows the agreements and conventions regarding conserving and developing HBs and cities. However, although the significant role of this office as it was considered in the MHCBC organisational structure (figure 5.8) is not activated in the MHCBC, it does not in fact exist at all.

5.3.5 Awareness Regarding KM in the MHCBC Context

The meaning of KM was identified by less than half of interviewees (8/20) according to their point of view about the meaning of the term knowledge itself. The meanings of the term knowledge were categorized into two types: tacit knowledge and explicit knowledge.

As tacit knowledge, it was defined as “a type of experience that some persons have as a result of doing something for a period of time.” Another point of view defined it as “our experience or know-how that could give us the abilities to analyze or criticize and give opinions and to direct the others.”

On the other hand, as explicit knowledge, knowledge was mostly defined as a type of information. For instance, it was defined as “useful information in our interested field or education or science that was experienced” and, “the sum of information that is attained by individual about various topics and specific features.”

Regarding KM, its meaning comes from the two words that are included: knowledge and management in addition to the meaning of the term knowledge. However, eight interviewees defined KM as:

- An art of directing previous experiences for sharing the benefit
- Managing knowledge or experience that some persons have as a result of doing something for a period of time
- The science of directing knowledge and the ability to identify the individuals that can provide knowledge and influence on others and also to identify the recipients of knowledge
- A task assigned to a person or persons to conduct work related to increasing the knowledge of others who are doing the work
- Something like training
- The process or method that is used to obtain the required information for a particular work
- Organizing the information of the institution
- Using new methods to make the process of obtaining information and knowledge easier.

Other interviewees (5/20) did not define KM but gave their impression of this term such as: “We are aware of this topic ‘KM’ but it is not applied in our environment;” “KM is a theme that could be absorbed; we feel it in our work and life;” “knowledge management is a strange expression in Arabic, because it is new. With some effort this expression can be understood;” and, “I am surprised and feel happy that there is a topic called KM. I have not thought that there is a science like this.”

Regarding how to develop knowledge in the MHCB, the head of the historic study section (AB) stated “this requires increased awareness by lectures or bulletin distribution; firstly, among high level management and then individuals.”

5.3.6 The Effect of Current Leadership on KM

Regarding the leadership of the MHCB and its effect on KM, less than half of interviewees (9/20) mentioned this theme. The head of the architectural studies section (BS) stated that “current top management in the MHCB encourages discussion and provided computers and some technical tools in addition to computer training courses are provided.” Also, a senior technical employee (TW) stated:

“The current MHCB head encourages pay for providing knowledge. Also, as an architect he has met the employees and discusses their work in their work places. It could be said that he plays a part in knowledge sharing activities in the MHCB.”

Furthermore, the head of the historic studies section (AB) stated that “current top management encourages developing employees’ knowledge; this appears in specialized training courses in the field of HB conservation.” Moreover, the head of the planning and studies department (YK) mentioned: “current management is keen on developing the human resources in the MHCB.”

However, three seniors held the opinion that high level management (department level) in the MHCB is not interested in developing employees’ knowledge. The library director (ER) stated that:

“The high level management suffer from a lack of willingness, if they are willing, as to how developing knowledge could be achieved. However, some leadership positions are not filled with experienced persons.”

Also, an ex-architectural employee (SA) claims that “the absence of an experienced manager in the technical department has caused limited knowledge development. Also, it has caused seniors to leave the organization.” Furthermore, the director of dar-Naeb for documents (KR) stated that the officials are not interest in developing information management in the MHCB.

However, regarding who should hold the responsibility of managing knowledge in MHCB, an ex-architect employee (FF) felt that this task should be done by a top management team as she stated “planning for developing knowledge should be at the top level management.” The MHCB’s library director (ER) stated that “qualified persons should be provided to conduct this mission.”

5.4 Regulations and Policies that Affect KM in the MHCB

Two governmental decisions regarding the organisational structure and administrative tasks of the MHCB were issued in 2006; they are:

- Governmental decision number 125 (2006) regarding the establishment of the MHCB (GPC, 2006)
- Libyan tourism ministry decision number 2 (2006) regarding the organisational structure and description of administrative tasks of the MHCB (GPCT, 2006).

The main aspects that were mentioned in decision number 125 (2006) include: developing human resources knowledge and skills, conducting workshops and training courses, establishing a database, preparing a guide for rehabilitation, organising and attending conferences, hiring individuals and consultancy organisations, and following up conventions and international treaties, in addition to cooperating with relevant organisations.

Regarding the development of human resources' knowledge and skills (GPC, 2006: article 3.7), it has been stated that one of the MHCB's tasks is to contribute with developing national skills in the field of conservation and the development of historic cities and buildings. Also, preparing and conducting workshops and training courses for art crafts, technicians, engineers, architects and owners in the field of HB conservation. The head of the institution (AJ) noted "the decision of establishing the MHCB, including an annual budget for buying references and training. We can buy books and subscribe in journals, even foreign ones, by contracting local providers." This demonstrates that the MHCB policies permit providing references and arranging activities for developing national skills in the field of HB conservation and cities in terms of workshops and training courses to develop employee knowledge.

Furthermore, article 3.8 (GPC, 2006) mentioned that one task of the MHCB is to establish a database for old cities and HBs through collecting and storing all relevant documents (plans, records, publishes, pictures, tapes and all documentary media) and all material regarding the heritage of old cities and historic buildings (physical and non-physical). This governmental decision shows the ability of the MHCB to provide IT to support KM activities in terms of providing a database system for capturing knowledge that facilitates re-using and updating knowledge within the organisation. Moreover, article 3.20 mentioned that the MHCB is concerned with preparing a guide for the rehabilitation of the old cities and historic buildings.

Regarding conferences and symposia, article 3.21 (GPC, 2006) stated that the MHCB can organise such events regarding the conservation of HBs and cities, and participate in regional and international ones. This decision supports the development of conservation knowledge in the MHCB. Furthermore, article 3.17 (GPC, 2006) stated that the MHCB can use individuals and consultancy institutions that have experience in the field of HB and city conservation. The head of the historic studies section (AB) stated that "the institution's policies permit cooperation with local experts for providing consultants, no financial difficulties". Moreover, act 3.22 calls on the MHCB to follow conventions and international treaties (as a source of knowledge) regarding the conservation and development of historic cities and buildings, in addition to ensuring international cooperation by coordinating with relevant organisations (in coordination with the relevant authorities). These governmental decisions provide appropriate outsourcing policies such as: employing specialists, following up the conventions and

international treaties, and cooperating with relevant international organisations to ensure that the organisation has the required knowledge available.

Finally, a group of interviewees (4/20) suggested that some policies should be provided in the MHCB that support the integration of KM within the institution, as the head of architectural studies (BS) suggested:

“Formal knowledge sharing activities is essential for ensuring collaboration of all. This collaboration itself might become one condition for employment and the good feedback in knowledge collaboration helps for upgrading employees.”

Also, with the same meaning the director of dar-Naeb (KR) suggested that “knowledge sharing could be considered in the list of core values and ethics. Also, it should be included in the employees’ annual qualification.”

5.5 Chapter Summary

The objective of this chapter was to provide the background to the research context and the institution that is responsible for conserving HBs in Libya. Also, it aimed to analyse organisational issues that are relevant to or which influence the management of knowledge in the MHCB.

The operational trials to preserve HBs in the city of Tripoli have gone through several stages without any executive mission. In 1985, the IOMOCT was established to start actual execution work, and it became the responsible section for refurbishment projects in the old city of Tripoli. However, its most recent name is the Management of Historical Cities Bureau (MHCB) and its responsibilities cover all the historic cities and buildings in Libya.

The accountability of the MHCB since its establishment has changed five times. It was changed to ministry of tourism in 2006 and its tasks became managerial tasks instead of implementation tasks. The accountability at present is to archaeology department, which is accountable to the ministry of tourism. The changes of accountability cause a type of instability in the MHCB. The heads of this institution have changed more than seven times. Also, MHCB became a management-oriented organisation. The changes to the MHCB’s tasks have caused a change in the knowledge that is required for performing its tasks and impacts on organisational structure according to the plan of each governmental board. This also has an impact on the technical employees, some of whom have left the MHCB along with their knowledge.

The MHCB headquarters is a refurbished HB in the middle of the old city of Tripoli; this location is helpful for easy contact with HBs. That the employees in the MHCB

coexist with HBs makes them have a good sense and knowledge of them. The pattern of work places and provision of a lecture room provides opportunities for meeting and sharing knowledge between technical staff. However, according to social and religion reasons the places were divided between male and female employees.

The MHCB has an allocated governmental budget in addition to resources from its investments. Legally this institution has items to pay for, such as employee salaries, training, stationery and collectibles. Any other payments require a permit from the board that it is accountable to.

The current organisational structure of the MHCB includes four main departments and numerous sections, in addition to a small branch in Benghazi city. However, the main sections in the MHCB that are responsible for HB conservation work are accountable to technical affair department: design and architectural studies, implementation supervision, and the urgent maintenance section, in addition to the historic studies section which accountable to the planning and historic studies department; other sections are supporting sections. However, it was observed that historic studies section is located in a different block in the MHCB headquarters and the presence of historians in the technical affairs department is very limited and vice versa. Also, there is routine when dealing between the technical affairs department and the historic studies department. This situation means limited direct contact that lead to insufficient knowledge sharing between the technical staff and historians.

Furthermore, the supporting sections which accountable to the planning and historic studies department are documentation section and the training section. Technical studies are stored in the documentation section in the planning and studies department. This makes reviewing and updating the database information less easily accessible for technical staff. Moreover, no research and development (R&D) section in organisational structure which should create new knowledge for conservation work.

In the MHCB context, the answers regarding KM expression indicate some awareness. The definitions reflect the point of view regarding knowledge itself 'is it tacit or explicit knowledge.' Furthermore, the current management is keen to develop the human resources in this institution. This appears in some specialized training courses in the field of HB conservation and the head of the MHCB shares his knowledge with others. However, some seniors hold the opinion that some leadership positions in the MHCB are not filled with proper persons. They are not interested in developing employees' knowledge.

Finally, the Libyan governmental decision regarding establishing the MHCBC concluded its tasks. They illustrate aspects of knowledge that should be provided by the MHCBC to conduct these tasks. Also, the regulations and organisation policies permit or support developing national skills. However, the MHCBC suffers from a lack of organisational policies regarding staff motivation and retention.

Chapter 6: Analysing Qualitative Data/ Essential Knowledge Aspects

6.1 Introduction

This chapter studies the qualitative information collected by interviews, organisation documents and observations. The objective of this chapter is to explore and analyze the knowledge aspects that are essential for conducting HB conservation work in the MHCB. This knowledge is discussed in four key categories:

- Assessing and documenting HB values and conditions
- Deciding the level of intervention in HBs (Conservation plan)
- Contract management
- Restoration process in HBs.

6.2 Essential Knowledge for Conducting HB Conservation Work in the MHCB

6.2.1 Knowledge Regarding Assessing and Documenting HBs

Three conservation activities were included in HB assessment and documentation, and these are: studying and assessing HBs' values, architectural surveying, and diagnosing existing HBs' condition (conditional survey).

The majority of interviewees (14/20) mentioned that knowledge regarding studying and assessing HBs values is the most significant issue for supporting the decision regarding the level of intervention in HBs. The head of the MHCB (AJ) stated that:

“Increasing the focus on the architectural and historic studies is crucial to avoid surprises during implementation work. In this way, a technical annex for the required studies in the old city of Tripoli is prepared.”

Historically, knowledge regarding the historic value of HBs contributes to their conservation. The location of a building distinguishes its historic value; for instance, all buildings in the historic core of Tripoli are considered significant historically (AE). Some knowledge aspects were mentioned by an archaeologist (H), who stated that:

“Proficiency in the historical reading of references which directly or indirectly mention some HBs provides facts about these buildings, when they were built, who used them, and what important historic events they present. Furthermore, old photographs and their dates tell us about what is old and new in the HBs, and also the alterations that negatively affect HBs. This helps us to conduct the restoration process correctly.”

Furthermore, the director of planning and the historic studies department (YK) stated:

“The most significant knowledge is regarding historic research methodology; how to study a HB, how to find its history, where did the materials (stone, wood or lime) come from. For example, historic researchers in the old city of Tripoli can start from the Ottoman period, and then go back to older ages. Some art crafts such as metal work give an idea about who made it. Some old Libyan families had this work and are known to have worked on some stages.”

Moreover, an archaeologist (H.T) gave an estimation of an HB’s age as:

“Some Italian buildings were built in the Ottoman period (before 1911), and some Italian companies built some buildings before the colonization. These buildings are considered to have more historical value because they are older and had a role in the occupation of Libya.”

One example of such a building is the ‘Banka Di Roma’ (appendix 3 and Figure 6.1) in the old city of Tripoli, which started its activities in 1907 and played a role in the occupation of Libya in 1911.

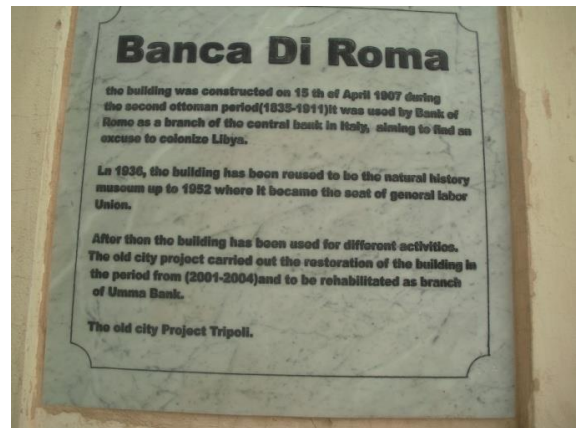


Figure 6.1: Bank of Rome in the old city of Tripoli (the author, 2010)

Architecturally, the knowledge regarding the architectural values of HBs is concentrated on the design style and aesthetic features of HBs, particularly, arches, columns, decorations, external cornices, traditional floors and wall ceramics, in addition to doors and windows. Also, a faculty staff member stated that:

“The design of buildings such as the Abdul-Wahab Mosque [figure 6.2], is significant architecturally in terms of the volume of the building and the proportion of their components.”



Figure 6.2: Abdul-Wahab Mosque in the old city of Tripoli (the author, 2010)

Four of the respondents were from an architectural background, stated that they suffer from a lack of knowledge regarding the architectural style of HBs in Libya, as they had started dealing with HBs all over the country. For instance, an ex-architect (AS) stated that most architectural studies are descriptive studies with few analyses of these HBs and their components. Some studies are about the use of color and their relation to the religion of the owners.

Economically, the HBs' economic value was considered by two interviewees. This could be attributed to the nature of this governmental institution and the nature of HBs themselves. An architectural faculty staff member (AE) stated that:

“We would not expect financial return from HBs, the return is mainly cultural. However, what should be considered is: knowing how to find a financial sponsor that can bear the costs of HB refurbishment. For instance, the restoration of the old French embassy in Rome was financially sponsored by the French government.”

Socially, a small number of interviewees (3/20) mentioned the social value of HBs. An opinion of an ex-architect (FF) was that HBs should be studied socially, particularly for the contribution to knowledge regarding the customs and traditions that affect the design of houses in the old city of Tripoli. On the other hand, a faculty staff member (AE) stated that “emotional values draw us to HBs; these buildings are protected by their cultural identity and history, and by people who love them and are keen to conserve them.” Finally, knowledge regarding HBs values facilitates the conservation work if this knowledge is disseminated among various parts in the society, as a faculty staff member (A.E) argues that “knowledge about HBs' values should be disseminated

among all officials, employees in relevant institutions, general people and also new generations.”

Regarding architectural surveys and preparing drawings of HBs, half of respondents (10/20) considered this activity to be the most significant knowledge that HBs conservation work depends on. Identifying the site of HBs is the first item of knowledge which should be known. The head of the architectural studies section (BS) noted the importance of the “spatial assignment of target sites for conservation and alerting the planning authorities to take care and protect them.” Some of the interviewees (3/20) emphasized that the knowledge about the architectural survey should include vocabulary and artworks in detail, as details show the significance of the architectural value of HBs (figure 6.2, 6.3). They also show the cracks and type of materials in the building (appendix 3). A faculty staff member (AE) mentioned that “in the field of HB conservation, the details are significant in the study of HBs, in presenting their values and in deciding the type of intervention.”

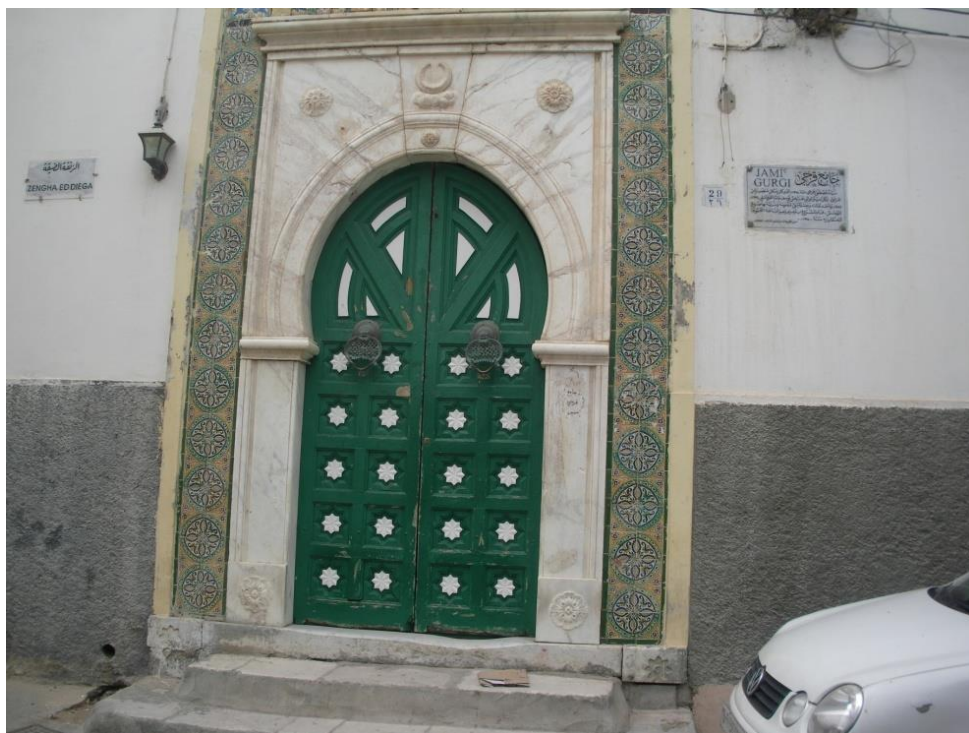


Figure 6.3: The Gurji Mosque Tripoli, details of the main entrance (the author, 2010)

To conduct an architectural survey and prepare drawings, knowledge about some devices and their use is essential. As three respondents pointed out, knowledge regarding the instruments of surveying and their use in architectural surveys and the assignation of sites is essential for their work. Also, others mentioned knowledge about the use of computers for drawing, in addition to digital cameras, as being part of HB

conservation work. These devices provide high level detailed drawings in addition to providing 3D drawings and facilitating digital documentation.

Regarding conditional survey knowledge, a technical employee (TW) stated that it is significant knowledge that technical staff in HB conservation institutions should have. The right diagnosis enables the architects or structural engineers to decide the level of intervention in these buildings in terms of identifying the type of remedy and using the HBs with or without alteration. The interviewees illustrated many types of defect such as floor defects, wall and roof cracks, and humidity on the walls and roofs (figure 6.4 and appendix 3). A technical employee (AM) stated that:

“Because of lack of knowledge, misdiagnosis leads to wrong treatment. For instance, the source of humidity in a wall: is it internal or external? The wrong diagnosis leads to the wrong treatment, causing the continuation of the same problem. However, previous experiences of wrong treatment are a source of knowledge.”



Figure 6.4: Humidity in walls, the former British consulate in Tripoli (the author, 2010)

6.2.2 Knowledge on Deciding the Level of Intervention (Action Plan)

More than half of the interviewees (12/20) emphasized the significance of knowledge on deciding the level of intervention in HBs. The institution’s architects and technical team should decide the type of work (repair or restoration) that should be done for HBs not the contractor or his engineer, because of the nature and sensitivity of HBs. One faculty staff member (AE) stated that “technically, if anything is removed from an HB, there is no way to replace it. It is something related to group memory.” A number of

interviewees were from an architectural background (14/20) mentioned that knowledge about how to return HBs into the original state and remove all deformations is crucial. A supervisor (TE) mentioned regarding restoration work at the Islamic museum that:

“During its life, the building has been refurbished several times. Some partitions which were built recently will now be removed. Floor tiles which were done recently will be replaced by tiles like the old original tiles. Finding original paint was conducted through removing layers of old paint using solvent materials. In the Islamic museum building, six layers of paint were found [figure 6.5].”



Figure 6.5: removing layers of old paint in the Islamic museum, Tripoli (the author, 2010)

An ex-architect (SA) argued that the main knowledge in our work is “how to repair or restore, not renew, HBs, for instance, conserving the wood work in the French consulate” (figure 6.6 and appendix 3E).



Figure 6.6: Conservation wood work in the former French consulate, Tripoli (the author, 2010)

However, the priority, as mentioned by the head of the supervision section (AH) is preventing HBs from deterioration and collapse, and added that “the temporal support of HBs which are in a very bad condition until the real work starts require knowledge about vertical and horizontal support.”

Furthermore, knowledge regarding re-using HBs and their related activities and studies, such as adaptation of the building for a new function or conduction of studies to return a building into its original historic function, are essential knowledge which should be provided to the technical staff of the institutions of HBs conservation. An ex-architect (JL) observed that knowledge regarding the re-use of HBs could be created during “the study of existing buildings and the lives within it, as both contribute to the absorption of HBs and help to choose the proper function.” Two different points of view were represented among the interviewees; the first was that HBs should be repaired as they are, then a suitable function is chosen. The second view was to adapt HBs to the new function. Regarding the first opinion, a civil engineer (NR) mentioned that “the function should not control the conservation process.” Also, an architect interviewee (FF) stated that:

“The goal is to conserve HBs; the function adapts to the HBs not the opposite. There should be criteria for the function of HBs following their repair. This can be conducted by studying the building from two aspects: firstly, the areas and dimensions of HB spaces, and the nature of their function. Secondly, the use of the site land on which the HB lies. This leads to an HB having a proper and successful function in such environment.”

The second opinion about re-using HBs is adapting them to the new function by alteration or redesign of the buildings if required. As an ex-architect employee (AS) stated, “different opinions occur regarding the restoration, such as whether the building should be considered according to one or other function that the building had in that past.” However, in all cases, the re-use of HBs should include the knowledge regarding accessing services (water, sewage and electricity). A supervisor of the Islamic museum project in Tripoli (T.A) stated that “the significant knowledge in our work is how to provide electricity, water and a sewerage system into the HBs without negatively affecting their value.” The Islamic museum project is an example for developing services in HBs; as they renew electricity, water and sewerage systems, in addition to providing a modern air conditioning system. These systems are underground services (figure 6.7 and appendix 3C).



Figure 6.7: underground services in the Islamic museum in Tripoli (the author, 2010)

Another example mentioned by an ex-architect in the MHCB (AS) is:

“The burning system in the Al-Helga Turkish Hamam [public bath] was changed from wood to fuel because firewood had become unavailable. This process requires some knowledge regarding the burning process and also created an alteration in the HB.”

Some other opinions about essential knowledge regarding the level of intervention in HBs were mentioned by interviewees, including provision for disabled/elderly people in and outside HBs, and how to design new buildings in a historic town or adjacent to HBs. Another example is how to design new complementary services such as ticket booking and a cafeteria for the Islamic museum project without negatively affecting the HB’s value. Finally, other knowledge which was mentioned is how to build inside HBs; in other words, how to keep the external elevations walls of an HB while constructing a modern building inside.

Furthermore, HBs conservation principles were mentioned by a small number of interviewees (2/20) while they were stating their opinion about construction materials or the conservation process. The head of the society for the protection of HBs (HB) emphasized that:

“The golden rule is using same materials, distinguishing old and new materials [figure 6.8] and repairing, not replacement materials. Also, there are criteria for colors which are informally used in the old city of Tripoli. For example, white for external walls, dark yellow for cornices and green for doors and windows.”



Figure 6.8: Distinguishing the old and new ceramics in the old French consulate, Tripoli (The author, 2010)

Furthermore, that the principle ‘repairs should be reversible’ was mentioned by one architect (FF), who stated:

“In the case of the use of new materials for refurbishing HBs, its life becomes longer but it loses its value. Materials of HBs should be left as they are. If knowledge regarding how to repair them is not available, we should leave them to future generations who might find solutions.”

It was observed that these principles are known to some extent among architects and others, but they are not applied formally, as there is no guide or reference available in the MHCB. In most of the projects (appendix 3), the principles were not applied correctly, possibly because of a lack of knowledge, in addition to “the policy of conservation in the MHCB being to avoid repeating repair works in the same HB, so the work tends to be refurbishment not just maintenance or repair” (AH).

A small number of interviewees (2/20) mentioned relevant HB regulation. An architect (SA) who was working in the MHCB as an inspector checking violations or working without a permit in the old city of Tripoli stated that:

“Knowledge that is essential in our work is about relevant HB regulations and types of offence, including deformations or changes that occur in HBs such as changing the door or window of a historic building or abusing the specification of material or colors of external painting. Also, we need to know how to apply regulations against offenders.”

6.2.3 Knowledge of Contract Management

One recent theme that appears in the MHCb is knowledge of contract management. Half of the interviewees (10/20), particularly those in high level management, concentrated on this subject. Contract management can be divided into three subjects: preparing contract documents, human resources and qualified contractors, and technical supervision of conservation work.

1. Contract documents are essential to the MHCb's work. The most important issue in the MHCb now (2010) is achieving studies and project documents that include bills of quantities for HB restoration projects, as the government will not approve spending of the financial budget for restoration projects without full documentation. The head of the technical affairs department (RM) stated that:

“The most important issue in the MHCb now is to provide studies and project documents that include items of work, specification, bills of quantities and prices. The government does not approve a financial budget for HB projects without these documents. Because this type of contracting was not done previously in the MHCb and we do not have knowledge or experience regarding it, we face some difficulties starting our projects.”

The Libyan government's regulations regarding governmental institution contracts include conditions for tendering. One of the key conditions is to provide bills of quantities and prices for each item. Also, if the variation of project price exceeds 15% of the contract value, a new contract should be signed. However, in the past, this institution was responsible for the implementation of projects and their budget. That situation made technical staff in this institution ignore contracts and their documents. One ex-architect employee (F.F) stated of contracts and bills of quantities that:

“In the past, this subject did not get attention. The MHCb was responsible for implementation and rent of properties. The expenditures were from this institution, except for the case of the former 'Bank of Rome,' as the building was allotted to al Uma bank who had become the financial sponsor of its refurbishment. Quantities and prices were estimated because the bank wants to know the cost of the project. Now the technical staff needs a lot of knowledge in this field.”

Although knowledge regarding preparing drawings of HBs is available in the MHCb, there is a lack of knowledge regarding preparing bills of quantities and project tendering. This is attributed to a lack of practice in the tendering process. The main difficulty in preparing the items of work and bills of quantities is the lack of standard specifications. A technical employee (A.M) stated about preparing a HB contract that

“there are no suitable specifications for HB conservation work.” Regarding how the MHCB deals with the current conservation projects, the head of the technical affairs department (R.M) stated that:

“In the plan of the MHCB, 12 HBs will be refurbished, as will the external walls (elevations) in the old city of Tripoli. Now, we are working according to a guide for pricing these projects based on the areas and the condition of the HBs: intermediate, bad and very bad. However, the prices are higher than prices of normal refurbishment projects. These prices are a guide to obtain a governmental budget for these projects and help us during the tendering process.”

However, the head of the MHCB (A.J) noted of the contracts that:

“It could be conducted according to items of work and bills of quantities but HBs’ conservation work is surprising. For example, if a layer of wall plaster was removed, an historic aesthetic artificial work could be found under it. The repair of artificial work might cost more than the value of the original contract itself. However, currently according to the lack of knowledge regarding providing project documents, the MHCB cooperates with consultancy organizations to conduct this mission.”

Another consultant interviewee (H.B) mentioned that the “expectation of the actual cost of HB restoration projects is difficult, as the actual cost increases according to variation in orders. The course plus tender is the proper one, this means do the work, and then measure it.” Also, a supervisor (T.E), speaking about tendering, mentioned that:

“In HB restoration projects there are no references to measure the contract value. However, scope of work in HB restoration projects should be identified firstly, and then the contractor(s) offer their prices. For example, in the Islamic museum project, a modern air conditioning system was requested, and the contractor gave his price based on his study. There is a risk in putting a price on restoration work because during the work new stuff appears.”

Furthermore, a faculty staff member (A.E) stated that “research should be part of the contract, and the cost is not important if the work is done correctly.”

Another point regarding contract document is technical terms. A discussion with a group of technical employees regarding some technical terms, such as conservation, repair, restoration and maintenance, illustrated that these terms were used one instead of another. The common term/s used for instance to cover the refurbishment work in HBs in Arabic are two terms together ‘Sianna and Tarmeem.’ These terms approximately mean maintenance and repair. However, this situation calls for unification of the technical terms that are used in the field of HB conservation. Furthermore, AE stated that “in the contract, a clear meaning of technical terms should be illustrated.” Also, an

architect (F.F) claims that “the technical terms that are used in the MHCB are not understood by all the relevant individuals with the same meaning.”

2. All human resources that are relevant to HB conservation work, for example, employees, specialist consultants, contractors, construction materials traders and craftsmen, are part of the institution’s work. However, no explicit knowledge regarding their CVs and details is provided in the MHCB. The head of the design and studies section (B.S) stated that “when we get stuck in some problem, we look for a consultation. Sometimes we depend on ourselves to identify and contact them informally.”

Furthermore, the criteria for choosing a qualified contractor was considered by a university staff member (A.E) as he stated:

“According to what happens in some current projects, the work is given to contractors without the keenness of choosing the most suitable, someone with experience in HB conservation work. If the proper contractors were known the process of choosing becomes easier and less risky. Also, knowledge should be provided regarding the abilities of craftsmen which could be divided into two categories: a craftsman who knows the result of his work and the other one who knows how to apply what he is ordered to do.”

The head of the supervision and implementation section (A.H) stated that:

“Contractors vary from small local firms up to international companies. Often a small firm (sometimes one family’s individuals) is ordered to maintain the buildings that belong to the MHCB or other small HBs. On the other hand, some projects are implemented by international companies, for example, the National Heritage Museum project in Tripoli, Libya. Supervision of these huge restoration projects requires knowledge regarding everything relevant to the contract.”

Knowledge regarding evaluating the quality of the contractors is crucial in the field of HB conservation, as the contractors should have previous experience in similar projects, efficiency and abilities. The MHCB has coordinated with the consultant office to prepare a contractor qualification procedure. However, this procedure for qualifying contractors for the MHCB contains similar items that are applied in new construction projects (section 7.3.2C). Regarding categorizing the contractors, the head of the MHCB (A.J) stated:

“There is a path of elevations [HBs’ external walls] with 518m length in addition to 12 HBs will be restored. 22 contractors applied for these projects, been screened into 12 contractors categorized into 3 groups A, B and C, according to their abilities.”

3. Knowledge regarding conservation work supervision: all interviewees who have previously conducted supervision work on HBs (8/20) were convinced that tacit

knowledge and experience are essential for the supervisors of an HB conservation work site. Distinguishing poor work and making decisions is a key to supervisors' tasks. The restoration projects require a team of technical staff to decide the type of required work and supervision of the restoration work. The coordinator of protecting HBs (H.B), who is a supervisor of such work, stated that the "MHCB's supervision staff are the responsible team for controlling the executing of companies' work in HB restoration projects. They should be able to recognize both right and wrong work. This requires enough knowledge." The head of the supervision and implementation section (A.H) who is responsible for such work in the MHCB stated that:

"The type of work has changed as in the past our institution was an executive organization, our work in this section was completely refurbishment projects include everything relevant to the project: workers, materials, in addition to technical supervision of the work. This situation continued up to 2006, and since this date we have started work with contractors. Now, our task is supervision of HB conservation work, and we are the responsible for adopting the materials and the quality of work."

The decision making regarding the restoration work is a crucial task for supervisors. Decision making is tacit knowledge captured by practice and experience, in addition to qualifications in the field of HB conservation. The author has observed a case that a supervisor made a quick decision during the continuity of work; the supervisor of the Islamic museum project, Tripoli, adopted a grade of paint from three grades of the same color (Figure 6.9). In this situation, if the supervisor does not immediately decide, work delays may occur.



Figure 6.9: Paint grades that were adopted in the Islamic museum project, Tripoli (the author, 2010)

A university staff member (A.E) stated that:

“The supervisors should have knowledge regarding how to manage the contract and recognize the defects. Works during the contract period are changed and construction materials should be adopted, and this requires making fast decisions.”

Furthermore, knowledge regarding dealing with archaeological findings was mentioned particularly by supervisors who have an archaeology background. The head of the society for protecting HBs (HB) stated that:

“Who works in the field of HB conservation should have archaeological sense. When the person is alerted about this point his point of view will be changed and become more careful about archaeological findings.”

An archaeologist (H.T) emphasized that “supervisors should have principles of dealing with archaeological findings. The sites of HBs are often proper places for archaeological findings.” Furthermore, a supervisor of the Islamic museum restoration project (T.E), Tripoli, stated about his supervision experience: “an old olive mill was found under the floor of a room in this museum, to know its age, a test of carbon 14 was done. The result, this olive mill is more than 200 years old. It is now adopted to be one of the masterpieces of museum exhibits”.

As HBs and their sites commonly produce archeological findings, knowledge regarding the principles of dealing with them is essential in HB conservation work. Archaeological findings have an impact on restoration work as they provide evidence of a buildings’ age, the historic function of an HB and emphasize its value. On the other hand, archaeological findings cause delay on these projects.

Moreover, regarding security and safety, one technical employee (T.W) stated that “dealing with HBs is risky work. These buildings are very old and likely to fall (Figure 6.10). Also, deserted old buildings often are not healthy. Knowledge regarding how to deal with safety and health within HBs is essential in this work.” Moreover, the head of the supervision section (A.H) stated that “supporting HBs particularly, the deteriorated ones is not an easy work. It requires knowledge and care while working. Mostly, HB restoration sites are risky sites.”



Figure 6.10: Jama al-Mushat Tripoli, showing the risk of falling during work (the author, 2010)

6.2.4 Knowledge Regarding HBs Restoration Processes

Knowledge regarding restoration processes can be divided into: knowledge regarding the methods and, construction materials and equipment.

1. Knowledge regarding operational work includes the old construction methods that were used to build HBs. Old methods were mentioned by a small number of interviewees (4/20). The head of the supervision section (A.H) pointed out that knowledge regarding the old construction methods of HBs is captured during the supervision of previous refurbishment work. A structural engineer (N.R) mentioned that there is some similarity of HBs' construction systems, as she stated:

“In our reports of HBs inspection, we consider the type of building method. Generally, all HBs that we dealt with are wall bearing systems (thick walls) with stone columns and arches. The main difference appears in the roofing; for example, the roofs of worship buildings include domes or vaults, whereas residential and other public buildings have flat roofs.”

Furthermore, the main problems that require knowledge for repairing them are cracks and humidity in HBs' walls (Appendix 3, Figure 6.11).



Figure 6.11: Monitoring the wall cracks in the Islamic museum project (the author, 2010)

During a visual survey (Appendix 3), one example for treating cracks in HBs' walls was observed. It was conducted by checking the movement of walls through monitoring the cracks (Figure 6.11). If the crack is stable, the treatment process starts, and if not, the situation requires diagnosis of the settlement of foundations and is treated by a continuous foundation. One example is supporting the foundations of the arts and crafts school in Tripoli (Figure 6.12).



Figure 6.12: Supporting the foundations of the arts and crafts school, Tripoli (the author, 2010)

Regarding the treatment of cracks, the supervisor of the Islamic museum restoration project stated that:

“The process of dealing with wall cracks requires knowledge according to the situation, for example, large crack treatment includes digging longitudinal holes (niches) parallel to the wall, each of 20 cm, and fixing a stainless steel bar (dowel) in each niche. Stainless steel bars are the suitable material because it does not impact on the plaster layer. A fiber mesh or galvanized mesh is used to avoid split of thick filling layer of epoxy material (non-shrinkage mortar).”

In some projects, instead of fixing a stainless steel bar, concrete keys are used to repair wall cracks (Figure 6.13).



Figure 6.13: Concrete keys used to repair wall cracks, Tripoli (the author, 2010)

Moreover, the knowledge regarding how to solve the problem of humidity in the walls is limited. The head of the supervision section (A.H) stated that the “real solution for the problem of humidity in HBs’ walls has not appeared yet.” One example of dealing with humidity in HB walls was illustrated by a supervisor from the Islamic museum project (TE):

“This problem was solved by removing two meters of old plaster on the lime stone wall. Then, it was plastered with three layers: pozzolana mortar, fiber mesh covered by mortar containing polymers, and lastly a metal mesh (to prevent cracks between the old and new plaster) covered by a thin layer of lime plaster.”

Lastly, some interviewees (4/20) mentioned that more knowledge should be provided, such as how to repair: details of HB elevations, cornices, deteriorated floors, domes and arches. The head of the supervision section (A.H) claims that “a guide for HB repair is not available in the MHCB, and this negatively affects our knowledge, particularly new employees.” However, the author has observed that new knowledge regarding how to solve the problems of previous wrong physical interventions in HBs is required.

2. Knowledge regarding construction materials and equipment includes four subjects: old materials, current local construction materials, recent repair materials, and equipment. The majority of interviewees (14/20) emphasized that knowledge regarding construction materials is considered the most important issue in HB conservation work.

Knowledge regarding old materials is essential because it provides evidence for assessing HBs' value. For instance, quality construction materials were used in public buildings or officials and rich people's buildings in ancient ages. The head of the protecting architectural heritage society (H.B) stated that: "knowledge regarding these materials is the first step to find proper treatment. Restoration calls for the use of the same original materials." Some of these materials still exist, such as lime stone and brick (Appendix 3). However, old materials should be studied carefully, as the head of the MHCB (A.J) stated:

"Some of the problems are related to certain old materials For example, when deteriorated lime stone, which has aged several hundreds of years, comes into contact with similar plaster materials used for treating or plastering it, some problems may occur, as the condition of this stone may negatively affect the quality of work."

A technical employee (A.M) mentioned that "knowledge about tests of old construction materials and the laboratories or organisations that provide these tests is essential." Also, the director of the historic studies department (Y.K) stated that "knowledge regarding laboratories that can conduct materials tests is significant for diagnosing the materials' condition."

Furthermore, some old materials are not available now, such as some types of ceramics. This means that a certain amount of this material has to be reproduced. As an ex-architect employee (A.S) stated, "the experience of reproducing an amount of a special type of ceramic based on a sample of the original ceramic was a rich source of knowledge. However, distinguishing between the old and new materials was achieved" (Figure 6.8).

Moreover, regarding knowledge conserving old doors and windows in HBs, a faculty staff member (A.E) emphasized that "old doors and windows must not be changed because they have cultural value. Sometimes repairing a door is better than changing it in terms of cost, too." Moreover, a technical employee (A.M) called for "Re-using old materials from destroyed buildings." However, this idea is inconsistent with HBs conservation principles.

Knowledge regarding local construction materials is very significant to conduct the work economically, but some current construction materials are not suitable for use in HB restoration work. For instance, cement is one unsuitable material that has been used in previous projects achieved by the MHCB in the last two decades (Appendix 3). A civil engineer (N.R) stated that:

“We get knowledge about the harm of cement by observing the results in previous refurbishment work. However, some reasons causing this condition are that the proper materials for repairing HBs were not provided by the institution, and this situation negatively affects our knowledge about these materials and their use.”

Also, the head of the architectural studies section (B.S) mentioned that there was a lack of knowledge regarding materials and their use in HBs, as she stated that:

“The result of previous refurbishment work in HBs gives the feeling of new buildings (an HB looks like a new one). This was attributed to using available materials such as cement and paints. We lack knowledge regarding proper HB repair materials.”

A technical employee (A.M) stated that “cement is the only material that was provided” However, lime has recently been infrequently used. This was explained by one interviewee (Y.K) who stated “knowledge regarding using lime was known locally, but it has not been used because Portland cement is provided and its use becomes safer and easier.” However, the head of the HB protection society stated that “the knowledge about suitable materials for supporting HB foundations is significant; now reinforced concrete is used for this operation” (Figure 6.12). Moreover, to prevent horizontal forces in arches, a pre-stressed metal was used in the Islamic museum restoration project (Figure 6.14).



Figure 6.14: Pre-stressed metals to prevent horizontal force in the Islamic museum’s arches (the author, 2010)

However, the lack of knowledge regarding types of metal that should be used to prevent horizontal forces in arches caused more problems in the former British consulate in Tripoli (IT caused crack in columns which attributed to steel corrosion as shown in Figure 6.15).



Figure 6.15: The wrong type of metal was used in the former British consulate in Tripoli (the author, 2010)

Furthermore, knowledge of the use of recent repair materials and their relation to old materials is limited in the MHCB because their use is limited. For instance, the head of the MHCB (A.J) stated regarding paint that:

“A material such as paint that includes resin is another reason why walls keep humidity. Knowledge regarding how to provide and use a paint that does not include resin in its mixture is essential as HB’s walls should breathe.”

Regarding new repair material, an ex-architect (J.L) stated that the “lack of repair materials such as hydraulic lime is a result of it not being available locally. This led to a lack of knowledge regarding their use.” However, this problem still continues as the head of the technical affairs department (R.M) stated that:

“In the current maintenance of some HBs that belong to the MHCB, suitable materials for maintenance are not available locally. This situation forced the contractor to import the materials from abroad. Because these materials are not available, our knowledge regarding their use is limited.”

The author has observed some materials that are used in HB restoration work (Appendix 3), for instance, cement-based rendering (S 641) for restoration (Figure 6.16). Other materials that were used in the Islamic museum project are:

- KB 13 EN 998-1 general purpose rendering mortar (GP) for internal /external use
- B 550 M Fibre-reinforced mortar for repairing walls
- Gypsum lime plaster
- Eco Extra flex
- Metal mesh and fibre mesh, used if the thickness of plaster is high enough to prevent plaster cracks

- Solvent materials (for dissolving old layers of paints).



Figure 6.16: Recent repair material used in the Islamic museum project Tripoli (the author, 2010)

Finally, knowledge regarding the equipment and machines that are used in HB restoration projects was mentioned by some interviewees (5/20) who worked as supervisors of HB refurbishment sites. For instance, ex-architect employee (A.S) mentioned the importance of knowledge regarding equipment that could be used in the HB repair process, such as the equipment to inject mortar into cracks. Also, knowledge of designing forms is required for restoring cornices in HB elevations. Furthermore, the head of the supervision section (A.H) mentioned that support equipment is used to support HBs vertically and horizontally to prevent their failure (Figure 6.10 and 6.14).

6.3 Chapter Summary

The objective of this chapter was to explore in depth and analyze the essential knowledge for conserving HBs in the MHCBC context. This knowledge is categorized mainly into four main categories: documenting and assessing HBs' value and condition, an intervention plan, contract management, and restoration processes.

1. Documenting and assessing HBs' value and condition, including knowledge regarding: studying and assessing HBs' value and condition, an architectural survey and diagnosing existing HBs' condition (conditional survey). Knowledge regarding studying and assessing HBs' values historically and architecturally supports the decision making of intervention in HBs. Studying historic value includes assessing the site historically and when HBs were built, who used them and events they witnessed. Furthermore, the

knowledge regarding assessing and documenting HBs architectural value includes the design style and aesthetic features. Moreover, the common view among interviewees was that HBs have a cultural value not an economic one. The context of a government institution showed less interest in the knowledge regarding economic value of HBs. Moreover, the knowledge regarding architectural surveys and preparing drawings is essential for HB conservation. This knowledge includes preparing detailed drawing for HBs and using instruments to identify HBs' sites, in addition to processing photos. Finally, the main defects that were observed are cracks and humidity in HBs' walls and roofs. Knowledge regarding conditional surveys includes how to conduct the right diagnosis which leads to the right intervention.

2. An intervention plan, in terms of deciding the level of intervention in HB, includes the type of remedies that the HBs require and rehabilitating them with/out alteration. These tasks require also knowledge regarding HBs conservation principles and relevant regulation. Furthermore, it observed that new knowledge regarding how to solve the problems of previous wrong physical interventions in HBs is required. The main effect of lack of knowledge regarding deciding the intervention in HB is misdiagnosis leads to wrong treatment, causing the continuation of the same problem.

3. Contract management knowledge includes preparing contract documents, human resources and qualified contractors and technical supervision for conservation work. The most important issue in the MHCB now is to provide studies and project documents, including bills of quantities and prices as the budget of restoration projects depends on them. The efforts of looking for knowledge regarding preparing project documents and applying it will provide useful knowledge. Thus, it could be said that doing this work will improve knowledge regarding contracting in the MHCB. Regarding supervision, the knowledge those supervisors should have includes:

- Security and safety
- Dealing with archaeological findings
- Conservation principles
- Inspection and recording the work done in HBs and monitoring the work's progress
- Applying all details of contract
- Decision making regarding the restoration work, e.g. adapting materials and methods of restoration.

4. Finally, the operational processes of restoring HBs include knowledge regarding methods and construction materials. Knowledge regarding old construction methods is essential for current restoration. Also, knowledge regarding defects' remedies is crucial.

The MHCB suffers from the lack of a guide for HB repair and this negatively affects technical staff's knowledge, particularly juniors. Knowledge regarding construction materials and equipment includes old and current construction materials, recent repair materials and equipment. Old materials provide evidence for assessing HBs' value, as quality construction materials were used in public buildings or officials and rich people's buildings in ancient ages. The lack of knowledge regarding some proper materials for repairing HBs is attributed to the unavailability of these materials. Also, tests should be done on old construction materials and the laboratories or organisations that provide these tests are essential. Furthermore, knowledge regarding new repair materials and their relation to old materials is important in the case of their use. These materials are not produced locally and are also very expensive in comparison with local materials. Their use is limited, and knowledge regarding them is limited too. Knowledge that should be available is how the used materials for repair are compatible with old materials. Finally, knowledge regarding equipment that could be used in HB repair processes is also needed, such as the equipment to inject mortar into cracks and support equipment.

Chapter 7: Analysing Qualitative Information / Knowledge Sources, and KM Techniques and Technology in the MHCB

7.1 Introduction

The objective of this chapter is to investigate the knowledge sources, and KM techniques and technology in the MHCB through analysing the qualitative information that was collected from the interviews, organisational documents, observations and visual survey. This chapter is divided into eight sections. The first section introduces the chapter. The second analyses individuals in the MHCB context. This includes individuals as a source of knowledge and the employees' movement. The third section analyzes the documents in the MHCB context. The fourth section analyse HBs and their restoration process as a source of knowledge. The fifth section analyzes external knowledge sources. The sixth discusses knowledge management techniques in the MHCB. The section seven analyzes information communication technology (ICT) in the MHCB.

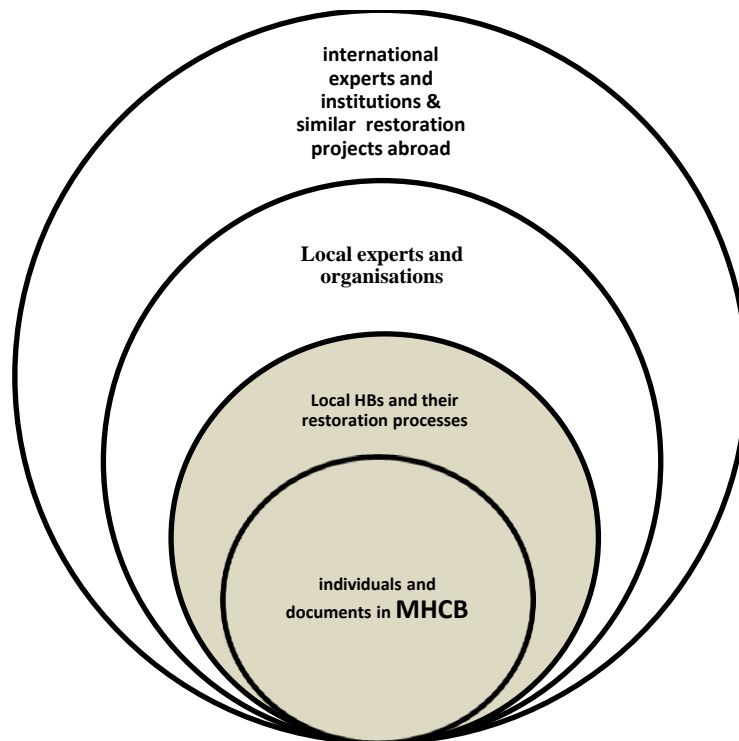


Figure 7.1: Internal and external HB conservation knowledge sources in the MHCB

7.2 Individuals in the MHCB Context

7.2.1 Individuals as a Source of Knowledge in the MHCB

Individuals are the main source of knowledge in organizations. Fewer than half of the interviewees (8/20) mentioned that experts and senior employees who work in HB conservation institutions are a source of HB conservation knowledge. The director of the MHCB library (E.R) stated that:

“People who have knowledge are more beneficial; they should be considered as people of interest. The officials in the institution should encourage them to share their knowledge with others.”

Also, a technical employee (T.W) stated that:

“Work colleagues are the main source of knowledge; they provide quick solutions for problems. For example, regarding how to repair a crack in the dome of Kushat Assufar Masjid in the old city of Tripoli, a colleague helped me to find a solution. However, this person has left this institution.”

7.2.2 Employee Movement in the MHCB

The main obstacle regarding knowledge sharing among employees is the seniors' leaving work. On this theme, fewer than half of the interviewees (8/20) mentioned technical employee movement in the MHCB. A senior technical employee (S.H) stated: “Unlike other departments, technical department staff are the most changeable staff, whereas in other departments their staff is more stable.” Also, the director of the MHCB library (E.R) stated that “A group of senior employees and consultants have left this institution. It was a loss for the institution, an irreplaceable loss.”

Regarding the effects of employee turnover, seven interviewees emphasized that it had caused a knowledge gap or leakage and non-continuity of knowledge transfer, in addition to being a waste of time and costing money to re-train them. Employees and others outside the MHCB agreed regarding the negative effects of this action. The head of technical studies (B.S) stated that “Architects and others who left the MHCB have caused a gap, because we have lost their knowledge.” Also, (A.B) stated “Knowledge loss occurs as a result of senior employees leaving the institution.” Moreover, F.F mentioned that “seniors have left the institution; most knowledge that employees have is in their minds, and unfortunately it leaves when the holder leaves the institution.” Furthermore, (H.B) stated “The departure of employees from the bureau has led to the loss of the knowledge that they possess. Also, there is the cost of the time and money rehabilitating others.” An ex-employee (J.L) stated that “senior architects and engineers who have left the institution have caused the non-continuity of knowledge transfer in

this institution; it has caused a type of damage to accumulated knowledge.” Finally, an engineer (R.M) mentioned the performance of work and leakage of explicit knowledge, as she claimed that “Employees who have left the MHCB negatively affect the performance of work; some studies and reports which had already been done by them were lost because only they know where they are.” However, at top level management, the head of the institution (AJ) stated that:

“Because of the lack of experts in the MHCB, we deal with external consultant offices. Our ambition is to dispense with their services in three years. This should be conducted by increasing the knowledge and abilities of our technical staff to the level of consultants.”

Previous quotations present a problem as MHCB cannot meet its objectives of conserving HBs effectively because of the huge technical staff turnover.

The main reasons why employees leave the institution are: administrative changes and limited motivations in addition to unhealthy and dangerous workplace in the old buildings are. A small number of interviewees (3/20) attributed this to the administrative changes. An ex- architectural employee (J.L) stated about the results of the administration changes that “the heads of this institution have been changed more than seven times since its establishment. When the head manager leaves some architects and engineers depart this institution too. Others leave because they disagree with their heads.” Others attributed that to the lack of organisation policies regarding staff motivation, as an ex-architectural employee (S.A) stated that “although their work type is harder than normal jobs not enough motivation was provided for technical employees.” Moreover, a technical employee (T.W) stated that “although of unhealthy and dangerous work place in the old buildings, there are fixed salaries and limited motivations for technical staff to continue in this institution.”

However, the MHCB suffers from a lack of architects and engineers. To deal with this constraint, the current head of the MHCB (A.J) stated:

“We called the human resources institution (governmental institution for recruiting) to provide us with a group of technical staff, and we could train them to conduct the work. Mostly, our condition (in terms of qualifications and experience) for new employment is not considered, nor are there enough technical employees. However, the MHCB uses members (short contract) to conduct some work. Also, the MHCB deals with external consultancy offices.”

Also, the director of the technical department (R.M) stated that a “limited number of qualified technical staff has led to the use of technical consultant offices to conduct comprehensive studies of HB conservation.”

According to the regulations, the employment process requires an approval from the ministry. However, although of the delay, recruiting or transferring employees from other institutions is possible and short term employment for specific work could be done in the MHCB.

7.3 Documents in the MHCB Context

7.3.1 Knowledge Repositories in the MHCB

Dar Ahmed Al-Naeb for Documents and Manuscripts (former Salat Assrosi School) and Library (former British consulate) are two HBs in the old city of Tripoli (figure 5.8). They have been used as the main explicit knowledge warehouse places in the MHCB.

Dar Ahmed al-Naeb for Documents and Manuscripts, which includes the MHCB archive, is the place of collecting the MHCB's documents (figure 7.2). It is a separate building located approximately 100m away from the main MHCB headquarters (figure 5.8). The documents that were stored in dar al-Naeb are: drawings, reports, studies, maps and photographs that are relevant to HBs and restoration work (table 7.1, figure 7.3 and figure 7.4), in addition to video and audio recording tapes (Figure 7.5). These tapes include lectures and presentations that were done previously. The wonder is that Dar Ahmed Al-Naeb for documents does not include documents in digital form.



Figure 7.2: Dar Ahmed Al-Naeb for Documents and Manuscripts (the author, 2010)

Technical and historic documents were listed in a folder (paper form record). The codifying process is not helpful for retrieving the documents as they are listed without, for instance, classification of document type (studies, reports, pictures...) or an alphabetical system. Also, there is no sufficient description for the contents of a

document that helps in accessing the required document. Furthermore, there is no voice or visual record/tape, nor any written documents that were done years ago. The library's director (E.R) stated regarding visual-audio records and other documents in Dar al-Naeb that:

“A lot of lectures that were presented by specialists were recorded in audio-visual form and stored without reuse or dissemination to relevant employees. The lectures finish at the same time of its presentation. It is not difficult to disseminate them; it needs just willingness and a group of employees to write (transcribe) and reverse their contents.”

The director of Dar al-Naeb (K.R) stated “our archive contains a lot of documents which we have not yet benefitted from.”



Figure 7.3: Dar al-Naeb for documents in the old city of Tripoli (the author, 2010)



Figure 7.4: Drawings and maps in Dar al-Naeb for documents in the old city of Tripoli (the author, 2010)

Table 7.1: Technical, historic documents in Dar al-Naeb for documents

Type of document	Number of documents
Paper documents	1063
Video and voice record tapes	325
Photographs	443 package
Digital documents	0



Figure 7.5: The MHCb audio/video records in dar-Naeb for documents Tripoli (the author, 2010)

Furthermore, the archive in dar-Naeb for documents includes thousands of items of correspondence and other documents (figure 7.6) which have not been organised or codified yet as (E.R) stated:

“Archive section includes also a lot of documents regarding repairing and refurbishments of HBs include drawings, reports and projects documents in addition to correspondences. All this stuff does not provide benefit because no one cares about them, even natural factors affect them negatively and they could be damaged. All this stuff should be stored digitally.”



Figure 7.6: Part of the MHCb’s archive in dar-Naeb (the author, 2010)

As it was observed in Dar-Naeb, accessing documents needs a permit and routine procedures, causing some constraints in acquiring knowledge. A senior technician (S.H) stated that “in addition to the delay in the procedure, that the archive and library are located outside the MHCB’s headquarter causes a type of difficulties.” However, to avoid loss of documents they should be maintained as the head of historical studies (A.B) stated:

“An official procedure regarding borrowing documents from Dar al-Naeb is essential, as without this procedure these documents could be lost. Lectures of experts and presentations of previous projects in video audio records should be transferred into written or digital forms. Also, preparing documentary films or programs is a tool for keeping their content. However, each department should provide a guide of the documents that it has. All stored documents should be refined (to identify the significant subjects) and indexed. A hard copy or more should be saved in a private place (not used) and reciprocal copies (shared) for daily work. However, the transfer of these paper documents into digital forms has been considered recently.”

The other explicit knowledge’s repository place in the MHCB is the Library (former British consulate). It is located in a separate building 300m far from the MHCB headquarters (figure 5.8). It includes specific books and journals in addition to the MHCB’s publications. The MHCB’s library director (E.R) stated:

“The library provides knowledge and information in the form of books, journals and other publications. It contains more than 25,000 titles in different subjects, particularly in the field of architecture, history and other general knowledge. There were some subscriptions; however, currently subscriptions are not available because of some financial difficulties. Books’ exhibitions contribute in provision specialist references. We deal with requests of employees and the visitors and provide them even which are not provided locally as possible. Because of some difficulties of dealing with foreign currencies we deal with private local publicising houses. This is a way that some books can be provided”

The library not only suffers from lack of subscriptions to recent relevant journals but also a lack of suitable references, different languages and the location of library outside the MHCB is additional obstacle. As (J.L) stated:

“The nature of the work requires use of references, lack of suitable references and the location of library outside the MHCB causes a type of obstacle. Also, English language is considered as an obstacle in addition to lack of Arabic references. Translation of main articles into Arabic is a helpful tool for transferring knowledge. Furthermore, academic research regarding historic cities and buildings that were conducted by Libyan researchers do not find their way to the MHCB. The majority of this research is very helpful for providing knowledge in the field of HB conservation.”

However, a faculty staff member (A.E) states that “in addition to copyright constraints, translated books do not benefit as originals. The original books are different when it is compared with translated books.” Also, the head of the technical studies section claimed that the “Library provides different disciplines publications; however, most of the references in the field of HB conservation do not provide deep knowledge.”

A notice that was observed is that the historians use the library more than the technical staff and, generally, the percentage of employees who visit the library is very low in comparison with the percentage of external visitors (most of them are students). This might attributed to employees can borrow books, whereas external visitors only use books inside the library. The head of the technical studies (B.S) stated that “There is a crisis of reading; only academics do.” Also, the library is a separate building located outside the main MHCB headquarters. Ex-architect (S.A) mentioned that “the location of library outside the MHCB headquarters decreases its use by technical employees.” Furthermore, the materials held in the library are not relevant directly to the field of HBs and their conservation, as ex-architect (F.F) stated, “The library helps in spare times. However, books and journals are not specialized in the field of HB conservation.” Moreover, there are not up to date references in the library.

Regarding using ICT in the library, the director of the MHCB’s library (E.R) claimed that “There is no internet service in the library. We still deal manually with library services instead of digital way. However, we requested a system from the officials.”

7.3.2 The processes and Content of the MHCB’s documents

The organizational documents that were analysed in this section include: technical data forms and procedures, technical reports and studies, and the MHCB’s publications. The documents that were analysed covered the period between 1991 and 2010.

1- Knowledge processes in technical data forms and procedures

The forms and procedures that were analysed include: a form for HB data collection, the requirements of technical studies in the old city of Tripoli and the contractor qualification procedure for HB restoration projects.

A. a form for collecting HB data (appendix 4) was prepared by the staff in the technical affairs department. It is located in the architectural study section in the MHCB. The form is a survey of HBs’ existing situation and includes 12 sections:

- 1) Brief historic background
- 2) HB location, its area and number of floors in addition to sketch of site plan

- 3) HB original and current use (history of its use)
- 4) HB style (locally, Ottoman, European...)
- 5) HB type (court with arcades, court without arcades, small house, new building)
- 6) HB components
- 7) HB condition (choices and description of each condition: excellent, good, medium, bad, collapsed)
- 8) Priority of required treatment (urgent, maintenance, not required)
- 9) HB value (historically and architecturally)
- 10) Architectural elements and features
- 11) Construction system (wall bearing, column and beam) and construction materials (walls, roofs and floors)
- 12) Technical and intervention decision.

The three page form includes multiple choice questions with description for some items. It was prepared to collect information for preparing technical reports about HBs. This form is a helpful tool for documenting the existing situation of HBs and articulating technical reports. However, it does not provide deep information because assessing HBs' value and condition for deciding the level of intervention in HBs needs more investigation than answering multiple choice questions or deciding in the same time.

B. The procedures of required technical studies include the condition for the studies that should be followed for preparing a comprehensive technical study for historic buildings. It is located in the technical affairs department and includes five sections:

- Documenting the existing situation
 - Historic study and archaeological architectural analysis
 - Architectural documenting (architectural survey)
 - Photographical documenting (visual survey)
- Structural study and diagnosis of the existing situation
 - Supporting design
 - Structural study for equilibrium and foundations of HB
 - Test for groundwater level
 - Laboratory test for the construction materials of HB
 - The patterns of defects and methods of remedy
 - The exact restoration of HB elements
 - Laboratory test for the materials of HB
- Proposes (deciding) re-use and restoration work
 - Re-use design programme
 - Restoration study
 - Studies for development design
 - Landscaping
- Electric mechanical work
- Quantities and specification.

This procedure provides explicit knowledge and could be followed for preparing HB conservation comprehensive studies. These studies include: documenting the existing situation of an HB, deciding on the type of intervention in terms of the re-use of the buildings and type of remedy required, and preparation of contract documents. This explicit knowledge could be shared between technical staff for re-use in preparing conservation studies. However, it was observed that this procedure does not include the requirement to consult previous reports previously done in the organization. However, tacit knowledge is required for assessing and deciding on different situations, and also to deal with different HBs according to different features and values.

C. The contractors' qualification procedure for HB restoration projects was prepared recently and it is under the authority of the technical affairs department. Because of the lack of knowledge regarding preparing such procedures, the MHCB has coordinated with a consultant office to prepare this procedure for choosing qualified contractors. The result is a list of contractors ranked on an approved bidders list. The bidder assessment criteria in this procedure are based on the following four major factors:

- Financial status 30%,
- Major contract experience and technical ability 40%,
- Quality assurance entity 20%
- Supporting documentation 10%.

Assessing each contractor's qualifications requires following the explicit knowledge offered by the procedure, as well as the experience and tacit knowledge so that the appropriate assessment is made.

2- Knowledge process in technical studies and reports

The studies and technical reports that were analysed in this section include:

- a) Architectural study for Santa Maria church
- b) Architectural study under title re-use Bank of Roma
- c) Structural study for Bank of Roma
- d) Conditional survey study for Hosh Mohsen
- e) Conditional survey reports of Gasawia building and Ben Musa Mosque
- f) Correspondence files for numerous restoration projects.

a) The architectural study about Santa Maria church in the old city of Tripoli is located in Dar al-Naeb for documents and includes:

- The introduction and historic background of its construction periods
- A site plan and the significance of its location
- A description of the existing building and an analysis which includes:

- Church entrances and courtyards
- Plans (spaces functions)
- Elevations, the tower and details (aesthetic aspects of the building)
- Sections (type of construction and heights)

b) The architectural study of the former Bank of Roma in the old city of Tripoli is located in Dar al-Naeb for documents. This goal of this study was to re-use this building as a branch of the Al-Umma bank (Libyan bank) and includes:

- An introduction and historic background to its construction and the functions that it historically had. Also, it determines the changes in this building.
- A site plan
- A description of the existing building, including:
 - Plans (spaces functions and areas)
 - Elevations (aesthetic aspects of the building)
 - Sections (type of construction and heights)
- Proposal drawings for the re-use of the building (figure 7.7)
 - Requirements of proposed function
 - Constraints
 - Architectural solutions

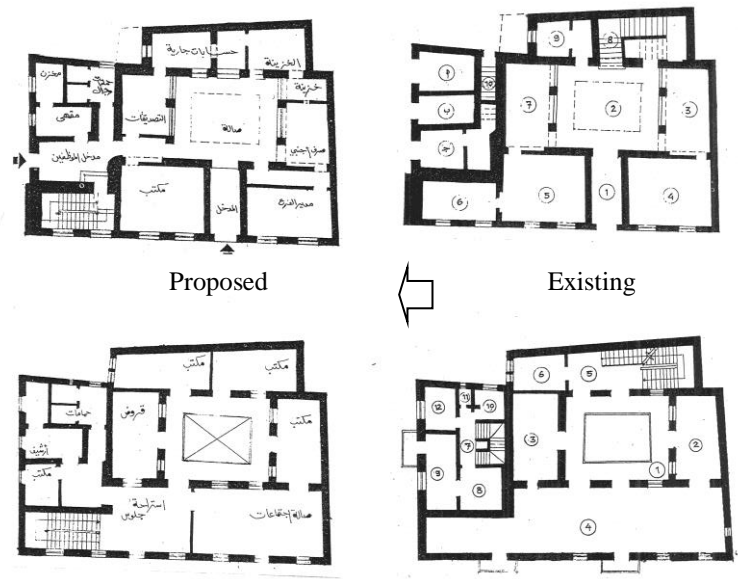


Figure 7.7: Drawings of proposal alteration in Former bank of Rome

These architectural studies of some HBs are descriptive studies of the existing situation and the re-use of these buildings. A review of these studies illustrated that there is a type of knowledge articulation in terms of following a typical format in preparing architectural studies.

Furthermore, it was noticed that both the architectural studies and historic studies included the historic background of HBs, date of establishing the building, historic periods that this building witnessed and its development, in addition to the historic

functions of the buildings. The architects are forced to investigate some historic references to find evidence, for instance, searching for the date of establishing these buildings, identifying its style and exploring their use historically. Also, they determine the changes in these buildings that can help for deciding type of use according to some historic period that these buildings attended. Architects in the MHCBC do not benefit from historical studies because each work was done separately, both studies were done concurrently, or the technical study was done first. This causes repetition of the same work in addition to insufficient historic evidence because of fragmentation of efforts. Historians might prepare partly what architects need for the architectural study in terms of historical use of the building that affects their design or alteration of these buildings and decides the proper function, but this is not often available because a comprehensive historic study requires a long time and it is always submitted after the architectural study.

c) Structural studies about the bank of Rome in the old city of Tripoli. This study is located in Dar-Naeb for documents. It was prepared in the MHCBC and includes:

- A site plan
- A description of the existing building, including:
 - Ground floor and First floor (existing)
 - Ground floor and First floor (constructional evidences of changes)
- Relation between this building and neighbour buildings.
- Construction materials used to build this building
- Construction methods by which the historic building was built
- Construction situation of the building in terms of floor, walls and roofs or ceilings (conditional survey) and proposed solution.
- Solutions for architectural alterations.

The architectural and structural studies of the former bank of Rome were prepared in 1992 by an architect and an engineer who left the MHCBC years ago. Although this person had left, the contents of their study provide knowledge for other generations. In this study the tacit knowledge was transferred into explicit knowledge for others, particularly as those in the same job could obtain knowledge not only about HBs' situation but also how to develop such studies. These studies' restoration processes were done in 2002. However, these studies have not been updated to include the alteration restoration processes that were done, nor the problems that were faced and how they were solved.

d) A conditional survey study for Hosh Mohsen in the old city of Tripoli was prepared by the technical staff in the MHCBC as a case study for a training course done in May 2010. This study is stored digitally on staff computers. The study includes assessing the existing situation of a building's elements (figure 8.8) and the causes of its deteriorated case. Also, it includes tests for stones, mortars, plaster layers, salt, water, colours, and ceramics. Furthermore, the sewage system and water supply were studied in addition to roof layers and foundations. The study includes repair of some structural elements and identify items of work.



Figure 7.8: Conditional survey drawing: Hosh Mohssen in the old city of Tripoli (the MHCBC, 2010)

e) The technical reports for diagnosing HBs situation were located in files belonging to the engineers who contributed to preparing them. The condition survey report of Gasawia building (two floors building) in the old city of Tripoli was prepared by technical staff in May 1998. This report includes the condition of ceiling or roof (higher floor), walls and floor of each space and the elevation of this HB. Also, the required work was briefly identified. The report does not include any photographs or drawings. However, knowledge regarding preparing reports of an HB condition survey has been developed recently, for instance, the conditional survey report of Ben Musa Mosque in the Kushat Assufar area in the old city of Tripoli. It was prepared by technical staff in May 2009. The conditional survey of this building, prepared in a table, includes the

condition of each space in the building (without repeating) and this table includes material types. This report includes tables, detailed drawings and pictures of the defects and damages and their specified places. Also, the report includes the required work in detail.

The knowledge regarding preparing conditional surveys of HBs was developed according to the requirements of work in the institution, For instance, the need for laboratory tests and studying the foundations and roof layers became part of the work. The requirements for developing structural studies were identified because of previous mistakes that appeared in former restoration work such as: wrong diagnosis or use of the wrong construction materials. In the field of HB conservation management, knowledge regarding previous restoration work helps in updating the required knowledge to conduct the restoration work correctly.

f) Regarding correspondence files, these include the diaries, letters and progress reports of finished refurbishment projects. The files of the former Bank of Roma, Santa Maria church and the national heritage museum (a former cigarette factory) projects in the old city of Tripoli were reviewed. These files are located with some staff in addition to the head of the technical affairs office. Correspondence files of restoration projects include mainly: the supplied materials and equipment in addition to progress reports that include what has been achieved. The correspondence files and progress reports neither include how the work was done nor document the problems that the restoration works faced and how the problems were solved. Furthermore, the work progress report of the national heritage museum prepared July 2009 includes a summary of the total activities achieved, for instance, quantities of demolition work and removal of plaster and floors. Also, the report included plans illustrating the places where work was done. Although the project documents could offer significant data regarding HBs and their restoration, the process of documenting restoration work is poor and based on pictures more than reports or written forms. Also, they do not include the problems that these projects faced and how they were solved.

3- The MHC B's publications as a tool for knowledge capturing and dissemination

The MHC B has published numerous publications (figure 7.9) which include: a periodical journal, books and booklets in addition to proceedings for symposiums organised by the MHC B. Some of these publications such as architectural and historic studies in addition to regulations and principles were used in the research literature

review and in this chapter as well. Most organization's publications are located in the MHCb's library in addition to the planning and studies department. The objective of illustrating these publications authored by employees and cooperating consultants in the MHCb is to determine their contents and the ways of knowledge capturing and dissemination in the MHCb.



Figure 7.9: The MHCb's publications (the author, 2010)

The MHCb published 12 issues of a periodically journal called *Atar al-Arab* between 1990 and 1999. This journal was published jointly with the archaeology board. The journal includes articles prepared by employees and consultants in the MHCb in addition to the specialist in the field of archaeology. Other subjects include translated material and architectural subjects, in addition to the archaeology board and the MHCb news. The articles that are relevant to HB conservation that were authorized by employees and cooperating consultants are mainly historic, architectural studies and present relevant governmental laws (table 7.2). However, although the publications contribute partially in knowledge capturing and dissemination, there is no encouragement for publishing in the MHCb, as (E.R) stated:

“Some works were published by personnel efforts in a local journal such as *Atar Alarab* journal. However, despite its success, it was stopped by the previous administration because of financial difficulties. The current administration has not released any publications.”

Table 7.2: Articles relevant to HB conservation that was published in Atar Alarab journal

Date of issue	Title of articles relevant to historic building conservation	Author
Issue 1 - Sep 1990	Unavailable	
Issue 2 - March 91	Old Arabic houses in the city of Tripoli	(Romanelli, 1923) Translated by Co-operator consultant (F. Kabazi)
Issue 3 - Sep 1991	The architectural complex of Darghot in the old city of Tripoli – historic study	(Wlgen, 1962) Translated by Co-operator consultant
Issue 4 - March 92	Al Nagha mosque in the old city of Tripoli – architectural study	(Swed, 1992) Arch. employee
Issue 5 - Sep 1992	Islamic Baths, with reference to baths in the old city of Tripoli– historic study	Co-operator consultant
	Former Bank of Roma in the old city of Tripoli – architectural study	(Tarhuni, 1992) Arch. employee
Issue 6 - March 93	Some missing Islamic buildings in the city of Tripoli – historic study	(Hamed, 1993) Co-operator consultant
	Ottoman Basha Islamic School in the old city of Tripoli – arch. study	(Elfituri, 1993) Arch. employee
Issue 7&8 -March 95	Methodology of maintenance and restoration in the old city of Tripoli	Co-operator consultant
Issue 9&10 - Autumn 97	Suqs (Markets) in the old city of Tripoli – historic study	(Jubran, 1997) Historic researcher employee
Issue 11&12 - Spring 99	Architectural arts of Tripoli city	(Hashem, 1999) Co-operator consultant
	The old hotels in Tripoli – historic study	(Jubran, 1999) Historic employee
	Law number 3 - 1994	(GPC, 1994)
	Features of the old city of Tripoli: complex of Darghot– historic study	(Hasnien, 1999)

Furthermore, the MHCBC has published numerous books, mostly historic studies including ones on Dar Alghadi, Alkharuba Mosque, the former French consulate, the former American consulate, and the old hotels and markets in the old city of Tripoli. Moreover, eight booklets⁶ were published, six of them regarding models of Islamic art and architecture in the old city of Tripoli published in 1998. The rest are booklets on the laws and regulations regarding HBs and cities, in addition to a guide regarding HBs in the old city of Tripoli, as shown in table 7.3. However, there is no encouragement for technical staff to publish or write articles as ex-architect in the MHCBC (F.F) claims, “Some material is published by personal efforts.”

⁶ A small thin book, usually with a soft cover, that gives information about something – Oxford dictionary

Table 7.3: Books and booklets that were authored in the MHCB

Book title	Author and Date
Dar Alghadi: The study includes section for identifying the location of a building, describing the building architecturally, the alterations and the existing situation and its use.	(Abozbeda, 2002)
Alkharuba Mosque the location and description of architectural features	(Bosiefi, 2002)
The former American consulate in the old city of Tripoli: historic study of the building and regarding relation between Libya and America. Part includes a description of the building and its location based on historical evidence, its use historically and its situation now (alteration and deformation)	(Abo Zbeda, 2004)
The Former French Consulate in the old city of Tripoli: historic study regarding relation between Tripoli and France and architectural analysis of developments and alteration of building's components. The importance of its location. Date of construction. Alteration based on maps 1857, 1865, 1873 and 1912.	(Jubran, 2005)
The markets of the old city of Tripoli: economic and historical study	(Jubran, 2010a)
The old hotels of Tripoli	(Jubran, 2010b)
Booklets	
Ornamentations on entrances, doors and windows	1998
Al – Maharib (niches)	1998
Ceramic tiles and plates	1998
Ornamentations on woodwork and metal work	1998
The tomb stones	1998
Gypsum Ornamentations	1998
Guide of the old city of Tripoli features	2002
Tripoli, history and civilization	2004
Libyan administrative law number 3 (1994) about the protection of historic cities, neighbourhoods and historic buildings and its implementing regulations	2007

Another type of MHCB publication is proceedings for the symposiums that were organized by the MHCB with others in 2004 and 2007:

- Conservation of old cities symposium 8-9 December 2004 Benghazi – Libya
- The 1st symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya 27-29/10/2007 Ghadames, Libya.

Proceedings for symposiums and the presentations in the symposiums themselves not only contribute to the dissemination of knowledge to relevant employees in the MHCB but also provide knowledge regarding specialists' details and CVs in the field of HB conservation, particularly local ones. Many Libyan postgraduate students' research in some universities abroad concentrates on Libyan HBs and cities and their conservation. However, the MHCB does not benefit from this knowledge because it is not published or disseminated to local conservers. Proceedings for symposiums and conferences are a venue to disseminate this research. A number of disciplines are presented in symposiums, for instance the principles of architectural heritage conservation and

disciplines regarding the effect of the environment on architecture in spaces; however, these are not provided locally either as training courses or as other MHCB publications. Table 7.4 presents some of the paper titles from these symposiums that are relevant to Libyan HBs and their conservation.

Table 7.4: Papers authored by local specialists and others in symposiums organised by the MHCB

Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya 27-29/10/2007 Ghadames, Libya.	
Paper title	Author(s)
Architectural heritage conservation: the purposes and the principles	(Wafa, 2007) Tripoli university
Conservation of historic and architectural heritage	(Salama, 2007) Tripoli university
Law no. 3 regarding HBs conservation (1994) between theory and practice	(Jubran, 2007)
Developing historic cities, Tripoli old city as a case study	(Itaiem, 2007) Tripoli university
Architectural composition in the old city of Tripoli	(Ghmati, 2007)
The effect of environment on architectural spaces	(Madi, 2007)
Using Maslow's theory for deriving strategic indications (social study)	(Abojenah, 2007) Tripoli university
Damp and the method to minimize its impact on historic buildings	(Mousaui, 2007)
Use of advanced technologies in HB restoration projects	(Bashemam, 2007) NGPLAH society
Symposium under title: Conservation of old cities 8-9 December 2004 Benghazi, Libya	
Methodology of HB restoration: case study of in red castle Tripoli	(Bashemam, 2004) NLGPLAH society
The architectural style of the old city of Tripoli	(Alhashmi, 2004) Zawia university
The Renovation and development of the old cities	Bashir Azlitni , 2004) Tripoli university
Towards sustainable development for old cities	(Abulghasem, 2004) Tripoli university
Analysis study of architectural heritage	(Shawesh, 2004) Tripoli university
The old city of Tripoli between the past and present: analysis study of structural and morphological properties	(Awedh, 2004) Tripoli university
Architectural heritage between economic feasibility and historic memory: study in heritage tourism	Omar al Mukhtar University

7.3.3 Constraints of the Documenting and Dissemination Process

Regarding constraints in the documenting and dissemination process, more than half of the interviewees (11/20) focused on the notion that the documenting process of restoration work was not done in the clear way, whereas the lack of a dissemination process was mentioned four times. The head of the architectural studies section (B.S) stated that "Correspondence starts during the presence of a problem, and the problem is identified, but after the solution is identified it is not documented at all." Furthermore, a technical employee (A.M) stated that:

“problems and their solutions not being documented and presented in a convenient way. Sometimes, the work was documented visually, and rarely by technical reports. Most knowledge is in supervisors’ minds.”

Moreover, documenting the restoration process is essential for developing a restoration work guide in the MHCBC. The coordinator of national group for protecting Libyan architectural heritage (NGPLAH) stated that the “Presence of an HB repair guide is essential to help employees in the supervision of restoration work. Issuing and disseminating a guide for the maintenance and repair of HBs is necessary.” The lack of availability of such a document provoked the head of the supervision section (A.H) to claim that “A guide for historic buildings repair is not available in the MHCBC; this negatively affects our performance, particularly new employees.”

The director of the technical department (R.M) stated that “Individuals document their achievements not their experiences (in terms of failures and problems that they have faced).” Some interviewees (5/20) identified reasons for not documenting the experiences of restoration work. The first reason was the shortage of technical staff, as the head of architectural studies section (B.S) argued,

“They are not documented because of a shortage in the number of architects and engineers in the MHCBC; all are busy on multiple tasks, and this forces the MHCBC to use surveyors who are not interested in writing or documenting.”

Also, a technical employee (T.W) stated that “technical employees do not have time to write their experiences.”

Others blame managers, as ex-architect (F.F) mentioned, “There is no formal programme for documenting or disseminating.” Also, (T.W) stated “Heads of departments do not care about reports of supervising work and they do not request it.” Moreover, ex-architect (S.A) stated that “Employees are not motivated by managers to document their work in an organized way that they can get benefit from them in the future.” By observing the reaction of the respondents it demonstrates that it is their responsibility but they do not like to acknowledge it. Even the head of the MHCBC (A.J) stated “It is an interesting point, and this issue requires attention.”

Regarding the disseminating process, a technical employee (T.W) claimed that “Studies of construction materials and any relative published materials should be disseminated to employees to get benefits.” Also, a surveyor (S.H) stated that “there no publications are disseminated in this organization.” However, the lack of disseminating explicit technical knowledge is expected and attributed to the lack of articulation. An ex-architect (J.L) stated that “despite the issuance of publications regarding historic

studies, the articulation of technical works such as architectural, structural and repair works receive no attention from the technical department.”

7.4 HBs and their Restoration Process as a Source of Knowledge

Dealing directly with HBs was one of the main sources of knowledge. The head of architectural studies (B.S) noticed that architects obtain some knowledge of HBs value in terms of sense of place during architectural surveys, as she mentioned that “living with these buildings (being familiar with HBs) during the architectural survey and preparing drawings of HBs provides absorption of architectural values and ratios in these buildings.” This demonstrates clearly that this type of tacit knowledge is captured by practice more than studying. Furthermore, an ex-supervisor in the MHCb (A.S) stated that:

“The supervision of restoration projects is a significant source for acquiring knowledge. When the suitable materials were not available such as some types of ceramic which were used ages ago, we were forced to contact a local producer to provide this ceramic. It was a successful experience that we have shared in the production process of this material, by providing the design with respect of conservation principles, in terms of avoiding the mimicking the old materials. We have got useful knowledge from this experience.”

The MHCb’s projects and other similar projects are a source of knowledge. The coordinator of the national group for protecting HBs (H.B) emphasized the benefit from similar projects to increase knowledge. However, the main constraint in acquiring knowledge from restoration work is the wrong method of restoration, as a faculty staff member (A.E) stated, by saying that the “former French consulate in Tripoli, it is good that this building was refurbished but as a specialist I object to this method.”

A visual survey was conducted in Tripoli city to explore the nature of restoration working processes in HBs (appendix 3). A set of observations led to identifying the main problems that HBs in Tripoli suffer from, some mistakes that occurred in previous restoration work, and some issues that comply with conservation principles in previous restoration work. Furthermore, the nature of restoration working processes in HBs is characterized by continuity and some repetition of work type. However, there is a wide variety of specific building situations for instance: size, high, age, value, complexity, construction materials, and the use of HBs. Moreover, there is also the weather during the work that requires different types of work, particularly, during the wet season. Differences in knowledge base that are gained from different situations have implications for knowledge capture and sharing. In general, current and previous

restoration work is a source of lessons learned and knowledge that is essential for future restoration work that will be achieved in the same building or other HBs.

Moreover, HBs' conditional surveys require conducting construction materials test; however, some of these tests are not available locally. The head of the planning and historic studies department (Y.K) stated that:

“We have faced a problem during a workshop in HBs conditional survey; some construction materials tests are not available locally. Some tests are available but not all tests.”

However, the lack of knowledge regarding the test of some construction materials is a constraint on the performance of conditional survey studies and the restoration itself.

7.5 Dealing with External Knowledge Sources

In the field of HB conservation, a variety of knowledge sources is important. External sources cover the shortage of internal ones. The external sources of knowledge could be categorized into three groups (figure 7.10): Local experts (belonging or not to organisations or consultant offices) including previous employees. The documents of relevant local institutions include for instance: the archaeology department, consultancy offices, academic organisations and scientific societies. Also, experts and documents that are relevant to international institutions such as UNESCO are sources of knowledge, in addition to similar restoration projects abroad.

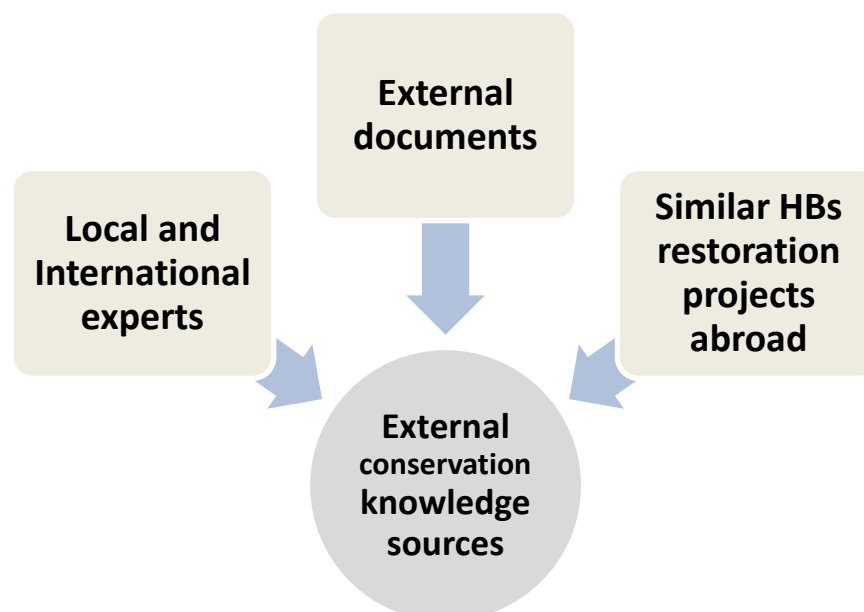


Figure 7.10: External knowledge sources

7.5.1 External Local Experts

Local experts in the field of HBs conservation are a key source of knowledge in the MHCb. The head of the architectural study section (B.S) stated that when they faced a problem they hired an external consultant (ex. architectural faculty staff member) and mentioned “Consultants are the best source of knowledge in our work.” These experts could be individuals who work separately or belong to local consultant offices or organizations. Also, the coordinator of the national group for protecting HBs (H.B) stated that “meetings with experts enrich the individuals’ knowledge.” The head of historic studies (A.B) stated that “Knowledge is derived from oral narrative so it arrives to interested individuals.” These experts could be categorised into: Local experts, including some previous employees, and old expert builders and craftsmen.

The head of the architectural study section (B.S) stated “local experts who have knowledge regarding HB conservation are scattered; different specialists without an organisation that gathers them.” Furthermore, as mentioned in section 7.2 previous senior employees could be considered as a source of knowledge according to their practice and experience in this field. During the field research, the author met some architects who had worked in the MHCb. The author noticed that their interest in HBs and their conservation was still active and they were willing to provide their knowledge. For instance, some of them were members of the national group for protecting HBs and an architect who had worked in the MHCb had an active web site called ‘Almirath’ (the heritage). This site focuses on Libyan architectural and crafts heritage (<http://mirathlibya.blogspot.com/>). However, some other previous technical employees were working for consultancy offices providing consultations to the MHCb.

Moreover, some of the interviewees (4/20) emphasized that old surveyors, builders and craftsmen who had worked in HBs were the source of conservation knowledge. Ex-architectural employee (A.S) mentioned that:

“An old surveyor who lived in the old city of Tripoli provided me and my colleagues with some important knowledge from his specialist and experience. Also, he had given a lecture about tradition building, methods and construction materials.”

Furthermore, a coordinator of protecting HBs society (H.B) stated that “Old expert builders are a source of knowledge; however their knowledge should be explained scientifically. This means their experiments should be put in a scientific case [tested].” A previous architect (J.L) mentioned about the old builders in the old city of Tripoli:

“Observing them when they are working with traditional methods and materials that were available until the eighties of last century, after that they retired and now they are very rare because of the age factor; some of them have transferred their career onto their sons.”

During a visit and meeting with a local contractor of the Almushat Mosque restoration project in the old city of Tripoli, he informed the author that he had gained his experience from his father (Muhammad Alhemal) who had worked in repairing or reconstructing some HBs in the old city of Tripoli. For instance, he had worked on Durghut Mosque (Figure 8.11), which was built between 1553 and 1565 and damaged during the Second World War. A label above an entrance of the mosque includes (in Arabic) an acknowledgement from an official in that period to Alhemal and others who conducted the work in 1946 (left Picture in Figure 7.11).

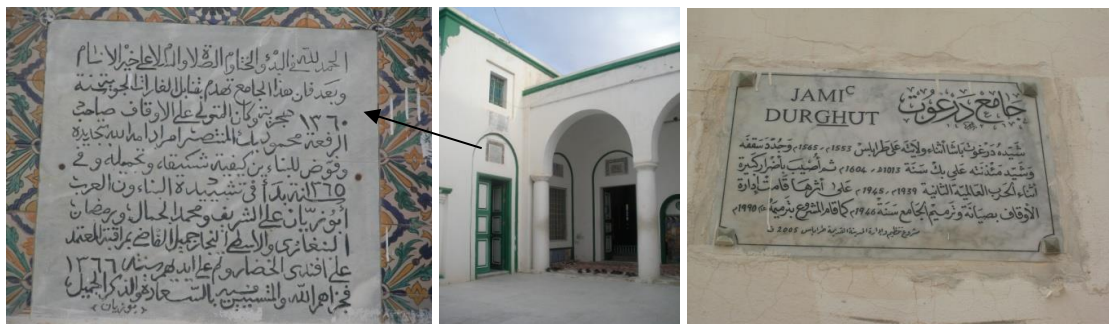


Figure 7.11: Durghut Mosque in the old city of Tripoli, Libya (the author, 2010)

However, the head of the historic study section (A.B) stated

“The benefit from expert art craftsmen and specialized workers is limited in the MHCb. However, some elders already provided some lectures in MHCb particularly regarding the history of HBs”.

Lastly, regarding how to benefit from experts, some interviewees (4/20) stated some opinions: the MHCb should recruit specialized experts, particularly for technical support and also to deliver lectures (story telling) in addition to workshops and training courses.

7.5.2 Relevant Local Organisations

Some local institutions: universities (particularly architecture, civil engineering, fine arts and historical studies), research institutions, local scientific societies, archaeology department and some other institutions are the sources of HB conservation knowledge. H.B calls for the benefits of different local sources of knowledge (individuals and documents) such as: the archaeology department, universities, societies and others. Academic institutions are a source of HB conservation knowledge.

Furthermore, a previous architect in the MHCb (J.L) stated:

“Academic architecture science started in Libya in 1969. This is the start of the interest in local architecture and HBs and cities in our country. Architectural students get some knowledge about HBs during their study in the architecture department, but not in depth.”

An ex-architectural employee (A.S) criticized academic courses:

“At the beginning the main source of our little knowledge is our academic study, it was general acknowledged. Architectural students get knowledge about the old city of Tripoli and HBs from their teachers as a part of education programme, and also, as some practice summer training in the MHCB.”

According to the syllabus of the architecture school in Tripoli University (table 7.5) some traditional courses help in the field of HB conservation, for instance, Architectural restoration, History of architecture, Islamic architecture, and Local architecture.

Table 7.5: Courses relevant to HB conservation in the Architecture school, Tripoli University

History of architecture arch 233	Survey of architectural history which includes study of architectural styles of the following: Egyptian, Babylonian, Assyrian, Persian, Greek, Chinese, early Christian, Byzantine, Romanesque, Gothic and Renaissance.
Islamic architecture arch 333	Study of Islamic architecture since its birth (inception) in the seventh century of our era. It reviews analytically and systematically the development of Islamic architecture as follows: the beginning of Islamic architecture, Umayyad architecture, Abbasid architecture, the early, classic and later classic Islamic architecture of north Africa, the early Islamic architecture of Spain and early Islamic architecture of Asia.
Local architecture arch 385	Study of regional characteristics of Libyan culture, climate, and landscape as determinates of local architecture. It reviews the three main areas: coastal, mountain, and desert architecture.
Architectural restoration arch 452	Study of various meanings of conservation. It reviews the different attitudes and techniques of historical preservation, architectural restoration, and architectural and urban conservation.

Furthermore, numerous Libyan postgraduate students' research focuses on historic buildings and cities. Although this research is the source of knowledge, most researchers have not published or disseminated their research locally, particularly to conservation institutions.

Regarding relevant societies, the coordinator of the national Libyan group for protecting architectural heritage (NLGPAH) stated about relevant courses that these are produced in some local institutions and in cooperation with society:

“Courses in the history of architecture are available in archaeology departments. Also, individuals in such organizations provide knowledge in addition to consultants. Cooperation of heritage societies with governmental institution contributes with knowledge sharing between them. Our society contributes technically in providing consultants for HB repair work. For instance: now NLGPAH is supervising the repair work in Mushat Mosque [appendix 3B] in the old city of Tripoli.”

7.5.3 Foreign Similar Restoration Projects and Relevant International Institutions

The external sources of HB conservation knowledge that are discussed in this section include: foreign bodies and similar scientific societies, similar restoration projects abroad, and international organizations.

1. Foreign bodies and similar scientific societies:

The experiences of other countries in the field of HB conservation and similar restoration projects abroad in addition to their publications were considered by four interviewees. One faculty staff member and previous consultant for the MHCBC (A.E) stated:

“The institution should recommend that architects and other staff should be sent to other countries which have previous experience, to learn the correct methods of HB conservation, and then adapt what they have learnt in their work. Also, there should be twinning with other historic cities abroad for using their experiences in restoration and administration. The use of others experiences for example, Perugia in Italy, applied the concept of planting function within the body of HBs [conserve HBs elevation and build inside]. However, blind imitation of the western in everything is not correct. Also, give some HBs to scientific institutions to try methods of repair.”

Furthermore, the coordinator of NLGPAH society (H.B) mentioned knowledge exchange with scientific societies abroad, for example, collaboration with Jerba society in Tunis.

Furthermore, the head of the MHCBC (A.J) stated that what is needed is “Cooperation with governmental consultant office in other countries in the field of HB conservation. For instance cooperation with the Turkish governmental consultant office, this office corresponds to the MHCBC.” Moreover, a surveyor (A.M) stated “Keeping contact with specialist companies in the field of HBs restoration is essential.” However, one example of cooperation mentioned in a book (one of the MHCBC’s publications) under title, French consulate in Tripoli (Jubran, 2005:146) mentioned the cooperation with French officials for conserving this building. It includes for instance, bringing some documents and maps relevant to this building.

2. Cooperation with International Organizations

Libyan Roman and Greek cities, in addition to Ghadames (desert historic city), were registered as international heritage sites in Libya. This situation permits them to benefit from international institutions. Although the old city of Tripoli was not registered as an international heritage, some cooperation with these institutions such as the United

Nations Educational, Scientific and Cultural Organization (UNESCO) exists. The Convention for the Protection of the World Cultural and Natural, which was issued on 16th November 1972, stated that the “Charter of the UNESCO provides for the dissemination of knowledge.” International institutions are considered a source of knowledge by few interviewees (3/20). An ex-architect employee (J.L) stated that:

“Cooperation with this international organization is very useful source of knowledge. However, the methodology of former local officials regarding dealing with external organizations and their opinion was ‘we could do this work without external help’. This is attributed to political reasons in the 90th decade. This made cooperation unsuccessful; particularly this city was not registered as one of international heritage sites.”

The current head of the MHCB (A.J) stated that:

“There are chances for benefitting from UNESCO’s branches such as ICROM. They have experts but their services are not free. UNESCO does not provide work but it can commission the work to consultancy offices.”

A university staff member (A.E) stated that “the fees are paid by our government to UNESCO; some HBs should be registered as international heritage.” Furthermore, the head of the documentation and historic studies department (Y.K) stated that:

“We cannot contact UNESCO or other international organisations directly. We have to deal with ministry of foreign affairs. However, during a former contact with UNESCO they offer some links such as giving their name to the conferences that will be arranged in Libya regarding conservation. This will encourage the specialists in this field to share in such conferences.”

The lack of benefit from UNESCO or its branches was previously attributed to political reasons in the 1990s. Libya is a member of UNESCO and has been paid for this participation. This organisation can provide knowledge particularly when the buildings are registered as international heritage. Some contribute such as by subscribing to UNESCO’s publications according to the charter of the UNESCO regarding the dissemination of knowledge. Also, conferences could be arranged in Libya conducted under the auspices of UNESCO. This will encourage the specialists in this field to share in such conferences. The tools for sharing knowledge include: training courses, conferences and subscriptions in the documents of international institution. However, the main constraint in dealing with UNESCO or other international organisations is that the contact is not direct, as the MHCB has to deal with ministry of foreign affairs.

7.6 Knowledge Management Techniques in the MHC B

The majority of interviewees (15/20) mentioned different techniques as supporting tools for transferring or sharing knowledge in the MHC B. The techniques that were mentioned include: discussions and asking for help, meetings, training, lectures and presentations, team work, rotation work system, trial and error, recruitment, conferences, monitoring and reading.

7.6.1 Discussion, Asking for Help and Meetings

Discussion among work mates and asking for help in daily work in addition to meetings were mentioned by six interviewees as techniques for knowledge transfer. The coordinator of the NGPAH society (H.B) stated that “Discussion with work mates and continual communication between individuals is essential for developing our knowledge.” The author observed that knowledge sharing in the technical affairs department happens spontaneously and a collaborative climate has been provided; male and female employees share in asking questions regarding the work, whereas informal discussions tend to occur within each gender separately in their halls. However, discussions between two genders regarding work occur often in formal events as the head of architectural studies (B.S) stated that:

“Female employees share in discussions with male work mates in lectures, presentations and meetings events. Respecting the confidentiality of female employees meetings is necessary.”

Also, a technical employee (T.W) stated that “female employees dislike dealing with men informally because of social and religious reasons.” Furthermore, female technical staff do not share in all types of knowledge exchange activities as the director of the technical affairs department (R.M) stated, “They have special reasons, some of them are mothers; they cannot work extra time or share in some tasks. However, some are willing to share in any type of activities.” An ex-architectural female employee (F.F) explained “Women’s time is limited and they cannot share in activities after the work period, as the women have to look after their homes, husbands and children.”

Generally, the context in the technical affairs department provides opportunities for meetings and sharing knowledge between technical staff while respecting the Islamic rules regarding separation between genders.

One formal tool for discussion is meetings. Employees present a formal event for discussing and solving problems. Half the interviewees (10/20) consider meetings as suitable techniques for sharing knowledge and solving problems. A technical employee (T.W) mentioned “Meetings in the technical department for discussing the problems that

are faced at work are effective; meetings are available in the technical department even if two or three persons do that.” Also, a technical employee (A.M) stated that:

“Decision making is based on discussion when the solution is decided for example, in the case of alteration in HBs. This increases our knowledge. However, often the final decision is the manager’s decision.”

Furthermore, a head of architectural studies section (B.S) claimed that “the goals of meetings are to present problems, motivate employees and state what is required from employees in next stage. However, the number of meetings in the MHCB is limited.”

7.6.2 Training Courses and Workshops

Regarding training courses, six interviewees mentioned this technique as a tool for knowledge transfer. The coordinator of NGPLAH society (H.B) mentioned that “More interest in training is essential for providing knowledge in the field of HBs conservation.” The head of the MHCB (A.J) stated that “Training is available for employees as they are the foundation of the institution.”

However, as shown in table 7.6, most training courses in the MHCB were computer courses in addition to some technical and management courses. Most courses were held outside the MHCB by external consultancy offices (external training). The exception is a course on preparing architectural drawings, which was conducted by a senior architect (internal training) in 1992. Three other training courses (Survey instruments 2009, conditional survey 2010 and data base system 2010) were conducted by external experts inside the MHCB headquarters with HB in Tripoli as case studies. These training courses (workshops) provided practice in the real context; this made the benefit greater. A faculty staff member (A.E) stated that “without practical knowledge, architects cannot deal with HBs, as this work looks like surgeons’ work.” Local workshops on HB conservation provided real practice in this field as the head of the historic studies department (Y.K) stated, “Local training provides a chance to apply the studies to local HBs, for example last May 2010 a training course about the methodology of HB restoration was conducted by an external expert. The case study was a HB in the old city of Tripoli called Hosh Mohsen.”

Table 7.6: Training courses in the MHCB (1990-2010)

Training courses in the MHCB	date
Architectural drawing – Internal training course by a senior architect	1992
Management for engineers and technicians - External course	1994
Ceramic - External course	1995
Basic design, Shadow and perspective - External course	1998
Survey instruments (total station) - External course	
AutoCAD - External course.	2004
International computer driving licence (ICDL) - External course	2006
Arch cad, AutoCAD-3D - External course	2007
International computer driving licence (ICDL) - External course	
Project management - External course	2008
AutoCAD 3D - External course	2009
Survey instruments (total station) - External course conducted in the MHCB	
Database system - External course conducted in the MHCB	2010
Photo shop - External course	
Conditional survey - External course conducted in the MHCB and a case study is HB in Tripoli	

Although some training courses are essential for new employees, no training was programmed for them in the MHCB. An ex-architect (F.F) stated that “the stage of training should be at the beginning of employees’ work but this is not available in the MHCB.” Also, an ex-architect (J.L) mentioned that “New employees who have intense interest were not oriented correctly. There is a lack of training.”

Another constraint is that foreign training requires consent and the decision should be provided from the ministry. The director of planning and the historic studies department (Y.K) mentioned that “Sending staff abroad for training is difficult and the procedure is complex and requires a governmental decision.” However, to deal with such a constraint the head of the technical affairs department (R.M) pointed out that “the MHCB cooperates with local consultancy offices to provide training courses that are not available locally.” In these courses the MHCB will contract with local offices and pay them local currency, and this overrides regulations that prevent governmental institutions from contacting foreign organizations without the ministry’s permission. Moreover, the head of the MHCB (J.L) stated:

“The contract conditions with consultancy engineering offices that will conduct some technical studies for the MHCB will provide foreign training in addition to training during the work for our technical staff. There is also a plan to send some employees abroad to achieve a diploma in the field of HB conservation. We will depend on ourselves in all technical work of HB restoration work in 3 years.”

Furthermore, regarding the role of training the head of the institution (A.J), stated that:

“The training section prepares a training plan yearly and chooses a type of training: technical or managerial training. This plan is prepared according to a meeting to discuss required training courses and who should attend them.”

However, the training section (see MHCBC’s organisational structure figure 5.8) suffers from a lack of knowledge regarding required training courses in the field of HB conservation and who provides them. The head of the planning and historic studies department (Y.K) stated that “we do not know the details of required training courses. Also we do not know who provides these types of training courses.” This is attributed partly to the responsibility of looking for such courses, which is not entrusted to technical persons.

7.6.3 Presentations and Lectures

Regarding presentations and lectures, six interviewees mentioned these as techniques for transferring knowledge. Presentations and lectures are useful techniques for acquiring knowledge. An interviewee stated “Lectures and seminars are essential for discussing cases and specific subjects regarding historic buildings conservation.” For instance, presentations on technical and historical studies contribute to the development of conservation processes. Also, presentations provide chances for sharing knowledge as H.B stated: “Presentations are a chance for sharing opinions and to get feedback from attendees.”

Furthermore, presentations of work problems during the project could be conducted for adopting construction materials or to find solutions for some problems that HB conservation projects face. For example, a supervisor (T.A) stated that “In the Islamic museum project, a presentation was conducted by the supplier of materials about some products, and based on this seminar the materials were adopted.” Furthermore, about the presentation, after the end of the conservation project, the head of architectural studies section stated that:

“Presentations of previous projects happen rarely. However, the presentation always is how the HB was and how it became instead of lessons learned from previous projects. In general there is no documenting process for how problems were solved.”

The negative points in the existing situation of presentations in the MHCBC could be concluded as: presenting the achievements not the lessons learnt, the opinions during the presentations are varied, and the constraint is no encouragement to seniors to deliver

lectures about their experiences in addition to a lack of invitations for external experts to produce lectures.

The head of the architectural studies section (B.S) stated:

“The presentations of finished restoration projects state how the HB was and how it became, this means presenting the achievement without presenting the problems and failures that occurred ... when a problem is presented during the project period, the architect or engineer does not get the proper solution. For example: I have faced difficulties in Abdul-Wahab Masjid project; presenting the problem has not provided me with a solution because of different opinions. This caused work delay”

Also, an ex-architect (A.S) stated that there are a “Variety of opinions during a presentation on a project which might cause work to stop, and sometimes non-specialist opinions can cause confusion.”

Moreover, a senior surveyor (T.W) stated “no lectures were introduced by employees regarding their experiences. There are no incentives that encourage seniors to present their experiences.” In addition to the lack of incentives this might be attributed to architects and engineers being rare in the MHCB and often very busy. Ex-architect employee (F.F) stated “The number of architects and engineers is limited. No chance to give more time for lectures and presentations.” However, head of architectural studies section (B.S) stated that “Lectures that are presented by external experts are limited in the field of maintenance and restoration of HBs. However, some seasonal activities are in the field of cultural, history and arts.”

To benefit from such activities, the coordinator of the national group for protecting architectural heritage (H.B) claims that “institutions should provide educational lectures for employees. External experts should be invited for giving lectures.” Also, the head of the architectural studies section (B.S) emphasized that “the problems during the work should be presented. The lecturer should be motivated and also technical staff should be motivated to attend the lectures and presentations.” Furthermore, an ex-architect in the MHCB (A.S) suggest that “Each employee should be ordered as a part of his work to prepare material in a topic relevant to HBs conservation and present it as a lecture or seminar.”

Regarding the willingness of employees to attend lectures, a senior surveyor (S.H) stated that “in the past, surveyors were not interested in attending lectures or conferences because of unawareness and small ages. Now, our interest has increased as experience and ages have increased.”

7.6.4 Symposiums and Conferences

Three interviewees mentioned the role of attending symposiums and conferences as a technique for capturing external knowledge. The coordinator of the NGPAH society (H.B) stated that:

“Symposiums and conferences goal in our developing countries always to solve problems and disseminate knowledge in some topics through gathering the specialists together to present their knowledge and exchange it and transfer knowledge to attendees. In Libya attending these events is free of charge. However, the officials did not benefit from conferences as they neither apply the opinions and experiences of others, nor increase knowledge of employees.”

Symposiums and conferences regarding HB conservation are rare locally (Libya). The head of the architectural studies section (B.S) stated that “Conferences regarding historic cities and buildings are very rare. Some are established once every three or four years. However, their themes are not concentrated on HB conservation.”

Three symposiums and one international conference were conducted in Libya between 2004 and 2010:

- Conservation of old cities symposium 8-9 December 2004 Benghazi – Libya.
- The 1st symposium: towards general strategy of architectural and urban conservation for historical cities in Libya 27-29/10/2007 Ghadames –Libya.
- The sixth international conference of the centre for the study of architecture in the Arab region (SAUD 2009) Tripoli – Libya.

Furthermore, the MHCB plans to organize symposiums on specific topics. The head of the MHCB (A.J) stated that “the MHCB is planning to organise symposiums periodically. The real contribution of relevant employees on such activities to develop their knowledge is our goal.” The MHCB plans to organise a symposium in 2011 under title construction materials and their use in HBs. The director of planning and historic studies department (Y.K) stated that:

“The proposed symposium that we intend to organize is about construction materials that are used in HB restoration work. This is a good chance to gain knowledge from experts and make contact with them.”

This proposed symposium under a specific title may contribute to the provision of specific knowledge regarding construction materials used to build and repair HBs, and the techniques of using these materials in restoration work. Also, it may help identify the local industry of traditional construction materials. However, it was postponed because of the Libyan revolution in 2011.

7.6.5 Rotation Work System

The rotation work system is another technique for getting internal knowledge. It is used in sections of the technical department. A technical employee (T.W) mentioned that “I have worked in many tasks in different technical sections. This happened informally because of a shortage of employees or as an alternative when employees are on holiday.” A shortage in the number of architects and engineers who are working in the technical affairs department is noticed. This forces most technical staff to work in many tasks in different technical sections such as: assess architectural value of HBs, architectural survey and preparing drawings, diagnosing HBs situation, deciding type of intervention and the supervision of restoration projects. This forced rotation work system technique (employee works for period of time in one section, then transfer into another one) contributes to an increase in the knowledge of technical staff. However, the head of architectural studies section (B.S) claims that:

“Shortage in architects and structure engineers causes confusion in the work. Architects and construction engineers are replaced by unqualified technicians, draftsmen and surveyors. Those require extra preparing to conduct some work when there is no alternative person to do it.”

7.6.6 Trial and Error

Trial and error in terms of learning from previous wrong and right experiences is a technique mentioned by six interviewees. Experiences are acquired from problems that were faced and treated in previous projects. In this subject, one civil engineer in the MHCB (N.R) mentioned that “when dealing with HBs, no references and no laboratory experiments are available to get information and knowledge, it is just personal effort.” Also, a technical employee (A.M) stated that “the solutions of previous technical problems could help other similar cases.” Furthermore, ex-architect in the MHCB (F.F) stated that “We get benefit from previous solved problems when similar problems are repeated.” Some previous experiences were acquired by trial and error techniques, as a senior technical employee (T.W) mentioned:

“Experiences such as disadvantage of using cement in HB repair work are one of the main sources of knowledge. Their advantages and disadvantages are a great chance for learning and avoiding their disadvantages in future.”

This interviewee in the MHCB mentioned that getting knowledge among technical staff has occurred by trial and error. However, an interviewee outside the MHCB (H.B), the coordinator of the NGPAH society, claims that the trial and error policy is a mistake as he emphasized that:

“Theoretical background is very important for decreasing the risk, time and efforts of trial and error for solving problems. However, trial and error policy in HBs without care is a big mistake.”

Furthermore, there is a lack of any documenting or disseminating process for solving problems; this is one of the weakest points facing managing knowledge in the MHCB, as knowledge that has been acquired by previous experiences is not transferred to others. An ex-architectural employee (J.L) stated that:

“There is lack of learning from previous mistakes and right experiences. The MHCB should disseminate the culture of learning from mistakes and considering mistakes as a chance for learning and a part of work.”

7.6.7 Recruitment

Seven interviewees mentioned the recruitment technique for providing knowledge in the MHCB. The coordinator of the NGPLAH society (H.B) stated that “Hiring HB conservation specialists will accelerate the MHCB’s employees capturing knowledge and enhance the institution’s work.” Regarding the criteria of recruitment, an ex-employee (J.L) stated that:

“Individuals who have knowledge and experience in addition to sincerity and credibility for managing the work should be attracted. These supposed individuals should be chosen according to criteria of competence and willingness.”

Also, the head of the architectural studies (B.S) stated that “the condition for recruiting employees should include willingness to work in the field of HBs conservation.” However, neither criteria for recruitment in the MHCB nor all required knowledge could be covered by it. An ex-architect in the MHCB (F.F) stated, there is “No criteria for recruitment.” Also, not all knowledge could be covered by recruitment as the head of the historic studies section (A.B) stated “not all required knowledge could be provided by employment.” Regarding dealing with specialists in the MHCB context, a senior engineer (N.R) stated that:

“There was a committee of consultants of different specialisms who had worked for the MHCB up to 2006. Their contracts had included attending the MHCB for two days a week for providing consultations; if there is a problem they share in discussing it.”

Regarding the need for consultants, the head of the architectural studies section (B.S) stated that:

“There is a need for consultations of various expertise; architects, engineers, historians, archaeologists and fine arts specialists are essential in our work.

However, the head of the MHCB was not interested in specialists in the field of HB conservation; no retention of the previous consultants group. When we face a problem, we look for a consultation; in fact, sometimes we depend on ourselves to contact consultants according to our knowledge about them.”

Also, the head of the historic studies section (A.B) stated that “experts may not respond to the invitation to contribute or have conditions; the time between expert time and institution work should be organized.” An ex-architect in the MHCB (F.F) stated that “Nostalgia and desire to preserve identity is the motivating reason for some local experts (outside the MHCB) to provide their knowledge, not money.”

On the other hand, the head of the MHCB (A.J) stated regarding the current process of recruiting consultants for specific works that “Our institutional policies do not prevent cooperation with specialists, when we need consultation a contact is made but the response depends on the consultants.”

From observation, identifying the specialists in the field of HBs and their conservation that were conducted by the researcher reveals that there was no list of CVs for those specialists in the MHCB. Also, knowledge regarding specialists exists in a few employees minds as tacit knowledge. Some employees have specialists’ numbers in their mobile phones.

7.6.8 Team work

Team work provides knowledge sharing between an organization’s individuals and could include individuals from outside. The team work technique was mentioned by four interviewees. The head of the historic studies department (Y.K) stated that “in the MHCB a team work technique has been applied. Historians work together with a technical team, particularly with architects, to conduct a comprehensive study of a particular HB.” However, although teamwork has been applied in the MHCB it has not been developed. Some team members believed that teamwork melts the person. An ex-architect in the MHCB (A.S) mentioned that:

“After the work order of the team work is issued a separation has occurred among different specialists; each works alone and the importance of discussing the work together was not given priority.”

However, applying this technique has not been successful in the MHCB as an ex-architect in the MHCB (J.L) stated:

“Team work: the argument is sound but application is wrong. Work order often includes a group of different specialist: architect, structure engineer, historical researcher and two or three surveyors. During the work, a type of divergence

happens. Although there is integration of their work, there is no coordination between them. The group does not absorb the meaning of team work. For example, architects and historians do not discuss what they need for their work.”

7.6.9 Monitoring

The monitoring of employees’ abilities and progress was mentioned by two interviewees. A senior civil engineer (N.R) stated that “New employees in the MHC B do not get training at the beginning of their work; they are just monitored by their section’s head or receive help from workmates.” Also, the head of the technical affairs department (R.M) stated that “Monitoring employees’ progress is essential.”

7.6.10 Reading (Private Study)

Lastly, four interviewees mentioned reading. An ex-employee (F.F) stated that:

“Self-reading of previous HB restoration projects’ documents ensures the validity of solutions of previous problems and how they were solved. This can help in amending and improving the solutions. Also, it will help save time and effort when dealing with HBs in many aspects such as: documenting, deciding the proper function, prepare contract documents and supervising.”

Also, reviewing the documents of previous conservation projects provides explicit knowledge. The coordinator of the NGPHB (H.B) presented an example to benefit from such documents:

“Although the prices of restoration work are not certain according to variation orders during the project, reading the financial documents of previous projects provides knowledge for indicating the prices of conservation work.”

On the other hand, a technical employee (S.H) stated that:

“Reading depends on the willingness of person. However, it is not enough to absorb the subject or to get information and knowledge. It should be supported by experts to explain the written information.”

7.7 Information Communication Technology (ICT) in the MHC B

Real use of computers and IT started only recently (2006) in the MHC B. Previously computers were used only for printing. HB drawings were prepared manually and stored in cabinets as shown in figure 7.4.

The current head management in the MHC B is keen to provide ICT; there is approximately one computer for each employee and a database system was provided in addition to internet services. Five interviewees mentioned IT; all of them considered IT in the MHC B to be in progress. A technical employee (T.W) mentioned that “IT is available; there is one computer for each technical individual.” Also, the head of the historic studies section (A.B) stated that “Recently, all work is done digitally, such

reports, studies and pictures. Other written documents could be stored digitally by scanners.” However, it was observed that the software that has been used in the MHCB is mainly AutoCAD and word processing, and there are no computer programs such as Case Based Reasoning (CBR), which would contribute to managing knowledge. Reports, drawings and adding pictures of HBs are done digitally (figure 7.12 and 7.13). Drawings that were prepared manually are transferred into digital forms by scanner (figure 7.14).

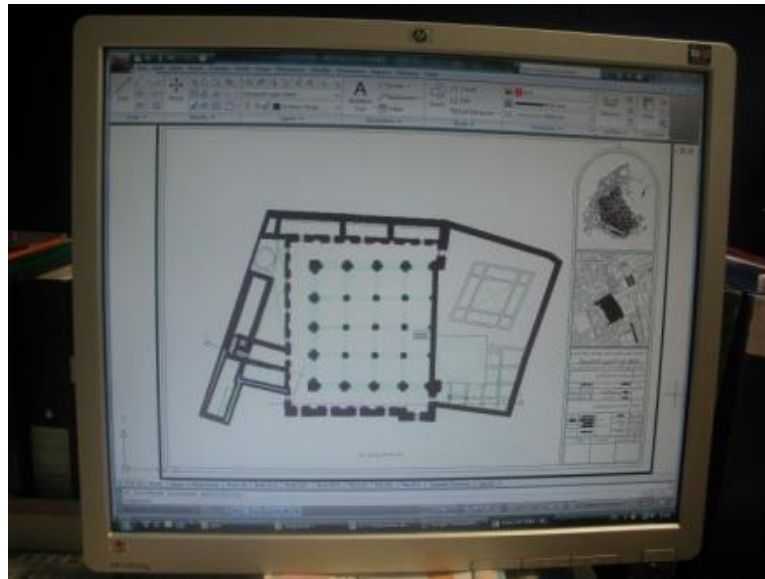


Figure 7.12: Use of IT for preparing HB drawings in the MHCB (the author, 2010)

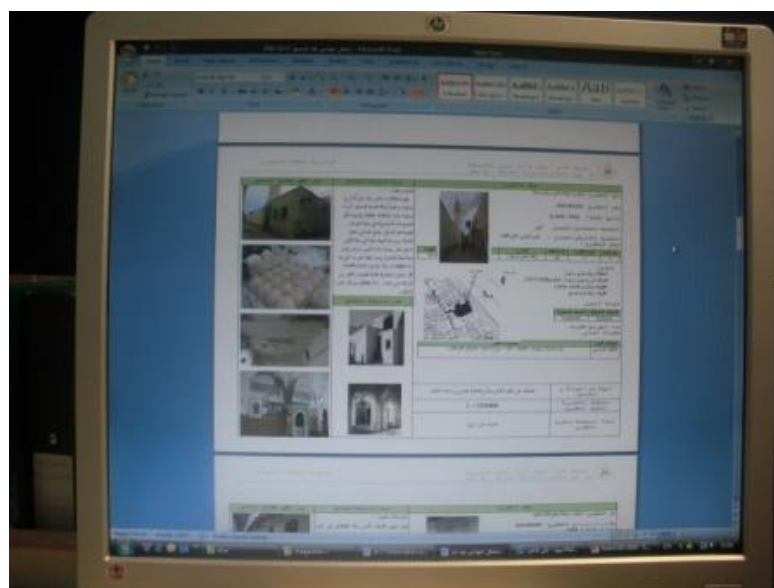


Figure 7.13: Use IT for preparing reports in the MHCB (the author, 2010)



Figure 7.14: Drawings that were prepared manually in the MHCBC transformed into digital form (Hmam Alhelga, the old city of Tripoli).

7.7.1 Computer Training Courses

Computer training courses had been provided to most technical employees. However, the nature of these courses is not relevant to the management of knowledge. It is simply general computer training (table 7.6), with the exception that some employees had had a training course on a database system. Knowledge regarding computer uses was shared among employees, particularly among architects, engineers and technicians.

7.7.2 The Website and Data Base of the MHCBC

It was observed that the website of the MHCBC (<http://www.hcl.gov.ly/about.php>) provided limited utility because it was not up to date and contained basic information. The database system of the MHCBC (established recently) was not connected to this website. Furthermore, the technical staff did not use emails or the online discussion forum to ask about problems they were facing in their work. Also, there was no connection between computers (intranet-LAN) and only limited connection to the internet in the MHCBC. The director of the financial administration was responsible for providing internet access to employees. However, the use of internet services was limited in the MHCBC.

Moreover, technical staff had difficulty with the English language. For instance, during a visit to the MHCBC, an engineer asked the author in Arabic about the meaning of ‘supporting the HB’ and also ‘bills of quantities’ in English, as he sought after some information about these subjects online. This causes difficulty gaining any benefit from the internet.

However, a new database system is under construction in the MHCBC (figure 7.15). The employees who were responsible for its establishment started with HBs' photographs and the next step was to document the articles regarding the old city of

Tripoli and HBs that were published outside the organisation. The director of the MHCb library (E.R) stated that:

“Recently, photographs of HBs require more care; old and new photos have been placed in the data base system. They have been collected from individuals or from the MHCb archive in addition to pictures from books and journals. Comments in pictures have been done to give some descriptive information for each picture. Sometimes some elderly people were asked to describe some photos.”

Also, the director of the planning and historic studies department (Y.K), ‘the supervisor of this system,’ added that the “database system of Libyan HBs is now under construction and it will include photographs and documents such as: studies, articles and reports.” The head of the MHCb (A.J) confirmed that:

“The technical archive will be changed into digital one contains all conducted studies, drawings, maps, reports and photos. This work will be put on the website of the MHCb after its development.”

However, at the time of the study, the author could not observe a database (not even the one proposed) regarding, for example: projects and restoration processes (except some pictures), relevant regulation and principles, CVs for staff and others that indicate their details and their special knowledge of HB conservation, and previous resolved technical problems.



Figure 7.15: Database system under construction in the MHCb (the author, 2010)

7.7.3 IT in Knowledge Processes

More than half of the interviewees (12/20) mentioned IT as a helpful tool for the explicit knowledge process. Four interviewees stated that IT is a tool for capturing knowledge, as the library director (E.R) stated that “Some knowledge could be captured online by search engines.” Furthermore, two interviewees emphasized the role of IT in

identifying experts and communicating with them online; the head of historical study section (A.B) mentioned that “IT provides opportunities to find experts everywhere by looking for them (their CVs) online and communicating with them.” Six interviewees mentioned the role of IT in storing and retrieving knowledge on an information base and its importance in the MHCb.

7.7.4 Constraints that Face Use IT in the MHCb

Fewer than half the interviewees (8/20) mentioned constraints that face the use of IT in the MHCb. Three points were mentioned: difficulties in using the internet, technical problems in computers and data base difficulties.

Regarding constraints in using the internet, although the infrastructure of the intranet was provided, the constraints of its use include: difficulty in English language and limited knowledge or information regarding HB conservation on Arabic websites. However, the benefit is limited because of the many different contexts. Some websites which present recent knowledge in the field of HB conservation are a suitable source. However, some difficulties are faced in attempting to benefit from this source. The head of the supervision section (A.H) stated that:

“We try to find some knowledge regarding HBs and their conservation in websites but most sites do not provide detailed knowledge. However, the lack of English language is a problem we often face with English language websites which are more detailed in this field.”

Also, the head of the historic studies section (A.B) mentioned that “Some websites are not free; however, the benefit is limited because of the different context” and (T.W) “we often do not need the internet in our work.”

Furthermore, technical problems in the MHCb include internet communication not available being always and viruses in computers. Breaks in internet communication were an external cause attributed to the provider, whereas treating computer viruses was an internal issue. The computers were prone to malfunction, but, although antivirus software was used, as S.H mentioned, “it is not up to date and there is no technical support to fix computers in the MHCb.”

Moreover, there were some difficulties with the database (established recently) in the MHCb; for two decades, the MHCb has stored its documents in written forms, and transferring the relevant documents onto the data base was not easy, as Y.K stated, “Since the establishment of this institution all documents were prepared in written forms. Digital form of reports and studies is easy to input in data base system, but

written forms more difficult in terms of re-write old works or scan them.” Another difficulty is with the input of data according to the code numbering of HBs; Y.K stated:

“There is some confusion when historians do not know the code numbers of some HBs according to the maps; this requires coordination with technical staff. Also, this situation faces us when we input data into the database system.”

7.8 Chapter Summary

The objective of this chapter was to investigate the knowledge sources, KM techniques and technology in the MHCb.

The first source of knowledge is senior employees working for the MHCb in the field of HB conservation. They are an internal source of tacit knowledge. However, seniors' leaving work caused knowledge leakage, non-continuity of knowledge transfer and some documents which were already done by them were lost. There was also the waste of time and the cost of rehabilitating them. Employees' leaving attributed to: administrative changes, the lack of staff motivation, and it being unhealthy and dangerous to work in old buildings.

The second source of knowledge is the MHCb's documents which are available in the MHCb in the form of specialist technical procedures, books, journals, symposiums proceedings, drawings, pictures, recording and video tapes. They are helpful tools for transferring knowledge, particularly to juniors and new employees. These documents were located in different places: Dar-Naeb for documents, library, with some staff, in some computers and files, and in folders in the technical affairs department. However, each trial to get knowledge from these sources was due to personal efforts. There was no formal process for organising, storing, retrieving and disseminating documents in the MHCb. The main observations regarding dealing with documents in the MHCb are:

a) Procedures and data collection forms do not include the requirement to consult previous reports done by the organization in the process for conducting technical studies. Also, it does not include a guide for documenting the process of the restoration work and assessing these experiences.

b) Architectural and constructional studies in the MHCb were not updated to provide sufficient knowledge for some disciplines such as how restoration work was done, the problems that these projects faced, and how they were solved.

c) There was no formal process for publishing in the MHCb.

The third source of knowledge is restoration projects, current and previous restoration work is a source of lessons learnt and knowledge that essential for future restoration work that will be achieved in the same building or other HBs.

In the field of HB conservation, a variety of knowledge is important. External sources cover the shortage of internal one. The external sources of knowledge could be categorized into three groups: local experts (belonging or not to organizations or consultant offices), including previous employees. The documents of relevant local institutions include for instance: archaeology department, consultancy offices, academic organizations and scientific societies. Also, there are the experts and documents that are relevant to international institutions such as: UNESCO and its branches in addition to similar restoration institutions. The tools for sharing knowledge include: consultings, training courses, conferences and subscriptions in the publications of international institutions.

Regarding KM techniques; numerous techniques were applied formally and informally in the MHCB.

1) Asking questions and discussions, in addition to meetings, were the techniques applied between individuals in the MHCB. The context in the technical affairs department provided opportunities for meetings and sharing knowledge while respecting the Islamic rules regarding separation between genders. However, formal meetings rarely occurred in the MHCB.

2) Training courses in the MHCB were general computer courses in addition to technical and management courses. Most training courses were held outside the MHCB by external consultancy offices. The constraints regarding training in the MHCB included: lack of local training courses in the field of HB conservation, and the complex procedure for foreign training.

3) Lectures and presentations are essential for discussing cases and specific subjects regarding HB conservation. However, a few lectures and presentations were produced in the MHCB. The negative points in the existing situation of presentations are: the presentation of the achievements of a project rather than the lessons learnt, and the seniors and external experts were not motivated or invited to produce lectures.

4) Team work has been applied in the MHCB in terms of architects, structural engineers, historians and surveyors being ordered to conduct a comprehensive study including architectural surveys and preparing HBs' drawings, historical studies, architectural studies, conditional surveys, deciding on the type of intervention in

addition to preparing contract documents. The constraints that were faced in the team work in the MHCb were that during the work, a type of divergence happened and there was no coordination within the team.

5) Most technical staff in the MHCb had worked in many tasks in different technical sections. This happened because of the shortage of employees. Although this forced rotation work system technique had contributed to an increase in the knowledge of technical staff, there was a negative effect in that architects and construction engineers were replaced by unqualified technicians, draftsmen and surveyors.

6) Some problems were solved by a trial and error technique. However, applying trial and error in HB without care might cause problems in HBs. In the MHCb no documenting or disseminating process for resolved problems was in place; this is one of disadvantage faced by the process of managing knowledge in the MHCb.

7) Although policies did not prevent cooperation with local specialists, no criteria for recruitment were applied and no database for their details and CVs in the MHCb.

8) Symposiums and conferences in Libya are conducted often not only for solving special problems but also to disseminate knowledge on some topics by collecting the specialists together to present their knowledge. However, the MHCb had started to become interested in organizing symposiums on special topics such as HB materials.

9) New employees in the MHCb had received some informal monitoring from some senior work mates or the head of the section that they worked in.

10) The reading of previous HBs restoration project documents contributed to validating the solutions of previous problems, whilst also saving time and effort in dealing with new HB conservation projects. However, whether this reading was done depended on the willingness of the person.

Finally, regarding ICT in the MHCb, the current head of management in the MHCb was keen to provide ICT facilities and training. Furthermore, some drawings that had previously been manually prepared were being transferred into digital form by scanner. However, the website of the MHCb provided limited utility because it neither up to date and nor connected to the database system of the MHCb. Moreover, the use of internet services was limited in the MHCb. Moreover, no criteria for what should be included in the database. Regarding the constraints facing the use of IT in the MHCb, three points were mentioned by interviewees:

- Language difficulty, there was limited knowledge or information regarding HB conservation on Arabic websites.

- Communication and technical problems with computers, there was no technical support to fix computers in the MHC B
- Database difficulties: for two decades, the MHC B had stored its documents in written form, transferring relevant documents to the database system was not an easy job.

Chapter 8: Analyzing Quantitative Data

8.1 Introduction

The objective of this chapter is to analyse the quantitative data that was collected from the questionnaire and organisational records regarding:

- The importance and availability of HB conservation knowledge in the MHCB
- The extent of applying KM techniques in the MHCB.
- The current use of IT and the obstacles to its use in the MHCB.
- The MHCB's circumstances and the affective factors in developing KM
- The technical employees and their movement in the MHCB.

This chapter is divided into eight sections; the first section introduces the chapter, and the second includes respondents' details. The third demonstrates the importance of conservation knowledge and its availability in the MHCB. The fourth analyses the extent of applying KM techniques in the MHCB. The fifth section studies information technologies and their application in the MHCB. The sixth analyses the MHCB's circumstances and the factors that affect KM in the MHCB. The seventh discusses statistical data regarding technical staff in the MHCB and their movement. Finally, the chapter ends with a summary.

8.2 Respondents' Details

One hundred and twenty two questionnaires were distributed and 65.5% (80/122) of them were returned. Less than half of the respondents (35/80) were MHCB employees; 26/35 working in the technical department, and 9/35 working in the historic studies department. On the other hand, more than half of the respondents (45/80) did not work in the MHCB. Seven of them (7/45) were ex-employees in the MHCB and 20 respondents were university staff members in the field of architecture (12/20), civil engineering (3/20) and fine arts (5/20) departments. Furthermore, four respondents worked in the archaeology department, four were members of the society for the protection of Libyan architectural heritage, and ten were working in construction firms and engineering consultancy offices.

The experience of the respondents was varied (Figure 8.1), with 14% of respondents (11/80) having less than five years' experience in the field of HB conservation. 24% (19/80) of respondents had experience of between 5 and 10 years. The majority of respondents (50/80) had more than 10 years' experience of work or interest in the field of HBs and their conservation.

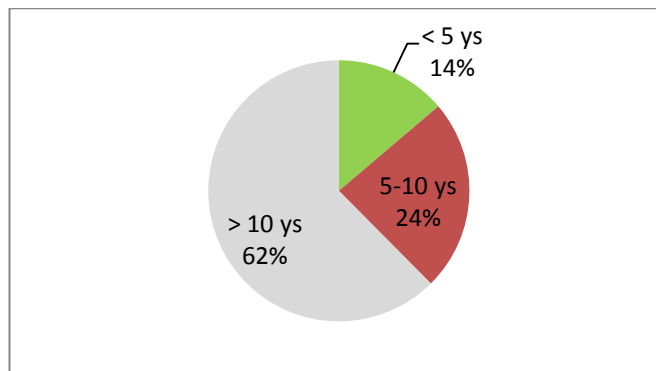


Figure 8.1: Experience of questionnaire's respondents

This variety of experience presented the opportunity for different opinions to be gathered, and the majority of answers came from experts.

The ages of respondents varied. The minority of respondents (5/80) were younger than 30 years old, and most of these were MHCB technical employees. The majority of respondents (52/80) were aged between 30 and 45 years and the remaining (23/80) were more than 45 years. Finally, the percentage of male respondents was 68.8% (55/80), whereas females comprised 31.2% (25/80). Regarding MHCB employees, 54.3% (19/35) were male and 45.7% (16/35) were female.

8.3: The Importance of Conservation Knowledge and its Availability in the MHCB

Questions were directed to all technical employees and historians working in the MHCB and others, according to their knowledge regarding the importance and availability of HB conservation knowledge in the MHCB. Results less than 2.5/5 are low rank; results between 2.5/5 and 3.5/5 are medium rank; and results more than 3.5/5 are high rank.

8.3.1: The Importance of Conservation Knowledge

The importance of most aspects of HB conservation knowledge that were included in the questionnaire is relatively high. Only knowledge regarding social, economic, environmental values of HBs and the equipment and machines that are used in HBs restoration obtained medium importance in the MHCB (table 8.1 and figure 8.2).

Table 8.1: The ranking of HB conservation knowledge importance in the MHCB

knowledge regarding	Its Importance Per 5	The rank of knowledge importance
Architectural survey and preparing drawings of HBs	4.65	1
Historical values of HBs	4.56	2
Diagnosing the existing situation of HBs (conditional survey)	4.35	3
Architectural values of HBs	4.35	4
Re-using HBs including alteration	4.11	5
Supervising HB conservation work	4.11	6
The required treatment that should be done in HBs	4.06	7
Principles of dealing with HBs	3.92	8
Repair processes	3.88	9
Preparing project documents and contracting	3.86	10
Recent repair materials that are used to repair HBs	3.85	11
Regulations those are relevant to HBs	3.83	12
Old construction materials that were used to build HBs	3.81	13
Local construction materials	3.77	14
Old construction methods that were used to build HBs	3.72	15
CVs and details for employees and HBs specialists	3.72	16
The equipment and machines that are used in HBs restoration	3.50	17
Social values of HBs	3.34	18
Economic values of HBs	3.32	19
Environmental values of HBs	3.20	20
The average of means	3.9/5 (78%)	

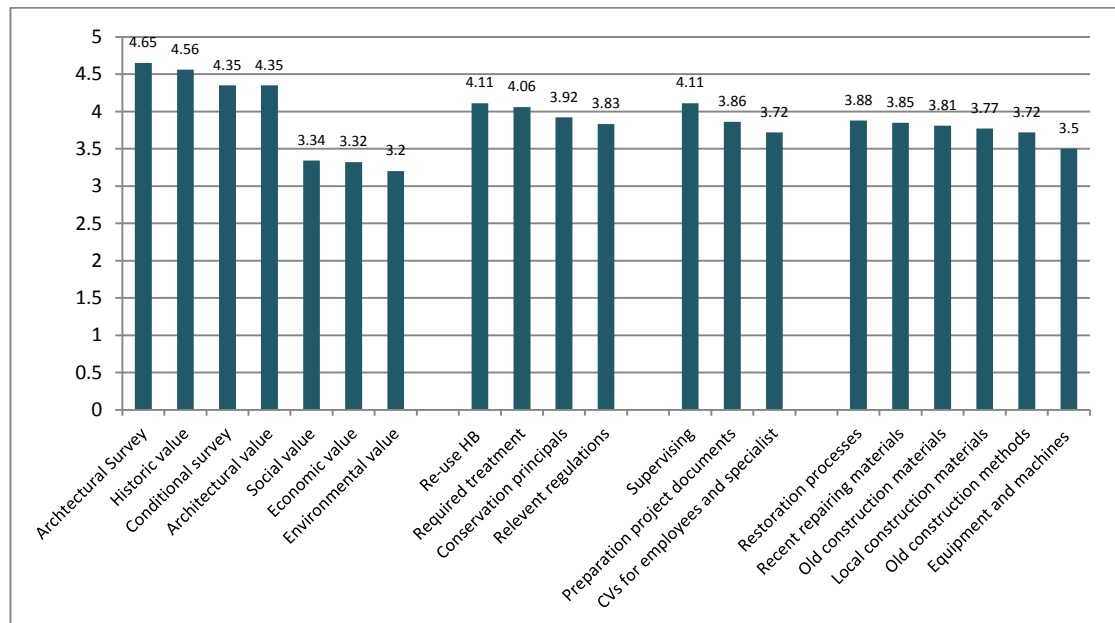


Figure 8.2: The importance of HB conservation knowledge in the MHCB

For more details the ranking of the importance of HB conservation knowledge was discussed in four key categories:

- Assessing and documenting HB values and conditions
- Deciding the level of intervention in HBs (Conservation plan)
- Contract management

- Restoration process in HBs.

1. Importance of knowledge regarding assessing and documenting HBs:

As shown in table 8.2, the architectural survey, historic values of HBs, conditional survey, and HB architectural values obtained relatively high results in the rank of knowledge importance in the MHCB. The mean is between 4.35/5 and 4.65/5. Furthermore, the social, economic and environmental values of HBs obtained medium importance knowledge (M between 3.2/5 and 3.34/5).

Table 8.2: The rank of assessing and documenting HB knowledge importance

Knowledge regarding:	Mean /5	N
Architectural survey and preparing drawings of HBs	4.65	80
Historic values of HBs	4.56	80
Conditional survey	4.35	79
Architectural values of HBs	4.35	80
Social values of HBs	3.34	79
Economic values of HBs	3.32	80
Environmental values of HBs	3.20	79

The chi-square test of independence (place of work; in or outside the MHCB) illustrated that the respondents outside the MHCB tended to give high grades (M=4.44/5), whereas for the MHCB employees, their result was medium (M=3.36/5), with p between 0.000 and 0.028.

2. Importance of knowledge regarding intervention plans in HBs:

All knowledge aspects regarding deciding the level of intervention in HBs (table 8.3) obtained relatively high grade of importance (M between 3.83/5 and 4.11/5).

Table 8.3: The ranking of intervention plan knowledge importance

Knowledge regarding:	Mean /5	N
Rehabilitation and re-use of HBs	4.11	78
Required conservation work of HBs	4.06	78
Principles of dealing with HBs	3.92	79
HBs' relative regulations	3.83	79

The chi-square test of independence illustrated a significant difference between all the results (table 6.3) when comparing the importance of knowledge according to place of work (in or outside the MHCB). Respondents outside the MHCB tended to give higher grades (M=4.63/5) than MHCB employees (M = 3.25/5). However, relevant regulations and principles obtained medium grades of importance in the MHCB (table 8.4).

Table 8.4: Chi-square test of intervention plan in HBs knowledge

Place of work	Required conservation work of HBs	Rehabilitation and re-use of HBs	Principles of dealing with HBs	HBs' Relevant regulations	Mean
IN-MHCB	3.45	3.54	3.11	2.88	3.25
OUT-MHCB	4.55	4.58	4.56	4.59	4.63

3. Importance of knowledge regarding contract management:

All items of contract management knowledge (table 8.5) had relatively a high rank of importance as the mean of results were between 3.72/5 and 4.11/5.

Table 8.5: Ranking of the importance of contract management knowledge

Knowledge regarding:	Mean	N
Supervising HBs conservation work	4.11	79
Preparing project documents and contracting	3.86	79
CVs for institution's human resources and specialists, contractors, construction materials traders and craftsmen	3.72	79

The chi-square test of independence illustrated a significant difference (Table 8.6) between all the results when compared to place of work (in or outside the MHCB). Respondents outside the MHCB tended to give higher grades of importance (mean=4.38/5) than MHCB employees (M= 3.28/5). However, know-who knowledge regarding competences, abilities and contact details for employees and specialists, contractors, construction materials traders and craftsmen obtained the lowest grades of importance in the MHCB (table 8.6)

Table 8.6: Chi-square test for contract management knowledge

Place of work	Managing and supervising HB conservation work	The preparation of project documents and contracting	CVs for institution's human resources and specialists, contractors, materials traders and craftsmen	M
INMHCB	3.48	3.45	2.91	3.28
OUTMHCB	4.61	4.18	4.36	4.38
sig.	.000	.005	.000	

4. Importance of knowledge regarding restoration process in HBs:

All items of knowledge regarding the method and materials of conservation work in HBs (Table 8.7) obtained relatively high grades of importance (mean between 3.72/5 and 3.88/5). However, knowledge regarding the equipment and machines that are used in HB conservation work obtained medium grade of importance (3.50/5).

Table 8.7: Ranking of the importance of restoration process knowledge

Knowledge regarding:	N	Mean
Maintenance, repair or restoration methods	79	3.88
Recent repair materials that are used in HB	77	3.85
Old construction materials that were used to build HB	80	3.81
Current local construction materials	79	3.77
Old construction methods that were used to build HB	80	3.72
The equipment and machines that are used in HB conservation work.	79	3.50

The chi-square test of independence illustrated a significant difference between all the results (Table 8.8) when compared to place of work. Respondents outside the MHCB tended to give higher grades ($M = 4.43/5$) than MHCB employees ($M = 2.91/5$).

Table 8.8: Chi-square test for restoration process knowledge

Place of work	Treatment processes	Recent repair materials	Old construction materials	Local construction materials	Old construction methods	Equipment and machines that are used in restoration	M
INMHCB	3.14	3.02	3.00	2.85	2.88	2.60	2.91
OUTMHCB	4.45	4.54	4.45	4.50	4.38	4.26	4.43
Sig.	.000	.000	.000	.000	.000	.000	

Other knowledge mentioned by the questionnaire respondents was knowledge regarding:

- 1) Safety and health
- 2) Dealing with archaeology findings
- 3) Survey instruments skills
- 4) Computer skills
- 5) English language.

Although few respondents mentioned these knowledge aspects, the first, second and third were deemed relevant to some extent to HB conservation knowledge, whereas computer and English language were deemed basic skills that might affect KM.

8.3.2: The Availability of HBs Conservation Knowledge in the MHCB

The availability of more than half aspects of HB conservation knowledge in MHCB is relatively low. Only knowledge regarding architectural survey and preparing drawings of HBs obtained relatively high grade of availability in the MHCB (table 8.9 and figure 8.3). Whereas knowledge regarding: Supervising HB conservation work, regulations those are relevant to HBs, architectural values of HBs, conditional survey, historical values of HBs, repair processes, and re-using HBs including alteration obtained medium grade of availability in the MHCB.

Table 8.9: The ranking of the availability of HB conservation knowledge in the MHCB

knowledge regarding	Its Availability Per 5	The rank availability	
Architectural survey and preparing drawings of HBs	3.83/5	1	High
Supervising HB conservation work	3.35	2	Medium
Regulations those are relevant to HBs	3.32	3	Medium
Architectural values of HBs	3.27	4	Medium
Diagnosing the existing situation of HBs (conditional survey)	3.02	5	Medium
Historical values of HBs	3.02	6	Medium
Repair processes	2.88	7	Medium
Re-using HBs including alteration	2.72	8	Medium
Preparing project documents and contracting	2.48	9	Low
The required treatment that should be done in HBs	2.36	10	Low
Social Values of HBs	2.35	11	Low
Principles of dealing with HBs	2.29	12	Low
Local construction materials	2.24	13	Low
Old construction materials that were used to build HBs	2.23	14	Low
The equipment and machines that are used in HBs restoration	2.08	15	Low
CVs and details for employees and HBs specialists	1.92	16	Low
Recent repair materials that are used to repair HBs	1.91	17	Low
Old construction methods that were used to build HBs	1.89	18	Low
Economic values of HBs	1.85	19	Low
Environmental values of HBs	1.56	20	Low
The average of knowledge availability in MHCB	2.52/5 (50.57%)		

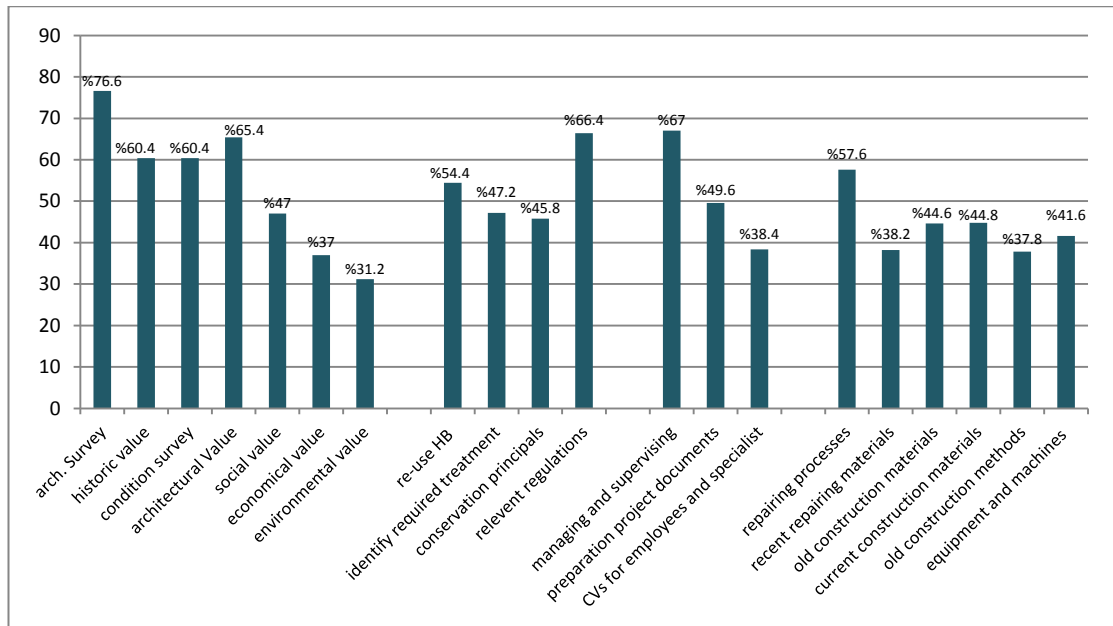


Figure 8.3: Percentage of HB conservation knowledge availability in the MHCB

The average percentage of total knowledge availability is in medium grade (50.57%). This percentage indicates the lack of HB conservation knowledge in the MHCB. For more details, the availability of HB conservation knowledge was discussed in four key categories:

- a- Assessing and documenting HBs
- b- Planning intervention in HBs
- c- Contract management
- d- Restoration process in HBs.

a- The availability of knowledge regarding assessing and documenting HBs:

Most knowledge aspects regarding assessing and documenting HBs (table 8.10) obtained low to medium grades of availability (M between 1.56/5 and 3.27/5). Only knowledge regarding architectural surveys tended to have relatively a high grade of availability in the MHCB (M = 3.83/5).

Table 8.10: Rank of availability of knowledge regarding assessing and documenting HBs

knowledge regarding:	Mean /5	N
Architectural survey and preparing drawings of HBs	3.83	42
Architectural values of HBs	3.27	43
Historic values of HBs	3.02	43
Conditional survey	3.02	40
Social values of HBs	2.35	28
Economic values of HBs	1.85	27
Environmental values of HBs	1.56	32

b- The availability of knowledge regarding intervention plan in the MHCb:

All knowledge aspects regarding deciding the level of intervention in HBs (table 8.11) obtained low to medium grades of availability (mean between 2.29/5 and 3.32/5).

Table 8.11: Ranking the availability of knowledge regarding HB conservation plans

Knowledge regarding:	Mean /5	N
Historic buildings' relative regulations	3.32	34
Rehabilitation and re-use of HBs including alteration or redesign	2.72	40
Required conservation work of HBs	2.36	38
Principles of dealing with HBs	2.29	37

c- The availability of knowledge regarding contract management in the MHCb:

All items of knowledge aspects regarding contract management (table 8.12) obtained a low to medium grade of availability (M between 1.92/5 and 3.35/5).

Table 8.12: Ranking of knowledge availability regarding contract management

Knowledge regarding	Mean	N
Managing and supervising HB conservation work	3.35	37
The preparation of project documents and contracting	2.48	33
Institution's human resources and specialists, contractors, construction materials traders and craftsmen	1.92	38

d- The availability of HB restoration process knowledge in the MHCb:

All items of knowledge aspects regarding restoration process knowledge (table 8.13) tended to have low to medium grades of availability in the MHCb (M between 1.89/5 and 2.88/5).

Table 8.13: Ranking the availability of knowledge regarding the restoration process in HBs

Knowledge regarding:	Mean	N
Processes of maintenance, repair and restoration	2.88	36
Current local construction materials	2.24	37
Old construction materials that were used to build HBs	2.23	39
The equipment and machines that are used in HBs conservation work	2.08	34
Recent repair materials that are used in HBs	1.91	34
Old construction methods that were used to build HBs	1.89	38

However, to determine the gap in knowledge, the results, which include the importance of knowledge aspects, were compared with the results of the availability of knowledge aspects in the MHCb. These comparisons indicate the gap in knowledge

according to its importance in the MHCB (figure 8.4). The first five in the rank which indicated with slight differences a gap in knowledge were knowledge regarding:

- Recent repair materials used to repair HBs
- Old construction methods used to build HBs,
- CVs and details for specialists and stock holders in the field of HB conservation
- Identifying the required treatment that should be done in HBs
- Environmental values of HBs.

Furthermore, the following ten HB knowledge aspects indicated with slight differences some lack of availability in the MHCB:

- Principles of dealing with HBs
- Old construction materials used to build HBs
- Historic values of HBs
- Current (common) construction materials
- Economic values of HBs
- The equipment and machines used in HB restoration processes
- Re-using HBs, including alteration
- Preparation of project documents and contracts
- Diagnosing the existing structural situation of HB
- Architectural values of historic buildings.

Finally, the remaining knowledge aspects which indicated less gap in knowledge in the MHCB were knowledge regarding:

- Restoration processes (maintenance, repair or refurbishing)
- Social values of historic buildings
- Architectural survey and preparing drawings of HBs
- Managing and supervising HBs conservation work
- Relevant regulations to HBs.

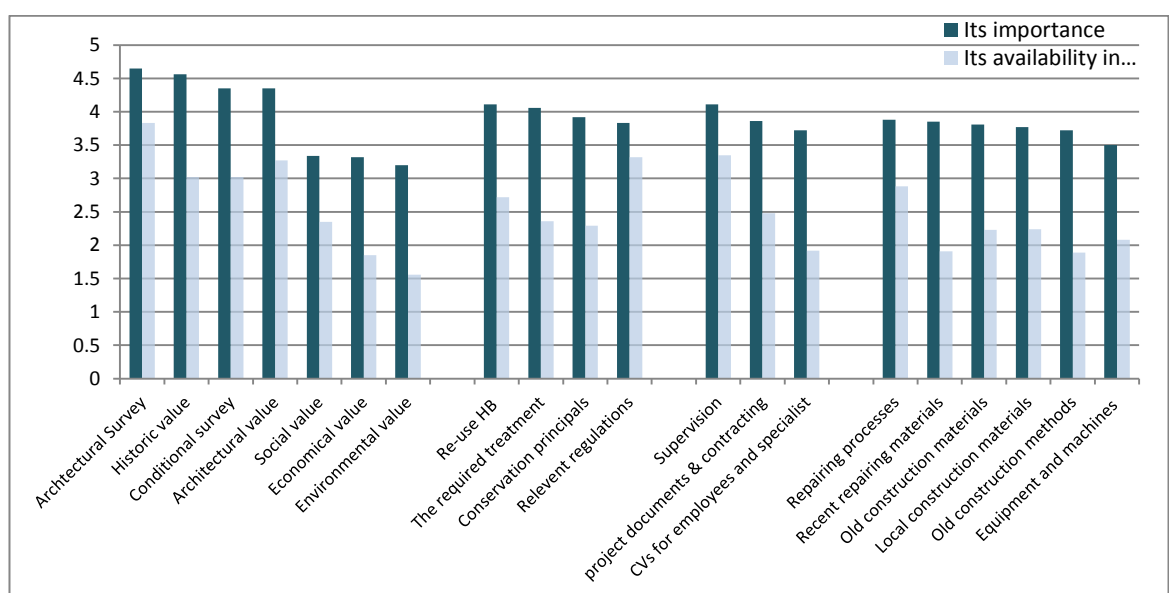


Figure 8.4: The importance of HB conservation knowledge and its availability in the MHCB

8.4: KM Techniques and the Extent of their Application in the MHCB

8.4.1: The Extent of Applying KM Techniques in the MHCB

This question was directed to the technical staff and historians working in the MHCB, and others, according to their knowledge regarding the application of KM techniques in the MHCB. The results indicate the extent to which KM techniques were applied in the MHCB. The results reflect a shortage in applying KM techniques in the MHCB, as the mean of all results (table 6.14) is 2.26/5 (45.30%).

Table 8.14: The ranking of applying KM techniques in the MHCB

Rank	Techniques	its application/5
1	Trial-and-error-policy	3.26/5
2	Discussion with others	3.16/5
3	Group task	3.14/5
4	Asking for help during daily work	3.12/5
5	Self-Reading (books, journals, other publishes)	2.87/5
6	External training: managed by professional organisations or experts	2.39/5
7	Attending conferences	2.19/5
8	Constructive brainstorming meetings for problem solving	1.92/5
9	Internal training: seniors train juniors within organisation	1.90/5
10	Rotation systems	1.87/5
11	Contribution in preparing a conference paper or a journal article	1.75/5
12	Contact and observing old builders	1.71/5
13	Lectures about previous experience (storey telling)	1.68/5
14	Mentoring new employees	1.66/5
15	Presentations for post project review and lessons learned	1.36/5
	the mean of all results	2.26/5

The five top ranked techniques that were applied in the MHCB (table 8.14 and figure 8.5) obtained the following results: trial-and-error 3.26/5, discussion 3.16/5, group tasks 3.14/5, asking for help during daily work 3.12/5, and self-reading 2.87/5 of applying in the MHCB. All these techniques were done by the employees themselves without the intervention of the organisation except for group tasks, as the work order was issued formally in this institution.

In the middle ranking of the techniques that were applied in the MHCB were: external training and workshops managed by professional organisations or experts (2.39/5), attending conferences (2.19/5), meetings (1.92/5), internal training, where seniors train juniors within the organisation (1.9/5), rotation systems, where an employee works for a period of time in one section, then transfers into another to learn the work in all sections (1.87/5).

Finally, the bottom ranked techniques that were applied in the MHCB were: contribution in preparing a conference paper or a journal article (1.75/5), contact and observe the work of elderly builders (1.71/5), lectures about previous experience (1.68/5), mentoring in terms of providing guidance and support to new employees (1.66/5), and post project review presentation (1.36/5).

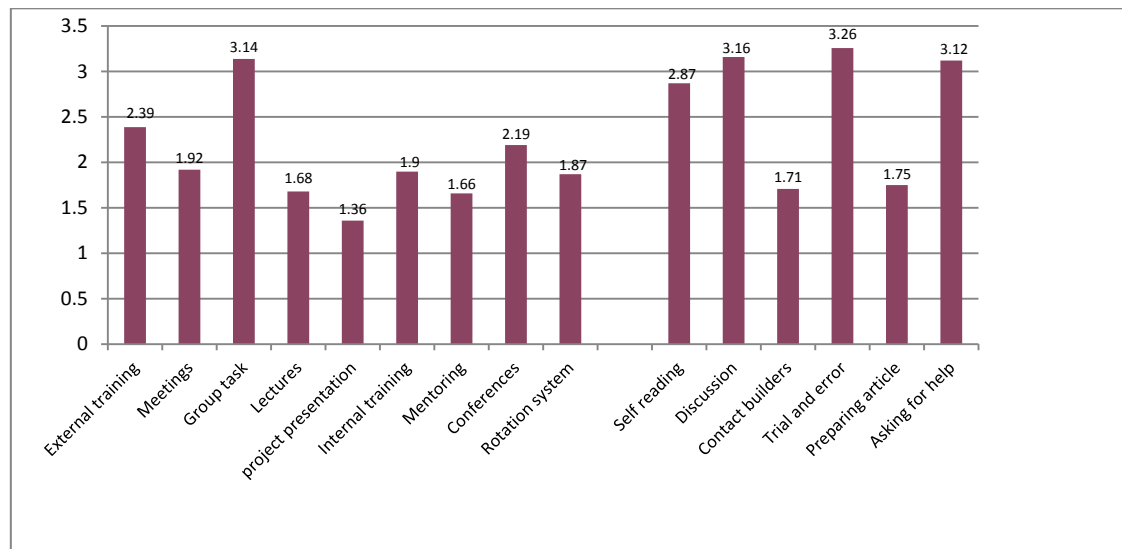


Figure 8.5: The means of applying KM techniques in the MHCB / 5

8.4.2: The Employees' Absorption Abilities from Learning Tools

The question regarding the absorption ability was directed to the employees not to others outside the MHCB (see section 4.4.4 and table 4.2). All respondents working in the MHCB (35/35) answered this question. The results (table 8.15) show that the hands on experience on site and attending training courses or workshops were the top techniques in the rank (M = 4/5), from which respondents' absorption abilities were usually high. The absorption abilities of respondents from other techniques, including discussing with others, self-reading and attending lectures or conferences, were in the medium grade (M between 3.17/5 and 3.45/5).

Table 8.15: The rank of respondents' absorption abilities from some learning tools

Rank of absorption abilities	Mean (M)	absorption abilities				
		← low		high →		
		Rarely	Occasionally	Sometimes	Often	Usually
1) Experience from working on site	4.00/5	0	2	6	17	10
2) Attending training courses or workshops	4.00/5	0	2	7	15	11
3) Discussion with others	3.45/5	0	6	11	14	4
4) Self-reading	3.31/5	2	6	10	13	4
5) Attending lecture or conference	3.17/5	1	6	15	12	1
Other activities						

8.4.3: The Role of the MHC B's Library in Providing Useful Knowledge in the MHC B

As shown in table 8.16, 58% of respondents tended to consider that the library provided useful knowledge.

Table 8.16: The role of the MHC B's library in providing useful knowledge

Scale	1 (Very low useful)	2	3	4	5 (Very high useful)	N
frequency	2	8	11	8	6	35
percentage	5.7%	22.8	31.4	22.8	17.1	100%

A correlation test of the respondents' answers showed that there was a weak reverse relation between respondents who responded that their absorption ability from reading was high, and respondents whose opinion that the library provides useful knowledge. However, the significance of this result was very low as a Spearman correlation = - 0.04 and $p = 0.82$ (table 8.17).

Table 8.17: Correlation test of respondents' answers regarding library role and absorption abilities from reading

		Correlations	Absorption abilities from Reading	Extent that the MHC B's library provides useful knowledge
Spearman's rho	Absorption abilities from Reading	Correlation Coefficient	1.00	-.040
		Sig. (2-tailed)	.	.820
		N	35	35
	Extent that the MHC B's library provides useful knowledge	Correlation Coefficient	-.040	1.00
		Sig. (2-tailed)	.820	.
		N	35	35

8.5: Information technologies (IT) and their application in the MHC B

8.5.1: the Importance of IT in HBs Conservation Institution

The rank of results (table 8.18 and figure 8.6) shows that the contribution of IT to preparing HBs drawings (4.35/5), providing relevant information (4.07/5) and reducing the use of paper forms (4.03/5) were in the top rank of importance as the majority of respondents agreed that IT contributed actively to these processes. Furthermore, providing an information/knowledge base (3.68/5), saving time of retrieving and reviewing (3.63/5) and providing secure records (3.07/5) was in the medium rank of importance. The online discussion forum was at the bottom rank of importance (2.97/5).

Table 8.18: Rank of importance of IT Contributions in HB Conservation Work in the MHCB

Rank of importance of IT Contributions	M	its importance					Sig. Of comparing In, out MHCB
		low ←				→ high	
		1	2	3	4	5	
1) Helpful tool for preparing HB drawings	4.35	3 3.8%	2 2.5%	6 7.5	22 27.5	47 58.8	0.105
2) Providing relevant information (web sites)	4.07	2 2.5%	7 8.8	13 16.3	19 23.8	39 48.8	0.209
3) Reducing the use of paper forms	4.03	4 5.0%	8 10.0	10 12.5	17 21.3	41 51.3	<u>0.028</u>
4) Providing an information/knowledge base	3.68	11 13.8	11 13.8	9 11.3	10 12.5	39 48.8	<u>0.000</u>
5) Saving time of retrieving and reviewing	3.63	8 10%	9 11.2	15 18.8	20 25	28 35	0.129
6) Providing secure records	3.07	13 16.3	19 23.8	16 20	13 16.3	19 23.8	<u>0.003</u>
7) Providing an online discussion forum	2.97	14 17.9	16 20.5	16 20.5	22 28.2	10 12.8	0.714

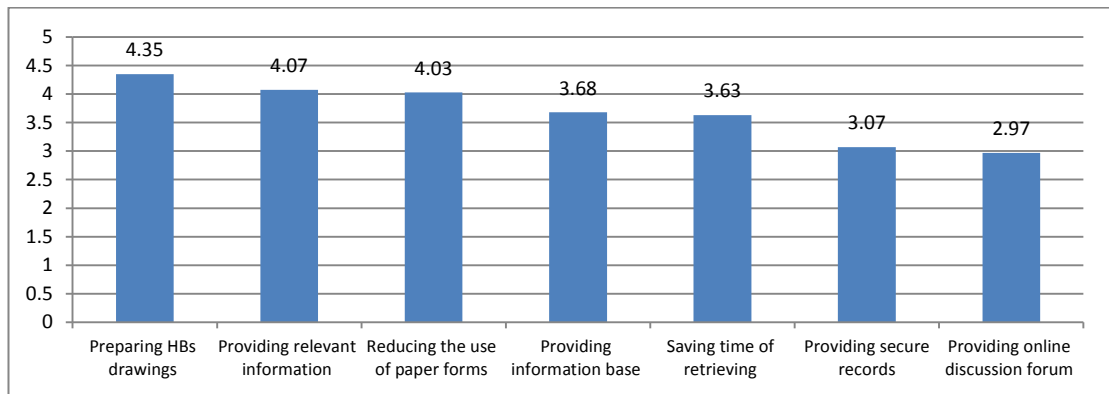


Figure 8.6: The mean of the importance of IT in the field of HB conservation

However, the researcher compared between the average results (Chi-square test, significant results if $p < \text{or} = 0.05$) of employees and other respondents outside the MHCB; (see results at right hand of the table 6.17). The results show that the respondents outside MHCB gave grades higher than MHCB employees regarding:

- The contribution of IT in reducing the use of paper forms, the significance of comparing means $p = 0.028$.
- Providing an information/knowledge base ($p = 0.000$)
- Providing secure records ($p = 0.003$)

8.5.2: Type of Storing Work Documents in the MHCB

All respondents used computers in their work and store their documents in different way (table 8.19). The majority of them (31/35) preferred to store their documents in both paper and electronic formats. Very few respondents (3/35) stored their documents electronically solely, and only one respondent stored his documents in paper form. The

tendency to store documents in paper and digital forms together could be attributed to difficulties that they have faced, as shown in table 6.20.

Table 8.19: Type of Storing Work Documents in the MHCb

Paper form	Electronic form	Both paper and electronic forms
1	3	31
2.9%	8.6%	88.6%

8.5.3 The Extent of the Use of Internet Services in the MHCb

Most internet services were underused (table 8.20 and figure 8.7). However, search engines were used ‘often’ by 8.6% (3/35), ‘sometimes’ by 11.4% (4/35) and ‘rarely’ by 54.3% (19/35) of respondents, whereas the MHCb website and e-mail were rarely used. Moreover, the online discussion forum was mostly never used in the MHCb as just 2.9% (1/35) of respondents used it often or sometimes and 11.4% (4/35) used it rarely. These findings reveal that the extent to which internet services were used in the MHCb was very low.

Table 8.20: The extent of the use of internet services in the MHCb

		1) never	2) rarely	3) sometimes	4) often	5) always
E-mail	Frequency	16	13	4	2	-
	Percentage	45.7%	37.1%	11.4%	5.7%	-
MHCb web site	Frequency	12	19	4	-	-
	Percentage	34.3%	54.3	11.4	-	-
Search engines	Frequency	9	11	12	3	-
	Percentage	25.7%	31.4	34.4	8.6%	-
Online discussion forum	Frequency	29	4	1	1	-
	Percentage	82.9%	11.4	2.9	2.9	-

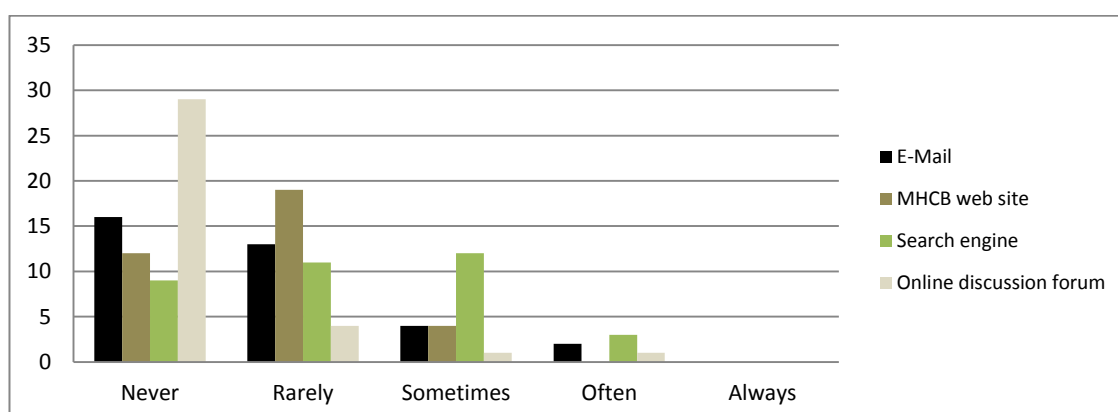


Figure 8.7: The extent of the use internet services in the MHCb

However, the explanation of the rare use of internet services in the MHCb might be attributed to obstacles to the use of IT in the MHCb, particularly telecommunication problems, as shown in the next section. A few opinions on the benefit of internet services were mentioned by respondents, such as they are used to know what is new in the field, to see new events in such projects, to see beautiful HBs, and the most significant: to see others' experiences.

8.5.4: Obstacles to the Use of IT in the MHCb

The main obstacles that respondents faced when using IT in the MHCb (table 8.21 and figure 8.8) were viruses, as 82.9% (29/35) of respondents had faced this obstacle, telecommunication problems, as 62.9% (22/35) of respondents had faced this obstacle, and hardware failure, as 62.9% (22/35) of respondents had faced this obstacle. Furthermore, 31.4% of respondents (11/35) had faced a software failure and 20% (7/35) suffered from a lack of computer knowledge. The least important obstacles were program changes, electrical problems and theft of data and equipment, as the percentage of respondents who had faced these constraints was between 5.75% and 11.4%.

Table 8.21: the obstacles which respondents faced when using IT in the MHCb

Rank	Main obstacles	Frequency
1	Viruses	29
2	Telecommunication problems	22
3	Hardware failure	21
4	Software failure	11
5	Other, lack of computer knowledge	7
6	Program changes	4
7	Electrical problems	4
8	Theft of data and equipment	2

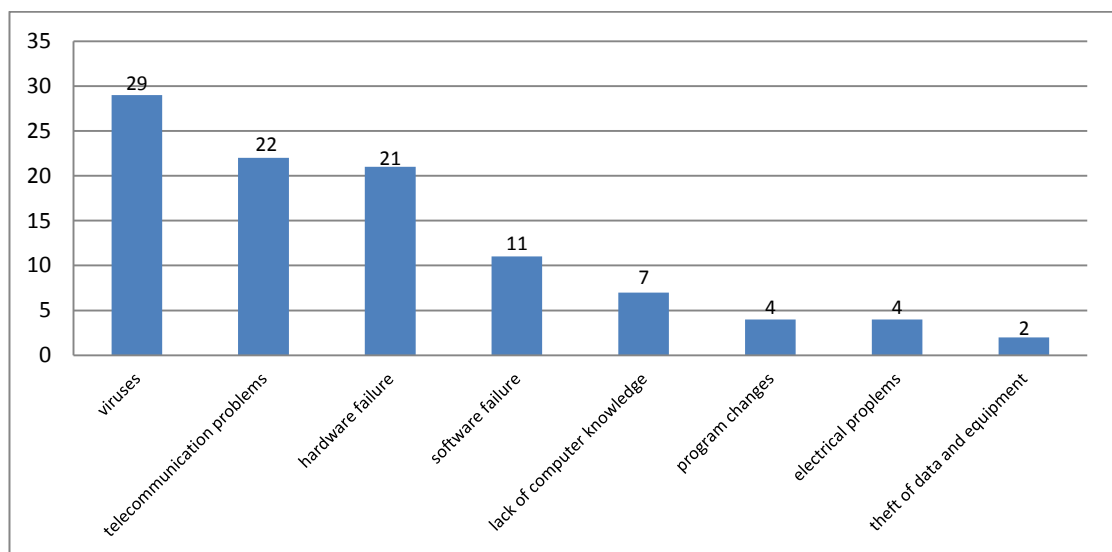


Figure 8.8: Frequency of facing IT constraints among respondents in the MHCb

A correlation test between method of storing work documents and constraints with the use of information technology (table 8.22) was conducted. The test findings demonstrate that the single respondent (1/35) who used paper forms only suffered from a lack of computer knowledge. A few respondents (3/35) stored their work documents electronically only, although they suffered from viruses and software failure. However, the majority respondents (31/35) who suffered from other obstacles preferred to store their work documents in both paper and electronic formats to avoid their loss.

Table 8.22: Correlation between method of document storage and constraints in the use of IT

Correlation between method of storing and the constraints in the use of IT	Viruses	Hardware failure	Software failure	Theft of data and equipment	Electrical problems	Telecom problems	Program changes	Other, Lack of computer knowledge
Paper form	0	0	0	0	0	0	0	1
Electronic	3	1	3	0	0	3	0	0
Both	26	20	8	2	4	19	4	6

8.6: The MHCb's Circumstances and the Effective Factors in Developing KM

8.6.1: Responsibility for Knowledge Development

The results as shown in table 8.23 show that the majority 93.7% (75/80) of respondents opinion was that knowledge development responsibility should be shared, although a few respondents (5/80) thought that it was the organisation's responsibility. This result reflects the respondents' view that achieving the goal of KM in the MHCb should be a result of cooperation between the employees and their institution.

Table 8.23: Responsibility for knowledge development

	Individuals' responsibility	Organisation's responsibility	Shared responsibility
Frequency	0	5	75
Percentage	0	6.2%	93.8%

8.6.2: The Extent of Satisfaction with the Content of Knowledge Shared in the MHCb

Regarding the extent of satisfaction with the content of knowledge shared in the MHCb (table 8.24 and figure 8.9), 45.8% of respondents (16/35) were satisfied or very satisfied. However, a significance percentage (40% or 47% when removing neither results) of respondents (14/35) were dissatisfied or completely dissatisfied, with 14.2% (5/35) being neither. This result indicates that there was a shortage in the quality of existing shared knowledge.

Table 8.24: The Extent of Satisfaction with the Content of Knowledge within the MHCB

Scale	5 (Very Satisfied)	4	3 Neither	2	1 (Completely Dissatisfied)
frequency	1	15	5	8	6
percentage	2.9%	42.9%	14.3%	22.9%	17.1%

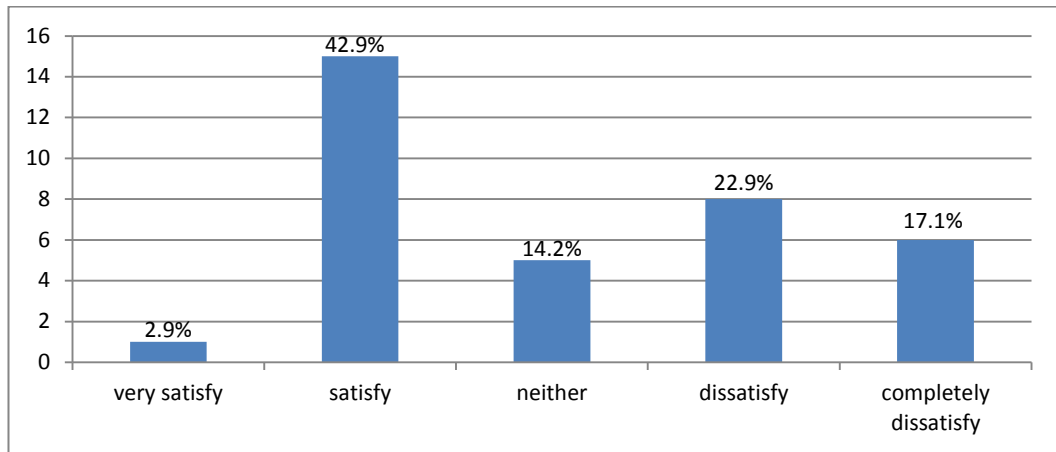


Figure 8.9: The extent of employee satisfaction with the content of knowledge shared in the MHCB

8.6.3: The Extent that Relevant Employees Have HB Conservation Knowledge

The average knowledge that respondents working in the MHCB felt they had was 3.02/5, as 28.6% thought that they had relatively low knowledge, 42.95% felt they had relatively medium and 28.6% relatively high knowledge (table 8.25 and figure 8.10). The results were distributed normally and indicated that these employees' knowledge in the field of HB conservation was at medium grade. The results indicated that more than 70% of the respondents working in the technical affairs and historic studies departments in the MHCB had medium or lower knowledge in the field of HBs and their conservation.

Table 8.25: The extent of obtaining HB conservation knowledge in the MHCB

Scale	1 (Low knowledge)	2	3	4	5 (High knowledge)
frequency	1	9	15	8	2
percentage	2.9%	25.7%	42.9%	22.9%	5.7%

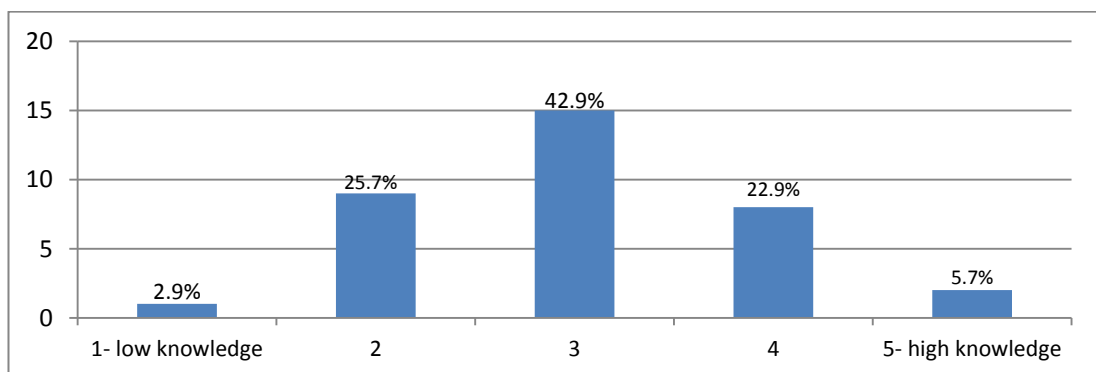


Figure 8.10: the extent of obtaining HB conservation knowledge in the MHCB (N=35)

8.6.4: Constraints of Contact with Employees in Other Departments in the MHC B

The majority of MHC B's employees (24/35) stated that they faced difficulties (always or sometimes) when they contacted employees in other departments, whereas (11/35) faced no difficulties (table 8.26).

Table 8.26: Constraints of Contact with Employees in Other Departments in the MHC B

Scale	Always	Some times	Never
frequency	8	16	11
percentage	22.9%	45.7%	31.4%

Fifteen of the twenty four respondents who faced difficulties mentioned the type of difficulties that they had faced (figure 8.11). They could be categorised into three sections, ranked as follows:

- Not understanding what was requested, in terms of the nature of the work and who had the knowledge, or just having a lack of knowledge. This type of difficulty was mentioned six times
- Delay, in terms of formal procedure and receiving manager's permission. This type of difficulty was mentioned six times
- Unwillingness to collaborate, even in a work group. This type of difficulty was mentioned four times.

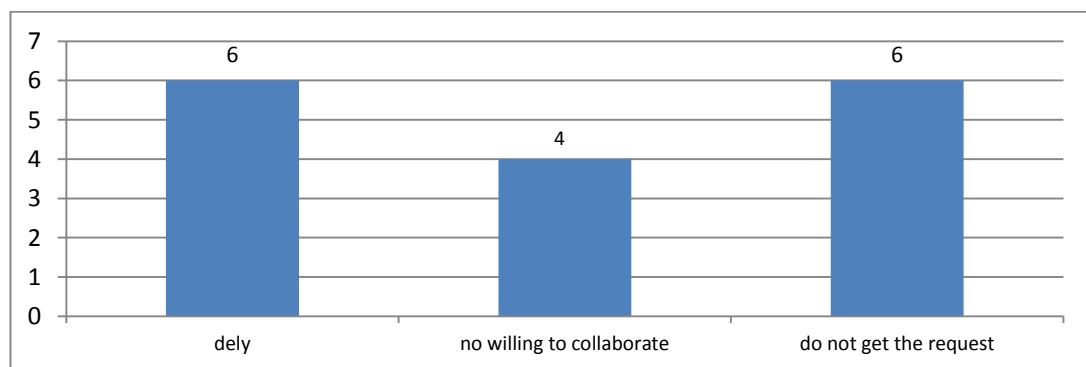


Figure 8.11: Frequency of facing difficulties when contacting other departments' employees in the MHC B

8.6.5: Difficulties in Requesting Documents between Departments in the MHC B

Regarding facing difficulties in requesting documents from other departments, 77.1% (27/35) of employees stated that they faced difficulties (always or sometimes), whereas 22.9% (8/35) did not (table 8.27).

Table 8.27: Difficulties in Requesting Documents between Departments in the MHC B

Scale	Always	Sometimes	Never
Frequency	14	13	8
Percentage	40%	37.1%	22.9%

Twenty three of the twenty seven respondents who faced difficulties mentioned the type of difficulty, which can be categorised into six sections (figure 8.12) as follows:

1. Delay, in terms of formal procedure between departments and need to obtain the manager’s written permission. This type of difficulty was mentioned 14 times
2. Unwillingness to collaborate, unwillingness to give documents even in shared work, and monopoly of information. This type of difficulty was mentioned five times
3. Not understanding the request, in terms of the nature of work and what is requested, or a lack of knowledge. This type of difficulty was mentioned four times
4. Mismanagement, for example: managers did not fulfil their responsibilities and here was no organisation between departments. This type of difficulty was mentioned four times
5. IT constraints, such as the version of a computer program not being compatible or being afraid of viruses in files. This type of difficulty was mentioned three times
6. Disorganised information, for example, individuals have some documents rather than a department and there is no organised archive. This type of difficulty was mentioned three times.

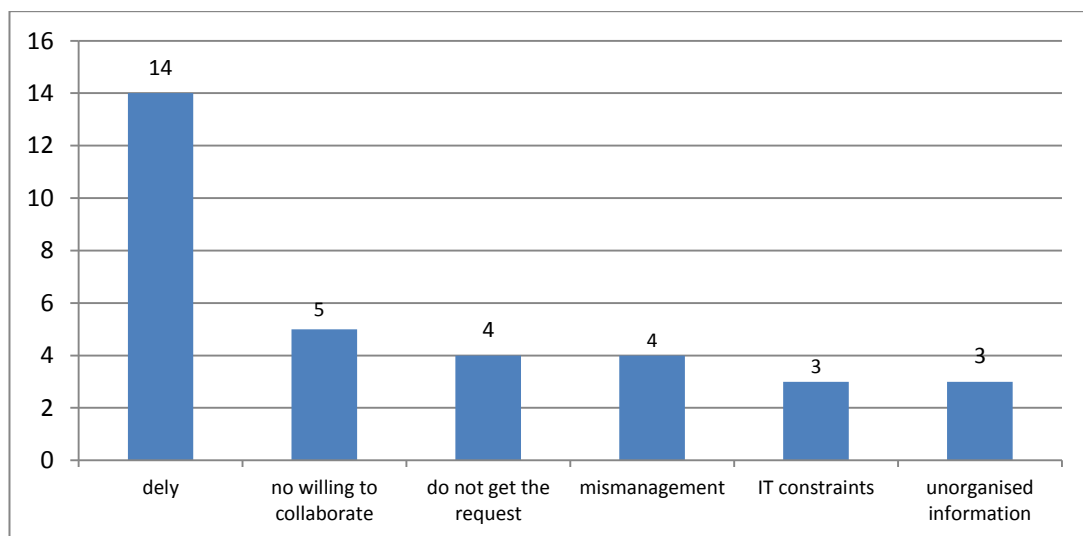


Figure 8.12: The frequency of difficulties faced when requesting documents from other departments in the MHC B

8.6.6: Culture of Collaboration in the MHCB (daily work in same place)

a. The extent of accepting the need to ask for help in the MHCB (table 8.28 and figure 8.13): the majority of respondents 82.9% (29/35) tended to agree or agree that it was acceptable to ask for help in their work environment. However, 17.1% tended to disagree.

Table 8.28: The extent of accepting the need to ask for help in the MHCB

Scale	Disagree	Tend to disagree	Neither	Tend to agree	Agree
frequency	-	6	-	21	8
percentage	-	17.1%	-	60%	22.9%

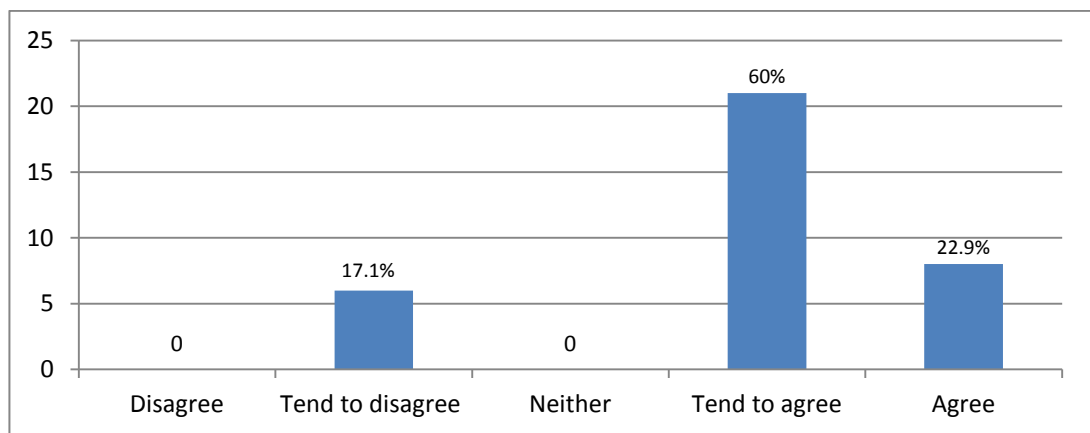


Figure 8.13: Frequency of accepting the need to ask for help in the MHCB working environment

b. The extent of accepting the possibility of mistakes in MHCB (table 8.29 and figure 8.14): more than half of the respondents 65.71% (23/35) agreed that it was reasonable to make mistakes in their work environment. However, 17.1% tended to disagree and 2.9% disagree. The result shows the extent of encouraging learning by doing and accepting a trial-and-error policy in the MHCB. However, being forgiving of those who make a mistake is a subject of debate regarding restoration work.

Table 8.29: The extent of accepting making mistakes in the MHCB

Scale	Disagree	Tend to disagree	Neither	Tend to agree	Agree
frequency	1	8	3	20	3
percentage	2.9%	22.9%	8.6%	57.1%	8.6%

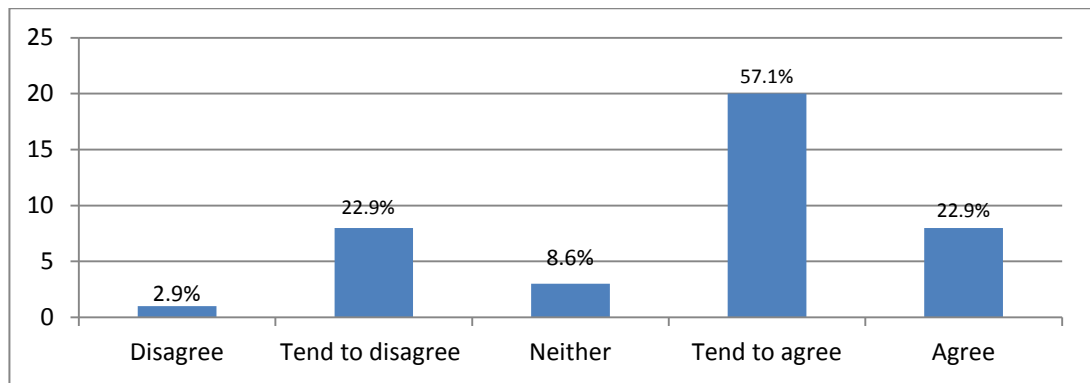


Figure 8.14: Frequency of accepting making mistakes in the work environment

- c. Possibility of sharing lessons in a culture of continuous improvement: more than half of the respondents (22/35) agreed that it was possible to share lessons in a culture of continuous improvement in their work environment (table 8.30 and figure 8.15).

Table 8.30: Possibility of sharing lessons in a culture of continuous improvement

Scale	Disagree	Tend to disagree	Neither	Tend to agree	Agree
Frequency	2	5	6	20	2
Percentage	5.7%	14.3%	17.1%	57.1%	5.7%

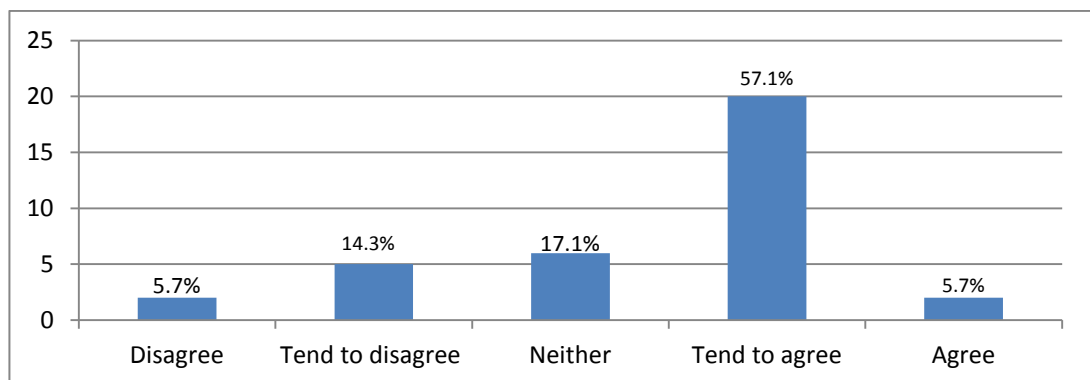


Figure 8.15: Frequency of the possibility of sharing lessons in the work environment

- d. Individuals' seeking and applying new learning in their job (table 8.31 and figure 8.16): fewer than half of the respondents (16/35) agreed that individuals in their job actively sought and applied new learning in their work environment. However, 10/35 of the respondents varied between disagreement 2/35 and tending to disagree 8/35. The rest of the respondents (9/35) neither agreed nor disagreed. Although the result reflects that the general inclination was slightly to agree, a significant percentage (28.6%) disagreed regarding the situation of seeking and applying new learning among the individuals in the MHCB.

Table 8.31: Seeking and applying new learning in the MHCB

Scale	Disagree	Tend to disagree	Neither	Tend to agree	Agree
frequency	2	8	9	14	2
percentage	5.7%	22.9%	25.7%	40%	5.7%

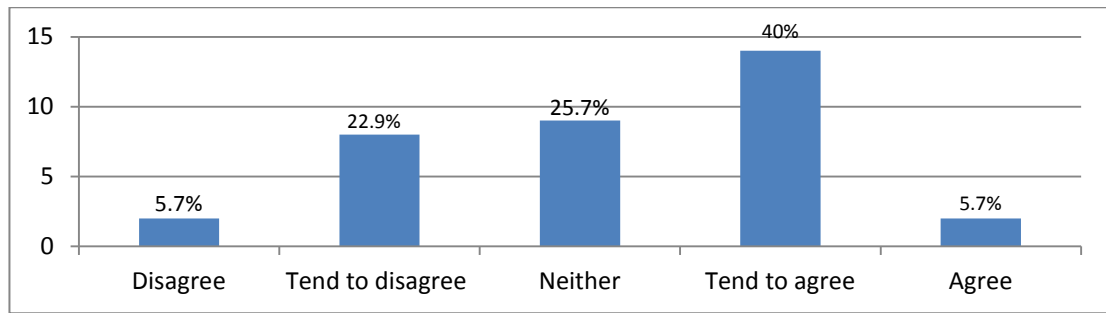


Figure 8.16: Frequency of opinions that individuals seek and apply new learning in the work environment

f. Senior employees transfer their knowledge to junior employees (table 8.32 and figure 8.17): more than half of the respondents (22/35) agreed that senior employees did transfer their knowledge to junior employees in their work environment. However, 22.9% of respondents tended to disagree that senior employees transferred their knowledge to juniors and 14.3% neither agreed nor disagreed.

Table 8.32: The extent of transferring knowledge from seniors to juniors in the MHC B

Scale	Disagree	Tend to disagree	Neither	Tend to agree	Agree
frequency	-	8	5	16	6
percentage	-	22.9%	14.3%	45.7%	17.1%

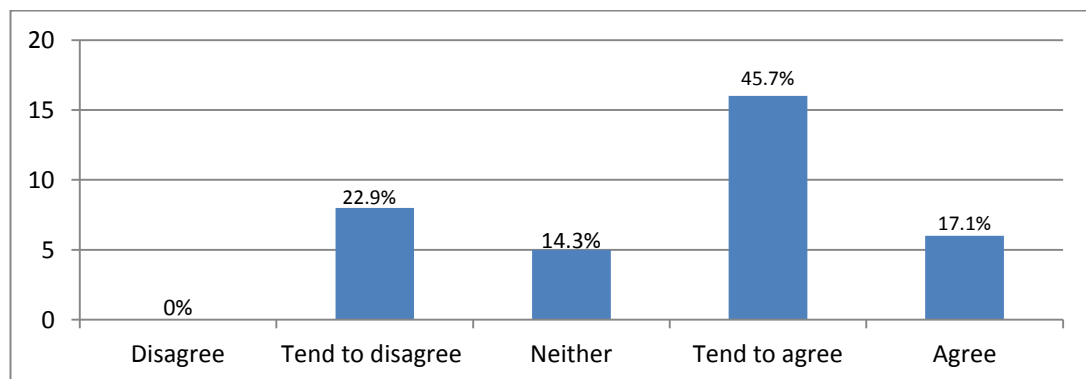


Figure 8.17: Frequency of opinions regarding transferring knowledge from seniors into juniors

8.6.7: The Effect of Senior Employees Leaving the MHC B

The majority of the respondents' (24/35) answers were in the high effect area, as 31.4% chose high effect and 37.1% chose very high effect regarding the negative effect on work of the absence of knowledge from senior employees who had left the MHC B (table 8.33 and figure 8.18) . The average of importance was 3.91/5. The result reflects the threat of the continued leaving of seniors who possessed knowledge of work performance.

Table 8.33: The extent of the effect of senior employees who left the MHC B

Scale	1 (Very Low effect)	2	3	4	5 (Very High effect)
frequency	0	5	6	11	13
percentage	0	14.3%	17.1%	31.4%	37.1%

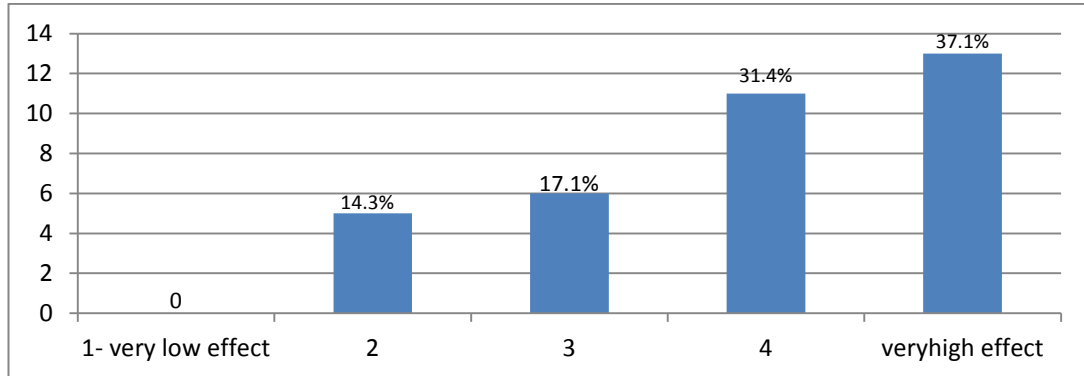


Figure 8.18: The negative effect of senior employees' leaving

8.6.8 The Preferred Source of Knowledge for Solving Daily Work Problems

The findings revealed how employees felt when faced with a difficult problem in their daily work in the MHC B, as seen in table 8.34. The findings show that contact with colleagues was their first choice (3.97/5) for obtaining knowledge. Also, a relevant document such as previous project documents was the second choice, with a high grade (3.94/5), while reading a reference was the third choice. However, contacting the manager and using internet were the least preferred choices. Other choices mentioned by two respondents were contacting an external consultant.

Table 8.34: Priority of acts for obtaining knowledge to solve a problem in daily work

Rank	Choices	M	1 st	2 nd	3 rd	4 th	5 th	6 th
1 st	Contact work colleagues	3.9714	15/35	7	10	3	0	-
2 nd	Review relevant documents	3.9429	11	14	7	3	0	-
3 rd	Read a reference	3.1429	4	9	11	10	1	-
4 th	Contact your manager	2.3143	4	3	4	13	11	-
5 th	Use internet	1.6286	1	2	3	6	23/35	-
6 th	Other, contact external consultant							2

8.6.9: The Extent of Interest on Whether KM is Needed Formally in the MHC B

The majority (88.6 %) of respondents (31/35) were interested or very interested in having KM formally in the MHC B (table 8.35 and figure 8.19). Removing the neither responses led to an increase in the percentage, to 96.87%. This percentage indicates the opinions regarding the need for KM formally in the MHC B.

Table 8.35: The extent of interest that KM is needed formally in the MHCB

Scale	1) Completely not interested	2)Not interested	3) Neither	4) Interested	5) Very Interested
frequency	0	1	3	14	17
percentage	0	2.9%	8.6%	40.0%	48.6%

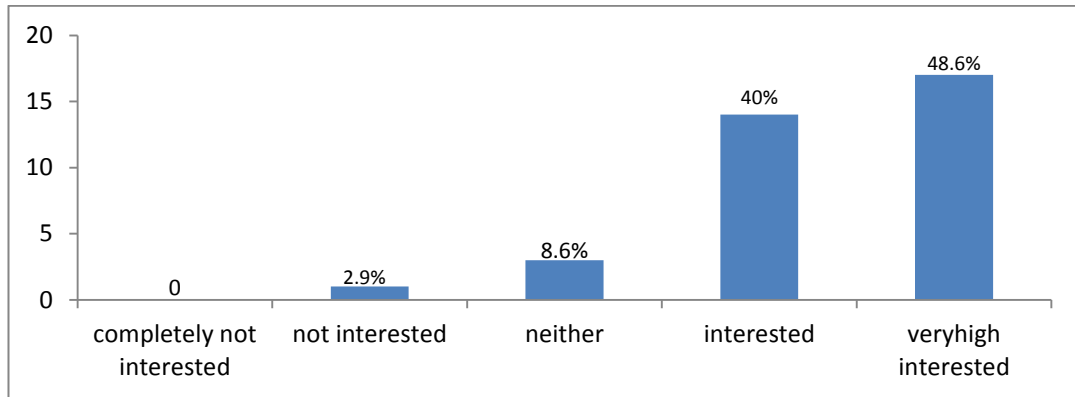


Figure 8.19: The interest of employees regarding the need for formal KM in the MHCB

8.6.10: The Effect of Influenced Factors on Developing KM in MHCB

a. The effect of the availability of suitable places (figure 8.20): the opinions of 54.28% (73% when removing neither answers) of respondents that suitable places for discussing and sharing knowledge were available and positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 20% felt that its effect tended to be negative. The remaining responses were neither positive nor negative. The positive percentage represents more than two and a half times the negative ones. This result demonstrates that suitable places were available for sharing knowledge, which can positively affect the development of KM in the MHCB.

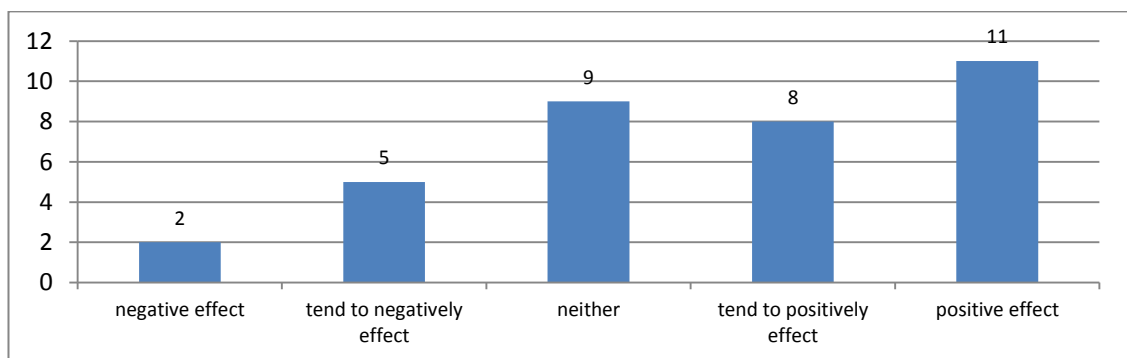


Figure 8.20: The effect of suitable places in the MHCB on developing KM

b. The effect of the competence of individuals (figure 8.21): the opinion of 40% (73.68% when removing neither answers) of respondents was that individuals' competence positively affected or tended to positively affect the development of KM in the MHCB. On

the other hand, 14.28% (5/35) thought that its effect tended to be negative. The remaining responses were neither (45.71%). Positive responses were approximately two and a half times the negative ones. The respondents tended to consider that individuals' competence affected positively the development of KM in the MHCB.

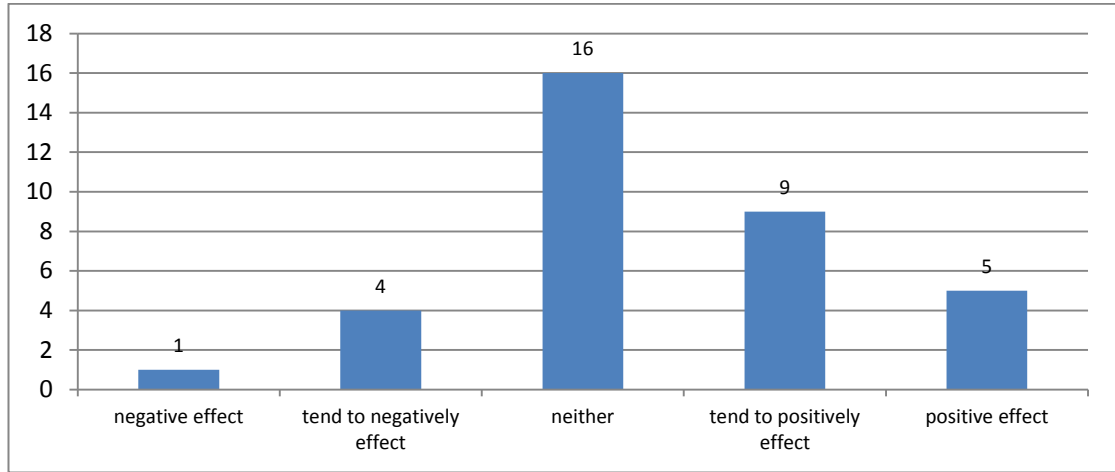


Figure 8.21: The effect of MHCB employees' competence on developing KM

c. The effect of personal experience (figure 8.22): the opinions of 42.85% (62.5% when removing neither answers) of respondents was that individuals' experience in the MHCB positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 25.71% of their opinions tended to be negative. The remaining responses were neither (31.42%). The positive responses were more than one and a half times the negative ones. The respondents tended to consider that individuals' experience could positively affect the development of KM in the MHCB.

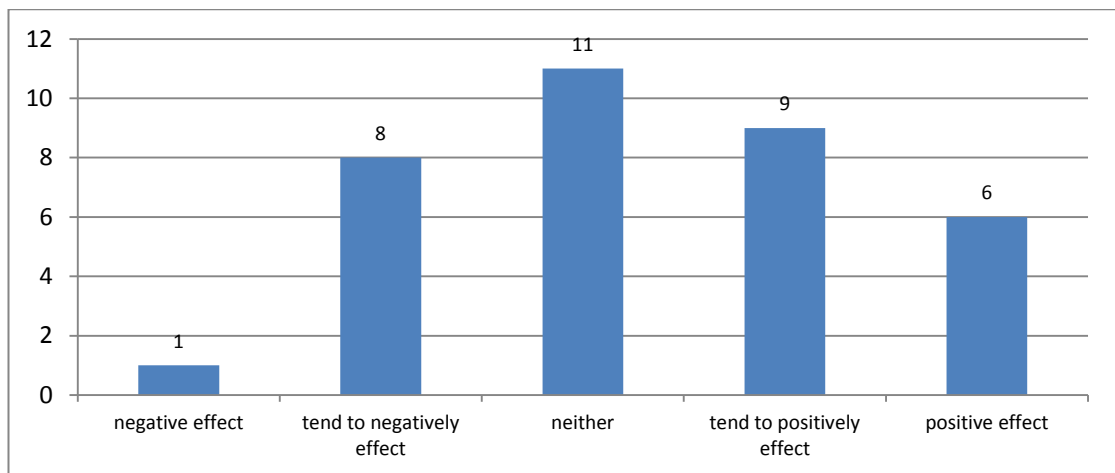


Figure 8.22: The effect of the personal experience of MHCB employees on developing KM

d. The effect of individuals' absorption abilities (figure 8.23): the opinions of 40% (66.66% when removing neither answers) of respondents was that individuals' absorption abilities in the MHCB positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 20% of their opinions tended to be negative. The remaining responses were neither (40%). The positive responses were twice that of the negative ones. The respondents tended to consider that individuals' absorption abilities could positively affect the development of KM.

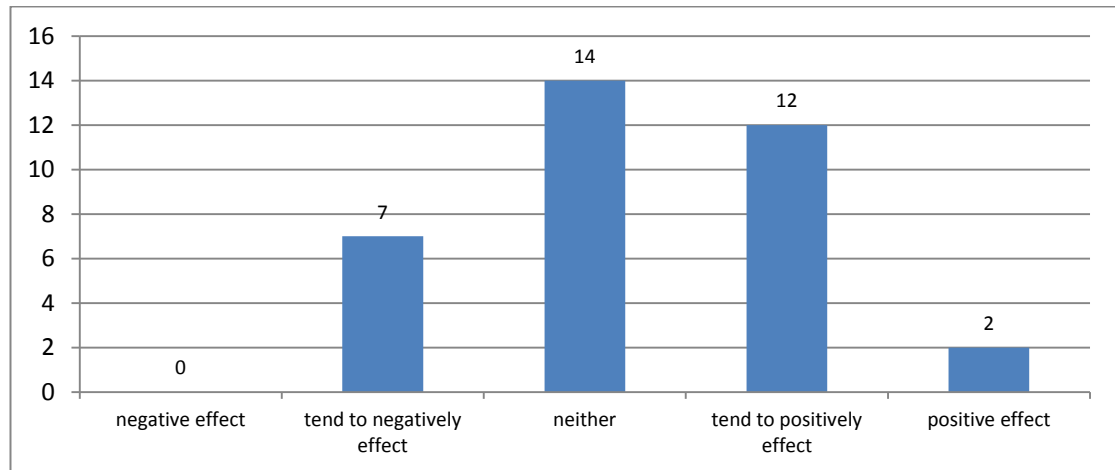


Figure 8.23: The effect of the MHCB employees' absorption abilities on developing KM

e. The effect of organisational policies regarding paying for knowledge (figure 8.24): the opinions of 48.57% (56.66% when neglect neither answers) of the respondents were that organisational policies regarding paying for knowledge positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 37.14% of their responses were negative or tended to be negative. The remaining responses were neither (14.29%). The positive responses were approximately one and a half times the negative ones. The respondents tended slightly to consider that individuals' absorption abilities could positively affect the development of KM.

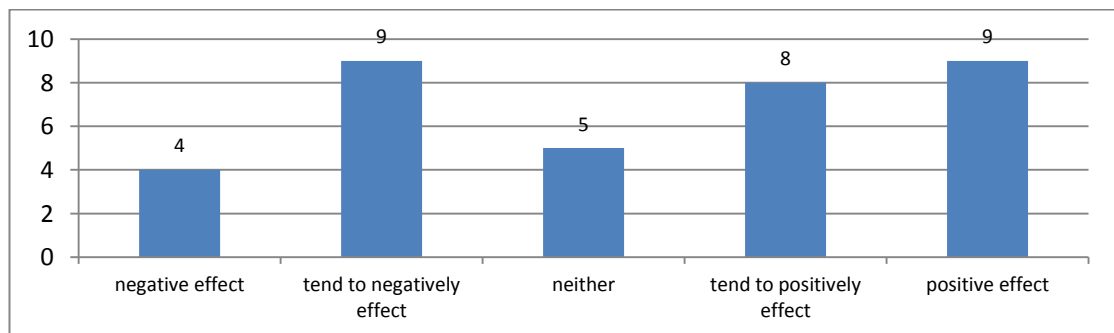


Figure 8.24: The effect of the MHCB organisational policy regarding paying for knowledge on developing KM

f. The effect of collaboration culture in the MHCB (figure 8.25): the opinions of 34.28% (60% when removing neither answers) of respondents was that corporate culture positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 22.85% of their responses were negative or tended to be negative. The rest of the responses were neither (42.85%). The positive responses were approximately one and a half times that of the negative ones. The respondents tended to consider that corporate culture positively affected the development of KM in the MHCB.

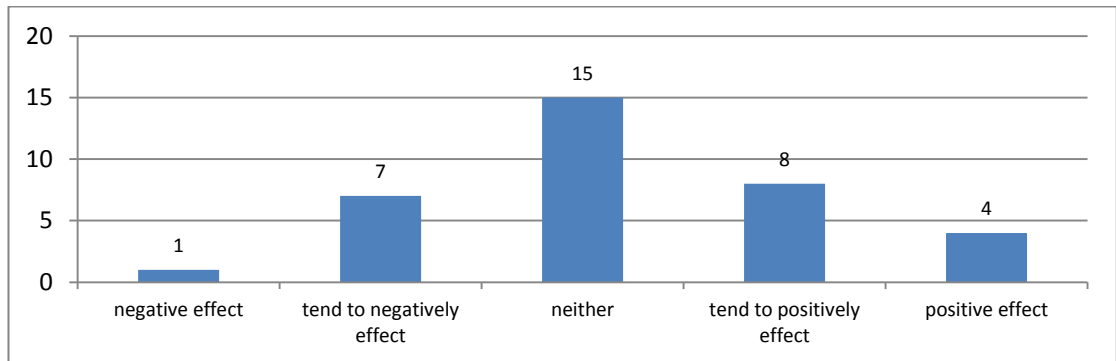


Figure 8.25: The effect of the MHCB collaboration culture on developing KM

g. The effect of organisational policies regarding staff motivation (figure 8.26): the opinions of 42.85% (55.55% when removing neither answers) of respondents were that organisational policies regarding staff motivation and retention positively affected them or tended to positively affect them in the development of KM in the MHCB. On the other hand, 34.28% of their responses were negative or tended to be negative. The rest of the responses were neither (22.85%). The positive responses were less than one and a half times those of the negative ones. Although the balance inclines to positive respondents, a significant percentage of respondents' opinions were negative. The respondents tended to consider that organisational policies regarding staff motivation and retention could positively help them effect the development of KM in the MHCB.

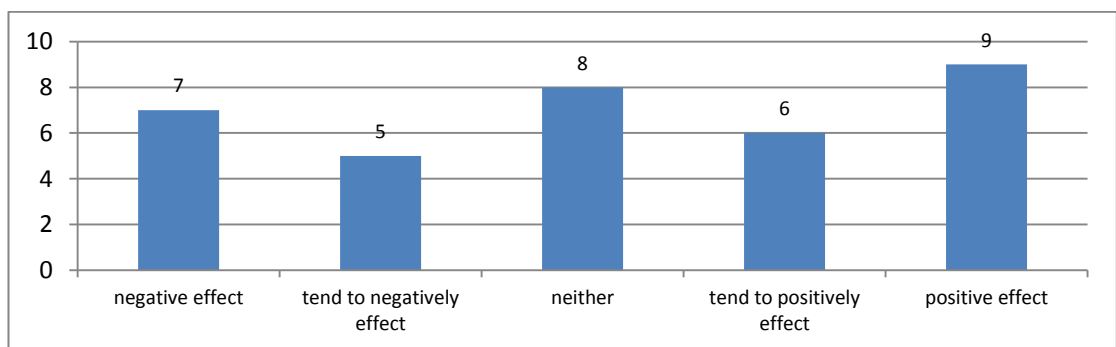


Figure 8.26: The effect of the MHCB's policy regarding staff motivation on developing KM

h. The effect of information communication technology (ICT) (figure 8.27); the opinions of 31.42% (50% when neglect neither answers) of respondents were that ICT positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 31.42% of their responses were negative or tended to be negative. The rest of the responses (37.14%) were neither. The positive responses and the negative ones were approximately the same. The responses were balanced regarding the effect of ICT in developing KM in the MHCB. Moreover, the responses were also balanced regarding the effect of IT in developing KM in the MHCB.

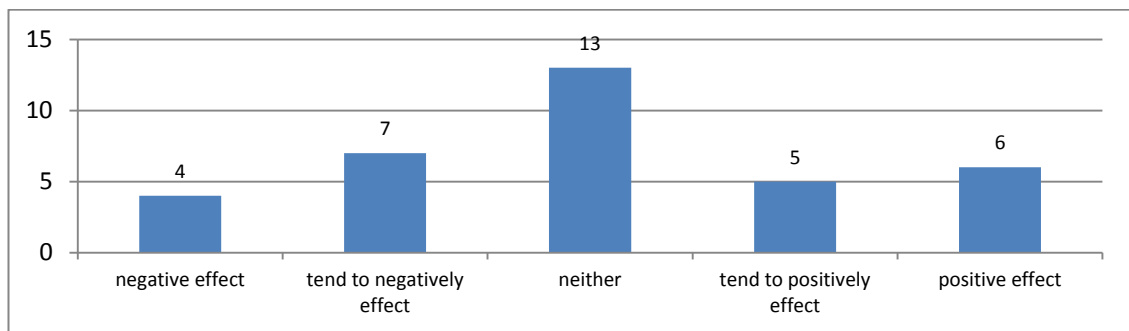


Figure 8.27: The effect of ICT on developing KM in the MHCB

i. The effect of leadership's vision (figure 8.28): the opinions of 34.28% (more than 50% when removing neither answers) of respondents were that the leadership's vision positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 34.28% their responses were negative or tended to be negative. The rest of the responses (31.42%) were neither. The positive responses and the negative ones were approximately the same. The responses were balanced regarding the effect of the leadership's vision on developing KM in the MHCB.

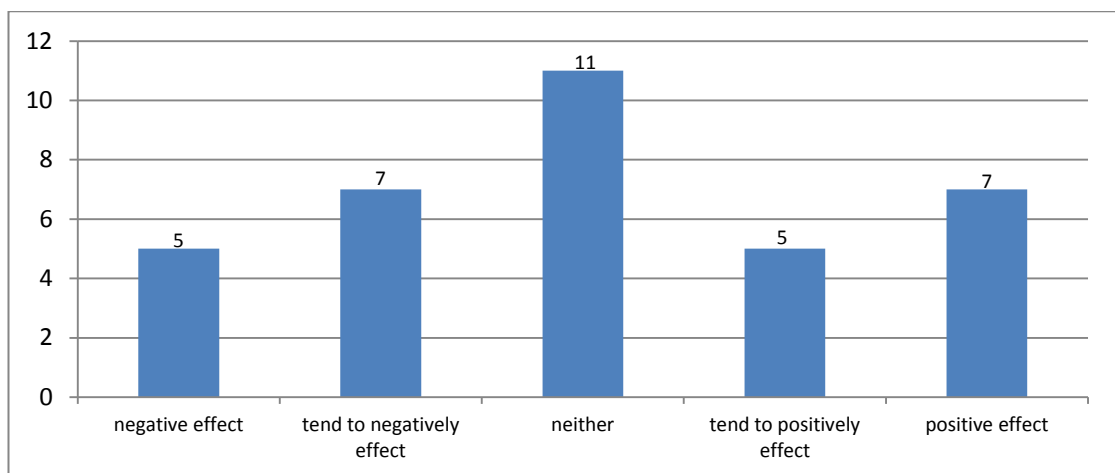


Figure 8.28: The effect of the leadership's vision on developing KM in the MHCB

j. The effect of organisational structure and coordination between departments on developing KM in the MHCB (figure 8.29): the opinions of 22.85% (32% when removing neither answers) of respondents were that organisational structure and coordination between departments positively affected or tended to positively affect the development of KM in the MHCB. On the other hand, 48.57% their responses were negative or tended to be negative. The rest of the responses (28.57%) were neither. The percentages of positive responses were approximately two times lower than negative ones. This result demonstrates that organisational structure and coordination between departments negatively affected the development of KM in the MHCB.

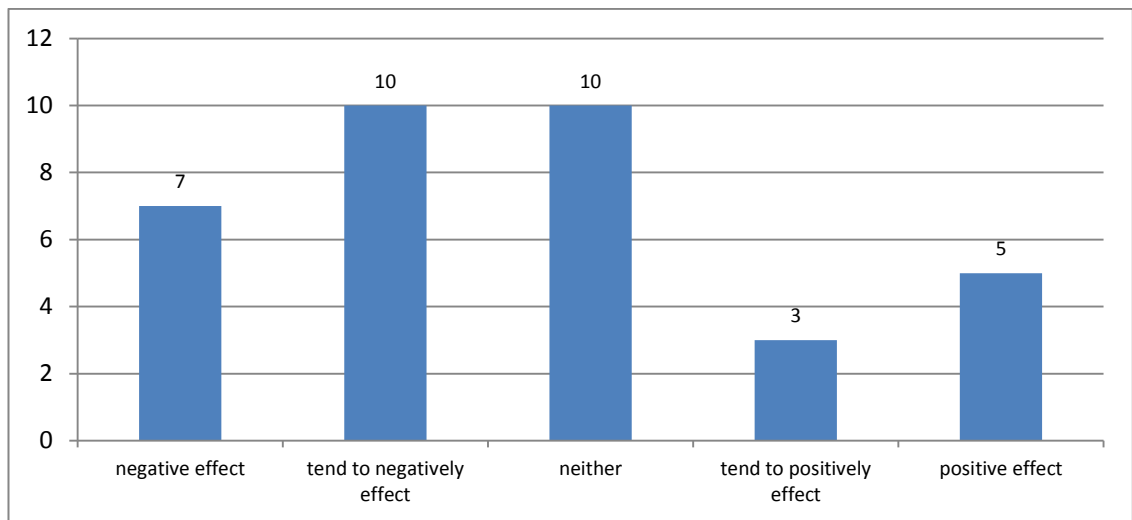


Figure 8.29: The effect of the MHCB's organisational structure on developing KM

As shown in table 8.36, the mean results show that the factors influencing the development of KM in the MHCB tended to have a positive effect except for organisational structure and coordination between departments. Individual factors, individuals' competence, personal experience and individuals' absorption abilities had percentages indicating a positive effect of between 62.5 and 73%. The organisational factors varied; suitable places for discussing and sharing knowledge obtained a high percentage of positive effect at 73%. The other organisational factors were the collaboration culture 60%, organisational policies regarding pay for knowledge and staff motivation 55.6 and 56.6%, ICT and leadership vision at 50%. At the bottom of the rank was organisational structure and coordination between departments with 32%.

Table 8.36: The rank (positive to negative) of factors in developing knowledge in the MHCB

rank	influenced factors	Parentage of positive effect	Its effect				
			← negative		positive →		
			1	2	3 (neither)	4	5
1	Suitable places for discussing and sharing knowledge	73%	2	5	9	8	11
2	Competence of individuals	73%	1	4	16	9	5
3	Individuals' absorption abilities	66%	0	7	14	12	2
4	Personal experience	62.5%	1	8	11	9	6
5	Collaboration culture	60%	1	7	15	8	4
6	Organisational policies regarding pay for knowledge	56.6%	4	9	5	8	9
7	Organisational policies regarding staff motivation	55.6%	7	5	8	6	9
8	Information Communication Technology (ICT)	50%	4	7	13	5	6
9	Vision of leadership	50%	5	7	11	5	7
10	Organisational structure and coordination between departments	32%	7	10	10	3	5

8.7 Technical Staff and their Movement in the MHCB

The objective of this section is to demonstrate the current human resources in the MHCB and their qualifications and experience, and to explore the employees' movement in the MHCB between 1986 and 2010.

8.7.1 Competence and Experience of the MHCB's Technical Staff

A list of current technical staff includes names, competence, section and the year of employment in the MHCB; these details were collected from administration records in the technical affairs department. The objective is to analyse the qualifications and experience that affect the development of KM in the MHCB.

The head of the MHCB had an MSc degree in the field of architecture, and had worked as a faculty staff member for ten years before being assigned as head of the MHCB in 2009. The technical staff in the technical affairs department numbered 29 employees; three were architects with a BSc in the field of architecture, three were civil engineers and six were technicians with a high diploma in the field of architecture or civil engineering. The remaining 17 members of technical staff were surveyors and draftsmen (see table 8.37 for the level of education in Libya).

Table 8.37: Levels of built environment education's certificates in Libya

Intermediate level	Graduate level	Postgraduate level
Secondary certificate 3 years	Architects and civil engineers - Bachelor degree 5 years faculty of engineering	Master degree 2 years (architecture, civil engineering, project management)
Surveyor/ Draftsman Intermediate certificate 3 years	Technicians - High diploma (college certificate) 3 years architecture or civil engineering field.	

The mean of the technical staff's work experience was between two and twenty two years; the mean of the architects' experience was eight years (six years in the MHCB); civil engineers was nine years (six years in the MHCB); technicians was seven years in

the MHCBS, and surveyors and draftsmen had 17 years in the MHCBS (Table 8.38). However, although these results show a high rate of experience in terms of the number of years (total mean = 7.52 years), it does not reflect the provision of experts in the MHCBS. This institution suffers from a lack of architects and engineers, with just four architects (one of them being the head of institution) and three engineers working in the MHCBS. This small number was attributed to architects and engineers leaving the MHCBS at a high rate.

Table 8.38: The number of technical staff and the mean of work experience in 2010

Technical staff	Architects	Civil engineers	Technicians	Surveyors/ draftsmen
Number of technical staff	4	3	6	17
Mean of work years	8.25	9	7.16	17.52

8.7.2 The Movement of the MHCBS's Technical Employees

The names and dates of previous employees who had worked in the MHCBS since 1986 were collected from the administration and financial documents of those previous employees. It was reviewed with some existing and previous senior employees to make sure that no names were missing.

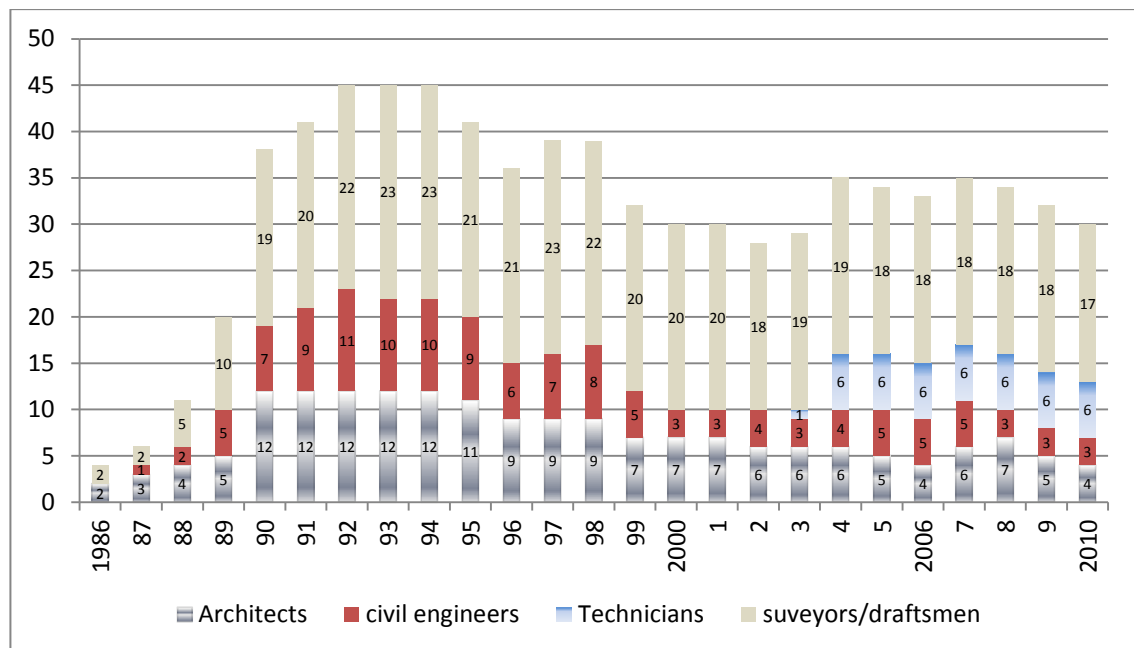


Figure 8.30: Number of technical employees in the MHCBS between 1986 and 2010

As shown in figure 8.30, the highest number of architects (12 architects) who had worked in the MHCBS was between 1990 and 1994. The number decreased later and fluctuated between four and seven in the duration between 1999 and 2010. Also, the highest number of civil engineers (11 engineers) was in 1992. The number decreased later and fluctuated between three and five in the duration between 1999 and 2010.

However, the maximum number of surveyors and draftsmen was 23 in 1993 and the number continued to be stable between 17 and 20 in the duration 1999 and 2010. The number of technicians remained stable (six) from 2004 and 2010.

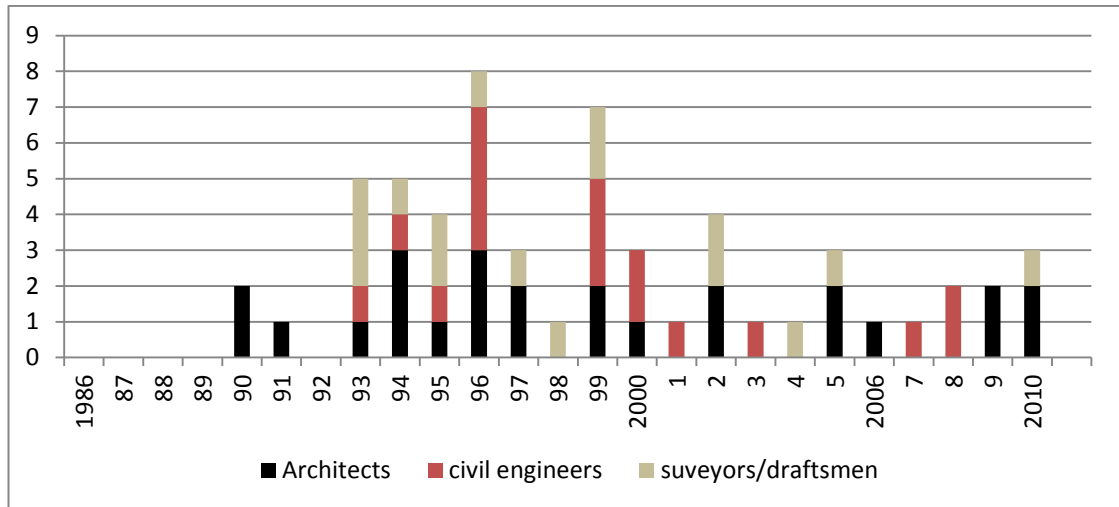


Figure 8.31: Number of technical employees that left the MHCB between 1986 and 2010

The maximum rate of departure for technical staff (figure 8.31) was 22% of total technical staff (8/36) in 1996. However, the comprehensive view (table 8.39 and figure 8.32) shows that the total number of technical employees who left the MHCB between 1986 and 2010 was 56, including 25 architects, 17 civil engineers and 14 surveyors/draftsmen. The percentage of total technical staff leaving was 65.12%. The most significant rate of departure was among architects (86.20%) and civil engineers (85%), compared with surveyors and draftsmen at 45.16%. No technicians left the MHCB.

Table 8.39: The number of MHCB's technical employees between 1986 and 2010

Duration of working in MHCB	Architects	Civil Engineers	Technicians	Surveyors+ draftsmen	Total
1986 - 2010	29	20	6	31	86
2010	4	3	6	17	30
percentage of leaving	(25/29) 86.20%	(17/20) 85%	0%	(14/31) 45.16%	(56/86) 65.12%

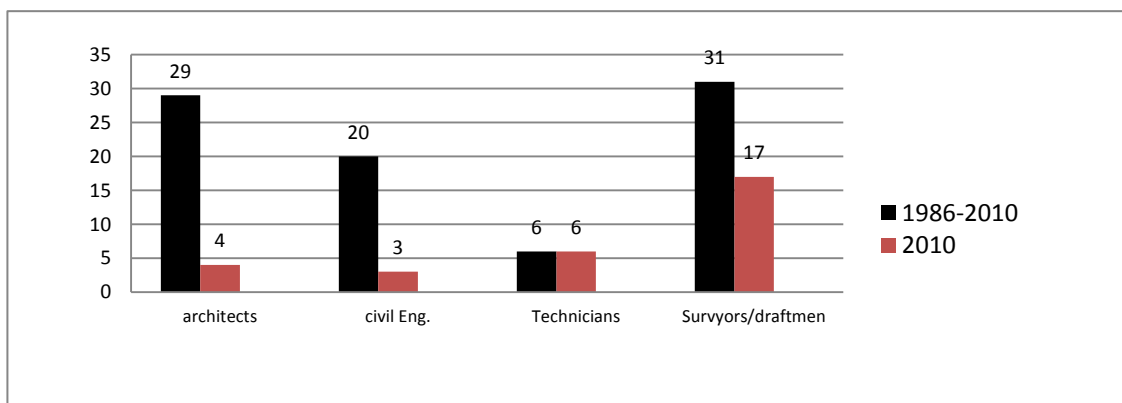


Figure 8.32: Comparison between the number of existing technical employees (2010) and total number of technical employees who worked in the MHCB between 1986 and 2010

The point here is that architects, engineers, surveyors and draftsmen have left this institution with the knowledge they gained from years of work experience in the field of HB conservation. This situation is considered a threat against managing knowledge in the MHCB because the institution has lost not only their personal knowledge but also the explicit knowledge they may have or have access to. Also, the institution has lost the time and money that was spent on developing their skills and knowledge. The most significant threat is that the technical staff are irreplaceable because this institution is unique not only in Tripoli, but in the country (Libya).

8.8 Chapter Summary

The objective of this chapter was to analyse the quantitative data that was collected from the questionnaire and organisational records regarding:

- The importance and availability of HB conservation knowledge in the MHCB
- The extent of applying KM techniques in the MHCB.
- The current use of IT and the obstacles to its use in the MHCB.
- The MHCB's circumstances and the affective factors in developing KM
- The technical employees and their movement in the MHCB.

1. The findings regarding the importance and availability of HB conservation knowledge in the MHCB demonstrate that the importance of most aspects of HB conservation knowledge that were included in the questionnaire is relatively high (the average is 78%). On the other hand, the average percentage of total knowledge availability is in medium grade (around 50 %). This percentage indicates the lack of HB conservation knowledge in the MHCB. A comparison of the means of knowledge importance with its availability in the MHCB showed that there is a significant gap in knowledge in the majority of aspects of knowledge particularly knowledge regarding:

- Recent repair materials used for repairing HBs
- Old construction methods that were used for building HBs
- CVs and details for specialists and stock holders in the field of HBs conservation
- Identifying the required treatment that should be done in HBs
- Environmental values of HBs.

2. The findings regarding the extent of applying KM techniques in the MHCB indicated that the majority of KM techniques suffered from a lack of application in the MHCB, as the mean of such application in the MHCB was between low (1.36/5) and medium (3.26/5). Four of five top ranked techniques that were applied in the MHCB were done by the employees themselves without the intervention of the organisation.

These techniques were: trial-and-error, discussion with others, asking for help during daily work, and self-reading. However, a group task (the third highest rank) was the only technique that was applied formally in the MHCB.

The results also illustrated that the greatest gap in applying KM techniques occurred in activities that should be organised by the organisation itself such as: presentations, lectures, meetings, mentoring for new employees, external training and internal training. Also, the rotation system, conferences and seminars and workshops do not elicit sufficient interest in the MHCB. However, the findings demonstrate that individuals were not interested in applying some techniques such as: contact with expert builders and preparing a conference paper or a journal article, in addition to insufficient self-reading.

Regarding the absorption abilities of employees from some learning tools, the findings show that the respondents' absorption abilities were often high from hands on experience of conservation work and attending training courses or workshops. However, absorption abilities from discussing with others, self-reading and attending lectures or conferences were of a medium grade. Finally, respondents tended to consider that the library provided for their knowledge needs and helped them to conduct their work.

3. The statistical findings regarding the importance of IT for conservation work illustrated that it was a helpful tool for preparing HBs drawings, providing relevant information, and reducing the use of paper forms. The previous three contributions of IT were top ranked. Furthermore, IT provided a platform from which individuals had access and shared HB conservation knowledge, a safe time for retrieving and reviewing explicit knowledge and facilitating secure records. The lowest rank was assigned to the online discussion forum. However, comparing the results from MHCB employees and other respondents outside the MHCB demonstrated a significant difference between the two groups regarding the role of IT in reducing the use of paper forms, providing secure records, providing an online discussion forum and providing information and a knowledge base. Low importance was assigned by the MHCB employees, and this reflects the extent to which these services were not provided in the MHCB and their lack of their use by MHCB employees.

Furthermore, the majority of MHCB employees preferred to store their documents in both paper and electronic forms together to avoid their loss. This is attributed to difficulties that they faced when dealing with IT. Also, the statistical findings indicate that internet services, such as search engines, the MHCB web site, E-mail and the

online discussion forum, were not used sufficiently in the MHCB. One reason for this may be the obstacles to the use IT in the MHCB.

The main obstacles to such use of IT in the MHCB were viruses, telecommunication problems and hardware failure, as the majority of respondent had faced these obstacles. Furthermore, the minority of respondents had faced software failure and suffered from a lack of computer knowledge. The least important obstacles were program changes, electrical problems and theft of data or equipment.

4. The results regarding the MHCB's circumstances and institutional and individual factors affected the development of KM in the MHCB show that the great majority (93.75%) of respondents' opinions regarding knowledge development responsibility in HB conservation institutions was that it is a shared responsibility. This result reflects the respondents' view that achieving the goal of KM in such institutions should be the result of cooperation between the employees and their institution.

Regarding the extent of satisfaction with the content of knowledge that is shared in the MHCB, although 45.8% of respondents were satisfied, a significant percentage (40%) of respondents were not. This result indicates that there was a shortage in the quality of existing shared knowledge. Also, more than 70% of respondents working in the technical affairs and historic studies department in the MHCB had a medium or lower level of knowledge in the field of HB and their conservation; this means a KM initiative is necessary to contribute to the development of employees' knowledge.

Regarding the collaboration between the main two departments of technical affairs and historic studies, the majority of respondents (68.6%) stated that they faced difficulties (always or sometimes) when they contacted employees in other departments. These difficulties can be categorised into three sections ranked as follows:

- Not understanding a request, because the proper person (who has knowledge) is not known, or lack of (knowledge) qualified persons, or misunderstanding the request.
- Delay as a result of formal procedures
- Unwillingness to collaborate from some employees even in shared work.

Moreover, the majority of respondents (77%) stated that they faced difficulties when requesting documents from other departments. The difficulties could be categorised into six sections, ranked as follows:

- Delay, as a result of formal procedures and need for consent from the head of department, mentioned 14 times.

- Unwillingness to collaborate by some employees, even in work groups, and monopoly of some information, mentioned five times
- Not understanding a request, because of misunderstanding what is requested or not available at all, mentioned four times
- Mismanagement: managers not bearing their responsibilities of giving documents, or organising departments, mentioned four times
- IT constraints: version of programmes not compatible or afraid that files contains viruses, mentioned three times
- Disorganised information: documents not organised probably, mentioned three times.

Regarding the culture of collaboration and sharing knowledge, the majority of respondents (82.9%) agreed that it was acceptable to ask for help in their work environment. The result reflects a positive point about encouraging the development of a KM initiative in the MHCB. Also, more than half of the respondents (65.71%) agreed that it was reasonable to make mistakes in their work environment. This result shows the extent of encouraging learning by doing, and also accepting a trial-and-error policy in the MHCB. However, the debate still continues regarding applying this to restoration work. Furthermore, about 63% of respondents agreed that it was possible to share lessons in a culture of continuous improvement in their work environment. The result is a strong point which encourages the development of KM initiatives in the MHCB. However, more motivation for the technical and historic researchers is essential. Moreover, fewer than half of the respondents (45.71%) agreed that individuals in their jobs actively sought and applied new learning in their work environment. On the other hand, 28.6% disagreed, in addition to 25.7% stating neither. Although the result reflects that the balance inclined to agree, the opinions of others should be considered. Seeking and applying new learning requires interest in a KM initiative as it is a way to learn by doing. Finally, more than half of the respondents (63%) agreed that senior employees had been transferring their knowledge to junior employees in their work environment. This result is a positive point for encouraging the development of a KM initiative in the MHCB. However, an average number of respondents' responses regarding the absence of senior employees who had left the MHCB had a high negative effect (3.91/5). This result reflects the threat of the continued departure of seniors and others who have significant knowledge to develop employees' knowledge, and also the essential need for a KM initiative in the MHCB to avoid knowledge leakage as a result of employees' leaving.

The questionnaire findings demonstrate that employees tended to contact colleagues as a first choice to obtain knowledge when faced with a problem in their daily work in the MHCB. Reviewing relevant documents or references came second. However, contacting managers and using the internet were the last choices. Also, the findings demonstrate that the majority of respondents (88.6%) were very interested or interested in having knowledge management formally in their institution. This positively affects the development of KM in the MHCB. The statistical results regarding factors influencing this development demonstrate that suitable places for sharing knowledge and, individuals' competence, experience and absorption abilities were available and would positively affect the development. Furthermore, the collaboration culture, organisational policies regarding pay for knowledge, and staff motivation and retention tended to positively affect development. Moreover, the statistical results demonstrated that the opinions regarding the vision of the leadership and ICT were balanced. Lastly, the respondents' opinions demonstrated that the current organisational structure and coordination between departments negatively affected knowledge development.

5. The statistical findings regarding MHCB's employees and their movement show that the total number of technical staff in the MHCB was 30. The rate of the technical staff's experience was 7.5 years, and their competence was adequate and could positively affect knowledge development. However, these statistics do not reflect the availability of experts in the MHCB. This institution suffered from a lack of architects and engineers, with just four architects and three engineers working in the MHCB. More than half of technical staff (17/30) was surveyors and draftsmen in addition to six technicians.

Furthermore, statistics on previous technical employees illustrate that the number of technical employees who had left the MHCB between 1986 and 2010 was 56, including 25 architects, 17 civil engineers and 14 surveyors/draftsmen. The percentage of total technical staff leaving was 65.12%. The significant rate of departure was for architects (86.20%) and civil engineers (85%), whereas among surveyors and draftsmen, the rate was 45.16%; no technicians left the MHCB. Architects, engineers, surveyors and draftsmen had left the MHCB with the knowledge that they had built from years of work experience in the field of HB conservation. This situation presents a threat against managing knowledge in the MHCB, not only because of knowledge leakage (what they have in their minds and also explicit knowledge may they have or have access to) but also the institution lost time and money spent on developing the skills and knowledge of employees.

Chapter 9: Discussion of the Key Findings

9.1 Introduction

The aim of the research was to investigate the concept of knowledge management and develop a framework for studying and understanding KM in HB organisations. The research questions that should be answered to achieve the aim include:

1. What is the concept of KM and what is its relevance to organisations?
2. What is the nature of historic buildings and what are the key issues in their conservation at the level of responsible organisations?
3. What is essential HB conservation knowledge in the MHCB? To what extent is it available in the MHCB?
4. What factors influence the management of knowledge in the MHCB context? And what is their impact?
5. How does the MHCB deal with knowledge? How does KM affect the MHCB's performance?
6. What are the key issues, strengths, weaknesses, opportunities and threats in the management of knowledge in the MHCB?

Answering these questions and developing the proposed theoretical model for studying and understanding KM in organisations, will contribute to understanding the problem of managing knowledge in the MHCB.

9.2 The Concept of Knowledge Management in Organisations

Knowledge management (KM) contributes to thinking differently about key organisational resources and processes (Quintas, 2005: 11). The definition of knowledge management that has been derived from several scholars (section 2.2.3) is that management processes enable organisations to identify the available and required knowledge, capturing and sharing it for effective use to achieve organisational objectives and create new knowledge. Knowledge management is not an end in itself its advantages include supporting necessary activities within the organisation, such as enhancing performance, improving the capabilities of the organization's human resources, problem solving, learning, strategic planning, and decision making.

The definition of knowledge is based on three tightly interconnected knowledge characteristics: the structural, the interpretation process and the functional characteristics (section 2.3.2). The structural point of view is concerned with explicit

knowledge in terms of knowledge formed by information, such as know-what knowledge, whereas the interpretation process points of view are concerned more with tacit knowledge, which is embedded in individuals or organisations and can be transformed into explicit knowledge. Thirdly, functional points of view are concerned with both tacit and explicit knowledge, such as knowledge of procedures, or know-how.

The key literature review findings regarding managing knowledge in organisations (chapter 2) demonstrated that the knowledge is created in a specific context and what has value in one context may not, or have little, in another (Quintas, 2005). Newell (2006: 169) stated that “knowledge as something possessed must be practised in a specific context to be meaningful”. Also, balance between people-based and explicit knowledge-based KM approaches is required for managing knowledge in organisations. However, the KM in this research was investigated in the historic buildings conservation context.

9.3 The Nature of Historic Buildings and the Key Issues in their Conservation

Historic buildings (HBs) are old buildings, mostly adapted for new and changeable functions, which have historic, architectural, economic, environmental and social values (section 3.2). The proper or comprehensive term which is used to describe the activities that are relevant to HB is conservation, which means “all the processes of looking after a place so as to retain its cultural significance” (ICOMOS, 1999: article 30). Historic building conservation includes all the managerial and technical activities that are done for conserving these buildings. The required knowledge for conducting these activities are mainly know-what and know-how regarding HB conservation, in addition to know-who knowledge regarding employees, specialists, suppliers and contractors and their abilities to conduct specific tasks (section 2.3.3).

9.4 The Essential Knowledge and the Extent of its Availability in the MHCB

As illustrated in figure 3.3 regarding the key processes in HB conservation at the level of responsible organisations, the most significant processes include: assessing and documenting HBs’ values and conditions, deciding the level of intervention in these buildings, and contracting and supervising the conservation work. However, knowledge regarding these processes was investigated throughout chapters 3, 5, 6 and 8.

9.4.1 Knowledge Regarding Assessing and Documenting HBs’ Value and Condition

The responsibilities of the technical sections in the MHCB (tables 5.2) include: preparing studies regarding HB values (assessing HB values); conducting architectural

studies; preparing the drawings and details of HBs (architectural survey), and conducting technical studies and research regarding assessing HBs' structure and elements (structural survey). Furthermore, the majority of interviewees (section 6.2.1) mentioned that knowledge aspects regarding assessing and documenting HBs are significant for deciding the intervention in HBs. The statistical results (section 8.3) demonstrated that although knowledge aspects regarding assessing and documenting HB values and their conditional survey have a relatively high rate of importance in the MHCB, their availability is in a medium rate.

The most available knowledge in the MHCB is regarding architectural surveys, which obtained a relatively high rate of availability. Knowledge regarding HB architectural value, historical value and conditional surveys obtained a relatively medium rate of availability, whereas knowledge regarding social, economic and environmental values obtained a relatively low rate of availability in the MHCB.

The importance of assessing and documenting HBs values and condition knowledge aspects in the MHCB do not contradict their importance in the wider literature (see more in sections, 3.3 and 3.7.1). For instance, regarding documenting HBs, ICOMOS (1990) emphasizes the need to thoroughly record HBs before any type of intervention to make the interpretation of HBs available when and where it may be needed, and to keep this knowledge and information for future work and future generations.

9.4.2 Knowledge Regarding Deciding the Level of Intervention in HBs (action plan)

In the MHCB, one of the technical department's responsibilities is conducting the architectural and structural studies for repairing and reusing HBs (table 5.2). More than half of the interviewees (12/20) emphasized that the institution's technical team should decide the type of work in HBs (section 6.6.2). This is attributed to the nature and sensitivity of HBs in addition to the need to comply with conservation regulations and principles. The statistical results (section 8.3) demonstrated that knowledge aspects regarding deciding the level of intervention in HBs obtained a relatively high rate of importance in the MHCB.

However, knowledge regarding identifying the required treatment, the principles of dealing with HBs, and rehabilitating HBs, obtained a relatively low rate of availability, whereas knowledge regarding relevant regulations obtained a relatively medium rate of availability in the MHCB.

The importance of knowledge aspects regarding the intervention in HB comply with their importance in the wider literature (section 3.6). For instance, according to BS7913

(1998), intervention in HBs means any action which has a physical effect on the fabric of historic buildings.

9.4.3 Knowledge Regarding Contract Management

The technical affairs department in the MHCB is responsible for technical contracting processes for HB projects that belong to the state (table 5.2). The contracting process and supervision of restoring the state's HBs belongs to government heritage-focused organisations' responsibilities, such as Malta heritage (Malta, 2011). However, according to the MHCB's top level management (section 6.2.3) the MHCB is facing difficulties regarding starting their projects because the governmental financial budget for restoration projects will not be provided without such documentation as bills of quantities and estimated prices. However, the MHCB suffers from a lack of knowledge or experience regarding preparing contract documents and the tendering process. This was supported by statistical results (section 8.3) which demonstrated that the rate of knowledge availability regarding preparing project documents and tendering is relatively low, whereas its importance is relatively high. Lack of knowledge regarding preparing project documents and tendering is attributed mainly to the MHCB was an implementer for its restoration works and the fact that contract documents were rarely prepared for restoration projects (section 6.2.3). This indicates that the importance and the need for some knowledge aspects in organisations could be changed according to the changes of organisation circumstances and priorities of work.

The literature review regarding HB conservation (section 3.7.3) demonstrates that quantity surveying (QS), specifications and conditions for HB restoration work, in addition to the contractors' qualification process in HB restoration work, are essential and have different standards in comparison with normal construction projects (Holm, 2000; Malta, 2011).

Furthermore, the coordinator of national group for protecting Libyan architectural Heritage (H.B) mentioned that know-who knowledge, such as knowledge regarding who can or has the ability to diagnose the defects in HBs, identify the right remedies or understand the restoration processes in HBs, is essential knowledge in responsible HB conservation organisations. Statistically, the importance of know-who knowledge importance regarding employees and specialists in the MHCB is relatively high but its availability is relatively low. The insufficiency of these knowledge aspects as observed in the MHCB (section 7.7.2) can be attributed to the lack of a data base that includes CVs and details of employees and specialists. The literature review demonstrated that know-who is essential in organisations. As Kamara et al (2002) stated, it is knowledge

regarding people with the skills for a specific task, and knowledge of the abilities of suppliers and subcontractors. Also, it is regarding “projects and the people who worked on them or CVs for staff that indicate their special knowledge” (Sun and Howard, 2004). Furthermore, Bishop (2009) stated regarding an expertise/skills database that it is “used to source individuals, encouraging communication”.

9.4.4 Knowledge Regarding Supervision of HB Maintenance and Restoration Work

The technical staff’s tasks in the MHCB (table 5.2) include technical supervision and inspection of implementation work in historic sites, particularly:

- Providing the HBs’ owners with technical consultants for restoring their buildings
- Supervising the implementation of restoration works and preparing progress reports
- Adopting the equipment, instruments and machines used in restoration work
- Adopting the samples of construction materials according to contract’s specifications
- Supervising urgent maintenance work (supporting buildings that are on the verge of collapse to avoid risk).

Knowledge regarding these aspects is required for technical staff. A minority of interviewees (5/20) in the MHCB’s context added that the supervisors also should have knowledge regarding: recognizing work defects, security and safety, dealing with archaeological findings, complying with all the details of the contract, and decision making regarding the restoration work (section 6.2.3). Also, the observation of repair works (appendix 3) in Tripoli demonstrated that knowledge regarding the main defects, such as cracks and dampness in walls, is required. However, the observation indicated that new knowledge is required regarding the know-how to deal with previous wrong treatment, particularly the incorrect use of cement mortar and concrete in HBs walls.

Statistically, all knowledge aspects regarding restoration work in the MHCB obtained a relatively high rank of importance. However, most of them obtained relatively low ranks of availability in the MHCB (section 8.3), particularly knowledge regarding recent repair materials and old construction methods. According to some interviewees, the unavailability of this knowledge in the MHCB context could be attributed to the rare use of recent repair materials for repairing HBs (unavailable locally). Also, there was no guide in the MHCB to provide knowledge for restoration work in terms of materials, methods and equipment, in addition to tests for old materials.

The importance of supervision knowledge aspects do not contradict with their importance as mentioned in the wider literature. This knowledge is essential for ensuring complying with HBs conservation principles and dealing sensitively with HBs (section 3.7.4). For instance, ICOMOS (1999) stated that supervision is required at all

stages of HB restoration. Also, at the managerial level, the planning and supervision for the restoration process requires knowledge, expertise, and practical know-how (Mullins, 1986).

9.5 The Factors Affecting KM in the MHCB's Context

Numerous organisational and individuals factors affecting KM in organisations were included in the proposed theoretical model for studying and understanding KM in organisations (figure 2.10). These factors were investigated in addition to other factors emerged during the field research. However, the factors that were investigated include the accountability, organisational structure, governmental regulations and organizational policies, working places, KM technology, culture of collaboration, awareness regarding KM, the role of leadership, and individuals in the organization's context.

9.5.1 The Accountability and the Organisational Structure of the MHCB

The MHCB is a government organisation which cares for HBs as the core business activity. Such an organisation aims to conserve HBs, not only to present cultural values but also to perform a function (section 3.5.2). The accountability of the MHCB at present is to the archaeology department, which is in turn accountable to the ministry of tourism. The accountability of the MHCB since its establishment in 1986 has changed five times. These changes impacted on the organisational structure and caused seven changes in the MHCB's head according to the plan of each governmental board that the MHCB was accountable to.

According to a review of organisational documents and interviewees' opinions (section 5.3.1), the accountability of the MHCB transferred in 2006 from the facilities ministry to the tourism ministry. Because of this change, the MHCB became a managerial-oriented instead of implementation-oriented organisation, and its responsibilities have extended to cover all the historic cities and buildings in Libya. This change affected the MHCB's performance as it led to the need for different knowledge such as knowledge regarding contracting processes. Also, three interviewees stated that it has affected some technical staff, who left the MHCB carrying with them their knowledge (section 7.2.2). However, the current accountability of the MHCB to the archaeology department and the ministry of tourism might be a positive effect according to the relation or the integration of tourism and archaeology with the field of HB conservation. This provides an opportunity for contact with specialists and access to relevant documents in these institutions. However, according to the author's literature

review, it seems that the effect of organizations' accountability in managing knowledge has not been mentioned previously.

In the MHCB, the organisational structure includes four departments and numerous sections (figure 5.8). The working place of technical employees is in the same area and contacting each other in the same department is convenient. The organisational structure supported personal interactions and communities of practice between sections. This complies with the broad literature (section 2.9.2) that calls for a flexible organisational structure for successful KM (Bishop, 2009).

However, the organisational structure in the MHCB contradicts the personal interactions between employees in different departments. It was observed that the presence of historians in the technical affairs department is very limited and vice versa (section 5.3.4). This is proved statistically (section 8.6.4), as more than 68% of respondents mentioned that they had faced difficulties when contacting employees in other departments. Also, approximately the same percentage points out that the current organisational structure in terms of the relation between departments did not support sharing knowledge activities in the MHCB.

Furthermore, technical documents are stored and managed by the documentation section which is accountable to the planning and historic studies department (figure 5.8 and section 5.3.4). Three senior technical interviewees mentioned that this caused the technical staff difficulties in getting documents and led to unwillingness to submit their documents for storing in this section (section 5.3.4). This is proved statistically as the majority of questionnaire respondents (77%) stated that they have faced difficulties when requesting documents from other departments (section 8.6.5). The difficulties regarding contact between employees and exchanging documents in different departments in the MHCB that affected its performance can be attributed to organisational structure. This includes:

- The restrictions that employees should not leave their departments
- Poor coordination between departments that leads to delay, as a result of routine and the condition of providing consent from the head of department
- Lack of willingness to collaborate by some employees and the monopoly of some information.

However, the situation of the organisational structure in the MHCB at the level of departments contradicts with the ideal situation mentioned in the wider literature (section 2.9.2). For instance, Anantatmula (2008: 457) stated that:

“The organization should have a structure which facilitates personal interactions and supports communities of practice to capture tacit and explicit knowledge within the organization and this structure should be extended to virtual teams and outsourcing personnel in applicable areas through appropriate communication tools”.

Finally, there is no research and development (RD) section in the MHCBC responsible for creating particular knowledge regarding, for instance, repair materials and restoration work. Gibson (1994) distinguished this mode (Mode 1) of knowledge generation within a disciplinary, primarily cognitive, context. By contrast to mode 1, mode 2 knowledge is carried out in a context of application (section 2.4). A research section is available in similar organisations responsible for conserving HBs, for instance, the National Built Heritage Centre (SCTA, 2012) was established to be a home of technical expertise in the field of urban heritage, achieving the development of local materials (mud and stone, for example) with the encouragement of traditional builders and traditional building artefacts (section 3.5.2).

9.5.2 The Effect of the MHCBC’s Policies and Governmental Regulations on KM

In the MHCBC, some policies contribute to developing knowledge (sections 5.4). For instance, the organisation’s policies and governmental regulations permit or support:

- Providing ICT facilities, such as a database system to store and retrieve information and knowledge in the MHCBC
- Cooperating with local experts to provide knowledge
- Organising conferences and symposia to acquire conservation knowledge
- Arranging workshops and training courses for developing national skills (employees’ knowledge) in the field of HB conservation
- Allocating an annual budget to buy references and fund training.

However, there are constraints on contacting foreign institutions, consultants or sending staff abroad for training (difficult procedure and governmental approval is required). Statistically, although approximately 56% of the questionnaire respondents agreed that the organisational policy positively affected the development of KM and staff retention in the MHCBC (section 8.6.10), a significant percentage did not. Dissatisfaction appeared in approximately 65% of technical staff, who had left the MHCBC in the last 20 years (more in section 9.5.8).

This situation contradicts with the wider literature as one KM goal is to ensure that knowledge-workers stay with the company through staff motivation policies (Beijerse, 1999). Scholars in the field of HB conservation call for appropriate outsourcing policies to ensure that the organisation has the required skills available (Dann and Wood, 2004).

On the other hand, Rowley (1999), and Murthy and Panchal (2011) state that developing organisational norms and values which support the creation and sharing of knowledge is essential for successful KM in organisations. Some norms or policies have been mentioned by Vector (2008), such as making content submission mandatory and incorporating rewards into performance measurement plans. However, Bishop (2009: 87) stated that KM activities should be seen as a useful aspect of work rather than something that is required and, therefore, the policies and procedures approach should be minimised.

9.5.3 The Effect of Headquarters Location and Working Places in KM

The MHCB's headquarters is a refurbished HB in the middle of the old city of Tripoli (figures 5.5 and 5.6); this is helpful for reaching HBs easily. That the employees in the MHCB coexist with HBs makes them have a good common knowledge⁷ of them. Also, staying in this HB provides the chance to observe what occurs in the building for periods of time after refurbishment.

The working places of the technical staff in the technical affairs department are in the same area. This space contains a shared lounge surrounded by four halls and facilities. The places were divided between male and female employees; each hall includes work places for 8-10 technical employees (Figures 5.7 and 5.9). Moreover, a lecture room with ICT facilities was provided in the MHCB's headquarters for formal meetings, lectures and presentations. Statistically, 73% of respondents (section 8.6.10) agreed that suitable places for sharing knowledge in the MHCB were available. This shared context provides a good environment for sharing knowledge among employees. This situation complies with the wider literature. Scholars emphasize that sharing a working place supports transferring knowledge and provides face-to-face contact and offers a common language that enables individuals to understand each other's actions and the background (Brown, 1991; Dougherty, 1992; Shin, 2001).

9.5.4 The Effect of Information Technologies in KM

According to interviews and observations in the MHCB, some ICT facilities were provided. There is approximately a personal computer for each employee and database system (established recently), in addition to internet services, telephones, data show and digital cameras. However, it was observed that the software used in the MHCB was mainly general computer programs, which have not been contributed effectively in

⁷The term 'common knowledge' is "knowledge that is known to all members of a firm. The idea of common knowledge is very similar to the idea of common sense, which helps to conduct the work in an organization by providing common grounds for all workers" (Bano et al, 2010).

managing knowledge (section 7.7). Furthermore, because of the technical difficulties that the MHCb's employees had faced when dealing with computers most preferred to store their documents in paper and digital forms to avoid their loss.

The statistical findings regarding the importance of ICT in the HB conservation work context (section 8.5.1) illustrated that at the top ranks were: helpful tools for preparing HB drawings, providing relevant information, and reducing the use of paper forms. The medium ranks included: facilitating storage and retrieval of information. The bottom ranks included: providing secure records and an online discussion forum.

However, internet services were neither used sufficiently nor efficiently in the MHCb (section 8.5.3, figure 8.7). Computers were not connected to each other or to the database, and emails were not adopted for communication in the MHCb. Also, the MHCb's website provided limited utility because it was neither up to date nor connected to the MHCb's database system. Furthermore, the online discussion forum was rarely used for asking questions and getting answers. Finally, the limited use of search engines for acquiring HB conservation knowledge might be attributed to the limited information on Arabic websites. Also, the benefit from other sites, for instance those in English, was limited because of different contexts and language difficulty among the MHCb's employees. The other causes for rarely using ICT services is attributed to the technical obstacles which have been faced the majority of respondents in the MHCb particularly:

- Computers prone to malfunction, as there was no technical support for fixing computers in the MHCb.
- Frequent internet communication problems; this external cause is attributed to the supplier.

The existence and use of ICT facilities for managing knowledge in the MHCb do not sufficiently comply with ICT's role as mentioned in the wider literature (section 2.8). ICT plays an important role in facilitating KM processes (section 2.6); it is required for effectively codifying, storing, and retrieving knowledge. Also, it supports accessing existing information and connecting or directing a user that has a problem or question to knowledge repositories or experts (Hahn et al., 2000).

9.5.5 Culture of Collaboration in the MHCb

In the MHCb, there was a collaborative climate in the technical affairs department, with male and female employees sharing knowledge by asking questions regarding work. The statistical findings demonstrated that employees tended to contact colleagues as a first choice for getting knowledge when facing a problem in their daily work. However,

it was observed that the employees' working places were divided between male and female employees and the informal discussions tended to occur between each gender separately in their halls. This is attributed to social and religious reasons (section 5.3.2). The head of architectural studies explained that in lectures, presentations and meetings, effective discussions occur formally between the two genders (section 7.6.1).

This situation was supported statistically (section 8.6) as the majority of respondents (82.9%) agreed that it is acceptable to ask for help and 65.71% agreed that it is reasonable to make mistakes in their work environment. Also, about 63% agreed that it is possible to share lessons and the same percentage agreed that seniors have transferred their knowledge to juniors in their work environment. These results indicate positive points that this context provides knowledge sharing among employees in the MHCB. However, the majority (70%) of respondents mentioned that they obtained a medium or less amount of knowledge in the field of HB conservation (section 8.6). Also, a significance percentage of respondents (38.50%) disagreed that individuals in their job actively seek and apply new learning in their work environment, and 47% of respondents were dissatisfied with the content of knowledge shared in the MHCB.

As mentioned in section 2.9.1, to create a culture of knowledge sharing and encourage recipients of knowledge, Sheehan et al (2005) listed four points that should be provided in organisations:

- It is acceptable to ask for help
- It is reasonable to make mistakes
- It is possible to share lessons in a culture of continuous improvement
- People actively seek and apply new learning.

In the MHCB it was acceptable to ask for help, reasonable to make mistakes in the work environment, possible to share lessons, and seniors had transferred their knowledge to juniors in their work environment as employees tended to contact colleagues as a first choice for getting knowledge. These results comply with the wider literature. However, the results indicate that there is a weakness in the content of existing shared knowledge and employees did not sufficiently seek and apply new learning in the MHCB. Furthermore, although accepting that employees make mistakes in the work environment is necessary to create a culture of knowledge sharing and encourage the recipients of this knowledge, this might cause a problem when dealing with HBs, whilst also contradicting the principles of working with HBs.

9.5.6 Awareness Regarding KM in the MHC B Context

In the MHC B context, although individuals did not have a background regarding KM, the interviewees' definitions regarding this expression (section 5.3.5) indicate some awareness and reflect the point of view regarding the term knowledge itself 'is it tacit or explicit knowledge'. Furthermore, the great majority (93.75%) of questionnaire respondents agreed that knowledge development is a shared responsibility between the institution and individuals (section 8.6.1). Moreover, the majority (88.6%) of respondents thought that KM is needed formally in the MHC B (section 8.6.9). These findings indicate that the MHC B's employees are aware of the need to develop their knowledge, KM is required in the MHC B formally and achieving the goal of KM is a result of cooperation between the employees and their institution. This complies with the wider literature which mentioned that an awareness that knowledge transfer has occurred or is needed is essential for KM (Newell, 2006).

9.5.7 The Role of the MHC B's Leadership in Managing Knowledge

In the MHC B the current head was keen to develop staff abilities and knowledge. This can be seen in providing ICT facilities, some specialized training courses and encouraging discussions (5.3.6). This to some extent complies with the wider literature (section 2.8.1). Leadership supports the acquisition and dissemination of information and knowledge in daily work processes. Also, they can secure funds and provide ICT to achieve KM objectives. For instance, Anantatmula (2008: 457) stated that:

“The leader plays a critical role in securing funds and building technology infrastructure to accomplish KM goals and objectives. Capable leaders garner the support of the top management and influence the collaborative culture”.

However, no leader/s assigned to guidance KM processes in the MHC B. Also, three seniors mentioned that the directors of departments in the MHC B are not filled with proper persons who are interested in developing employees' knowledge (5.3.6). Statistically, the respondents' opinions (8.6.10i) were balanced regarding the effect of leadership in developing KM in the MHC B. This contradicts with the role of leadership as mentioned in the wider literature, which emphasizes leadership's guidance of knowledge workers to facilitate KM processes within the organisation. For instance, Murthy and Panchal (2011) stated that a competent and committed leader/s should guide a group of knowledge workers who “facilitate, curate, and disseminate knowledge within the organisation”. Also, Anantatmula, (2008: 457) stated “organizations will experience better results if they choose a leader before a detailed plan for KM initiative is developed and implemented”.

9.5.8 Individuals in the MHCB and their Movement

The technical staff, such as architects, engineers, technicians, surveyors and draftsmen, in addition to historians and archaeologists, working in the MHCB could be considered as a source of knowledge (sections 7.2.1 and 8.7.1). Consortium (2007) tends to consider professional architects and structural/civil engineers acquired HBs conservation knowledge as he stated:

“Normally, it is the professional architect and/or structural/civil engineer specialised in conservation-restoration who acquires these knowledge, skills and competences to become what has often been termed the conservation architect”.

In addition to achieving the scope of work, architects and engineers contribute to transferring technical and management knowledge to juniors, technicians, surveyors and draftsmen, and also enrich the discussions that increase knowledge sharing. This could be attributed to their ability to assess and decide⁸ more than others according to their academic background, training and work experience. This experience could be acquired from contributing and leading the teams in all stages of HBs conservation work. Staying in the same job ensures employees get knowledge regarding HBs from accumulated experiences. Fielden (1982) stated that “staff retention is an important factor in staff developing a thorough knowledge”. In addition to performing the work, the availability of a sufficient number of specialist architects and engineers is crucial for avoiding redundant knowledge which occurs among small group. This opinion is supported by Hansen (1999: 82), who stated that “redundant information tends to occur among a small group of actors in which everyone knows what the others know”. This means ‘minimum specialists –minimum shared knowledge’.

The MHCB’s administrative records (section 8.7.1) showed that the number of technical staff in the MHCB is 30 (including the MHCB’s head) with a mean experience of more than seven years. Also, their competence was adequate (table 8.38). However, this does not reflect the availability of experts; the MHCB suffers from a lack of architects and structural/civil engineers. Just four architects and three structural engineers were working in the MHCB (2010) in addition to six technicians and 17 surveyors and draftsmen. The architects and civil engineers were the most frequently changed staff in the MHCB. The statistics of existing and previous technical employees between 1986 and 2010 (table 8.39, figures 8.31 and 8.32) illustrated that 85% of leavers were among architects and civil engineers, whereas among technicians,

⁸In the field of HB conservation, “the organisations and individuals responsible for management decisions should be named and specific responsibility taken for each such decision” (ICOMOS, 1999: article 29).

surveyors and draftsmen was 38%. This situation of technical employees' leaving (particularly architects and engineers) represents a threat against managing knowledge in the MHCB. According to interviewees' opinions, it has caused knowledge leakage from years of work experience in the field of HB conservation, and also of the explicit knowledge they may have or have access to. Also, there is no continuous knowledge transfer and damage to accumulated knowledge, in addition to wasting the time and costs spent on developing their skills and knowledge. Egbu et al (2005b) stated that:

“It seems that the importance of the employees' knowledge is often realised, perhaps too late, when the employee is about to leave the organisation, as he/she prepares to take with him/her knowledge and experience gained over the years”.

However, the reasons that were combined in the MHCB to make technical staff leave (section 7.2.2) include: the administrative changes that affect the role of the MHCB, lack of argument with their heads, and insufficient motivation policies, in addition to the fact that the work type is special and harder than normal jobs in terms of dangerous work places in the old buildings restoration projects (appendix 3B).

Staff leaving with their knowledge is known in the literature. For instance, Sheehan et al: (2005) stated that “senior staff retires or leave organisations regularly, potentially taking tacit knowledge and potential source of competitive advantage with them”. However, in the field of HB conservation, staff leaving is an irreparable loss, particularly in the MHCB, because the number of specialists is limited and only one organization is responsible for HB conservation. This mean no employees with sufficient experience from other similar organizations will transfer to the MHCB. However, it was observed that there was no contact with architects and engineers who had left the MHCB to take advantage from them.

The high rate of departure of architects and engineers who could not be easily replaced, and the lack of a sufficient number of architects and engineers, has negatively affected the MHCB performance. This is particularly true of delays of conservation work as the head of the architectural studies section (B.S) argued that all existing architects and engineers are busy on multiple tasks. According to the head of the MHCB, this forced the MHCB to depend on external knowledge sources (consultants and consultancy offices) for conducting HB conservation studies.

KM efforts can help recover some intellectual capital in the MHCB. For instance, they can provide sufficient policies that motivate them to stay in the MHCB.

Furthermore, there is an opportunity to benefit from architects and engineers⁹ who have left the MHCB after significant years of practical experience, particularly those who are still interested in HBs and their conservation and have a willingness to share their knowledge in providing lectures regarding their experiences, mentoring juniors, and providing training courses.

9.6 The Current Condition of Dealing with Knowledge at the MHCB

9.6.1 Dealing with Documents in the MHCB's Context

As shown in figure 2.10 KM processes are one of the main components of KM. The research investigated the current condition of dealing with explicit knowledge which was applied in the MHCB through several KM processes that mentioned in section 2.6.

Regarding the articulation of knowledge, the procedures for conducting HB studies and the methods of collecting information were developed to some extent in the MHCB according to the experience of using them (section 7.3.2 and appendix 4). However, they have not included the requirement to consult relevant previous studies or update them to include articulation of the lessons learned in conservation work. For instance, reviewing some technical studies and reports (section 7.3.2) has demonstrated that although they provide knowledge regarding some HB conservation disciplines, they do not provide sufficient knowledge for others such as how restoration work was done¹⁰, the problems that conservation projects faced, and how these were solved (lessons learned in HB conservation). Moreover, the studies and reports prepared by architects or engineers (even those who left the MHCB) often include knowledge relevant to local buildings and contexts, so that others, particularly in the same job/context, can get knowledge from them, not only about dealing with HBs but also how to develop such studies. The literature in the field of KM mentioned that to understand the hidden meaning, a rich data context in studies and reports is essential in the articulation process, as Brandon et al (1995: 359) stated:

“Since people always shuffle within and between companies, it is difficult to reach the historical report authors who understand the hidden meaning of project historical data. The historical data should provide a rich data context so that it can be used with minimum or no consultation of authors”.

⁹ Some of them, for instance, managing an active website interested in Libyan architectural heritage and others are members in the national group for protecting HBs.

¹⁰The documenting process of restoration work in the MHCB is limited and based mainly on photos.

Explicit knowledge is available in the MHCb's documents in the form of procedures, studies, reports, drawings, photos, visual/audio recordings, regulations, specialist books and journals. However, it is likely that documents which include explicit knowledge were not organised or stored properly. They are scattered in the MHCb; some written/digital documents are located with staff who have contributed to preparing them, or in departments' folders. Furthermore, although, most drawings, studies, reports and photos are conducted digitally, also, some previous paper documents have been transformed into digital form¹¹ (section 7.7), no specific computer programs were used for managing knowledge. Also, the MHCb's database has not contributed effectively in managing knowledge (section 7.7.2). This could be attributed to lack of criteria for what was or should be included. For instance, there was no information about previous projects and restoration process (except photos), relevant regulations and principles, CVs for staff and others that indicate their special knowledge in the field of HB conservation, or previous solved technical problems. However, physical knowledge repositories in the MHCb (section 7.3.1) were mainly located in two places which dealt formally with documents: Dar al-Naeb for documents and Dar Enoiji for culture (library).

1. Dar Al-Naeb for documents and manuscripts is the place for collecting the MHCb's documents in addition to the MHCb's archive (section 7.3.1). It includes: studies, reports, drawings, maps and photographs that are relevant to HBs and their conservation. Also, visual and audio recordings include lectures and presentations that were done previously in the MHCb (figures 7.4, 7.5 and 7.6). However, the cumulated explicit knowledge has not yet been used effectively. This is attributed mainly to the documents being neither organized nor codified effectively as employees were often not sure that the required knowledge was available. Each trial (seeking or asking) to get knowledge from these sources tended to be someone's personal effort. Documents were codified in Dar al-Naeb in a written list without classification or description of their contents and location. This negatively affected the MHCb's performance as this process is not helpful for retrieving documents and wastes time and contradicts acquiring knowledge.

This situation contradicts the process of storing, retrieving or accessing the required knowledge in organisations as mentioned in the literature (section 2.6). For instance, the essential in KM processes are:

¹¹ Although transforming all organization's relevant documents onto the database system is not an easy job, this task is possible.

- Explicitly encoding (documenting & capture) individuals' knowledge
- Organizing and storing it in an easily accessible manner (retrievable and updateable) in a shared knowledge repository
- Knowledge repositories require guidelines for included knowledge and what should be included.

Also, Lavy (2009) mentioned that “If the data stored in paper files is not organized, then retrieving particular information in a timely manner becomes almost impossible”.

Finally, regarding securing knowledge, Siemieniuch (2005: 75) claims:

“It should be remembered that security systems are only as secure as the people who use them, and it is better to assume that the purpose of security is to slow the rate of knowledge leakage, not to keep secrets”.

2. The MHCb's library includes external references, regulations and the MHCb's publications (section 7.3.1). These publications regarding conservation work are one technique for transferring knowledge. The library contributed to disseminating relevant knowledge to staff in addition to interested people. Furthermore, publications provide indirectly some knowledge regarding details and CVs for the specialists (authors) in the field of HB conservation. Statistically, although 58% of employees agreed that the library provided knowledge that helped them to conduct their work (section 8.4.3), it was observed that the number of employees that used the library was very low. This might be attributed to most references being neither relevant directly to the field of HB conservation nor up to date, in addition to the library being a separate building located outside the main headquarters of the MHCb (figure 5.5). Libraries contribute to disseminating knowledge in organizations and the literature review demonstrated the role of organizations in transferring knowledge between individuals in organizations. Gupta (2000: 19) stated that “Organizations can realize the full value of their knowledge assets only when they can be effectively transferred between individuals”.

9.6.2 KM Techniques and the Extent of their Application in the MHCb

Learning and sharing knowledge in organisations are strategies achieved through several KM techniques (section 2.7). In the MHCb, most KM techniques occurred informally as the four of five highest top ranks of techniques that were applied in the MHCb (section 8.4.1) were done by employees themselves without the intervention of the organisation. These techniques were: trial-and-error, informal discussion, asking for help, and self-reading, whereas group tasks were the only technique that was done formally among the top five. On the other hand, the biggest gap of applying knowledge techniques was in activities that should be organised by the organisation, such as

meetings, lectures and presentations, mentoring, and external and internal training, in addition to a rotation system and attending conferences. This indicates that these techniques had not got the sufficient interest in the MHCb.

Furthermore, the findings demonstrate that individuals are not interested in applying some techniques such as contacting and observing expert builders and contributing to the preparation of conference papers or journal articles. Moreover, the average employees' absorption ability from techniques that include expert or practising real conservation work or attending training courses was higher than other techniques (section 8.4.2). However, questions, discussions, meetings, training, lectures and presentations, team work, a rotation work system, trial and error, and monitoring, in addition to self-reading and attending conferences, were KM techniques that were applied formally/informally in the MHCb.

1. Asking questions, discussions and meetings are face-to-face interaction techniques applied among individuals in organizations. However, the context in the technical affairs department provides opportunities for meetings and sharing knowledge with respect for Islamic rules regarding separation between genders. Male and female employees shared in asking questions regarding the work whereas the informal discussions tended to occur between each gender separately in their halls (figures 5.7 and 5.9). Statistically, discussing and asking for help had the 2nd and 4th ranks of application in the MHCb whereas formal meetings had the 13th rank of application in the MHCb (section 8.4.1). Female employees shared in discussions with male workmates formally in lectures, presentations and meetings (section 7.6.1). However, only a few formal events were conducted, causing formal discussion between male and female employees to be rare. This can be attributed to there being no meetings scheduled or programmed in the MHCb. However, KM literature calls for face to face contact for exchanging knowledge, whereas the gender separation in working places and its impact in KM was not considered by KM literature.

2. In the MHCb, training courses were often general computer courses in addition to some technical and management courses. Most training courses were held outside the MHCb by external consultancy offices (external training). Few courses were conducted by external experts inside the MHCb headquarter with HBs in Tripoli as case studies, in addition to one course being conducted by a senior architect (internal training) (section 7.6.2). Statistically (section 8.4.1), the MHCb suffered from a lack of external and internal training as these techniques had the 6th and 9th ranks of application in the MHCb. The constraints that faced the training in the MHCb are that training courses

were not programmed, there was limited local training courses in the field of HB conservation, and the training section suffered from a lack of knowledge regarding the details of required training courses and who provides them (section 7.6.2). The situation of insufficient training contradicts the HB conservation literature which emphasizes that training is the complement of education and staff should be suitably trained. For instance, Dann (1998:146) emphasized that HB conservation staff should be suitably trained, particularly in user- and contract-focused activities. Also, Consortium (2007) stated that in the field of HB conservation training is the complement of education, undertaken by architects and/or structural engineers to become professionals, leading to the acquisition of conservation theory and practical knowledge, skills and competences.

Specialised training courses are available internationally. For instance, the international centre for the study of preservation and restoration of cultural property (ICCROM) organises regular training courses, including architectural conservation courses. These courses are open to participants such as mid-career professionals and other decision makers in conservation from different disciplines, including architects, archaeologists, engineers, planners and site managers (ICCROM, 2005). Also, this organisation provides visits to similar restoration projects in the countries where these training courses are conducted. However, the MHCB's technical staff had not benefitted from such courses because of the local policies in terms of complex procedures for foreign training.

3. In the MHCB, proper places for meeting and presenting were available and the interesting in attending lectures and presentations had increased among the MHCB's employees. However, few lectures and presentations had been conducted. Statistically, lectures and presentations techniques were rarely applied in the MHCB. They obtained the 13th and 15th (per 15) ranks of application in the MHCB (section 8.4.1). However, the weaknesses in the presentations of HB conservation projects in the MHCB were presenting the achievements not the lessons learned in completed projects. Also, there were few specialized people attended and sharing in the discussions during presenting the difficulties that need solutions in projects under achievement, and this affected the performance in terms of delay in decision making regarding the difficulties that are faced in conservation work. The unique aspect of working in the field of heritage conservation is that specialists and elderly people who know about HBs are often willing to introduce their knowledge regarding HBs, particularly the elders. Some elderly people have already provided some lectures in the MHCB particularly regarding the history of HBs. However, the MHCB does not invite these specialists to attend and

produce lectures, and nor are senior technical staff and historians motivated to produce lectures and presentations (section 7.6.3).

However, the wider literature presents the importance of lectures and presentation techniques for transferring knowledge to attendants (section 2.7.3). These activities provide chances to discuss specific cases and subjects in addition to lessons learned. Furthermore, knowledge can be transferred from seniors to others through storytelling, which “can be used to create a good knowledge and judgment of personal descriptive capability to do things effectively and skilfully in organizations” (Snowden, 1999).

4. Team work was in the MHCB in terms of architects, structural engineers, historians and surveyors who had been ordered to conduct a comprehensive HB conservation study, including preparing HB drawings, historic studies, architectural studies, conditional surveys, deciding the type of intervention in addition to preparing contract documents. Statistically, team work was available in the MHCB as this technique obtained the 3th top rank of availability in the MHCB (section 8.4.1). However, although team work was applied in the MHCB a type of divergence and lack of coordination happened during work (particularly between historians and technical staff) which contradicts sharing knowledge between the team (section 7.6.4). This negative effect on team work was caused by some employees in the MHCB being restricted from leaving their departments, in addition to a lack of coordination between departments.

However, the current situation of applying the team work technique in the MHCB contradicts with the wider literature (section 2.7.4), which identified and presented the importance of team work in combining existing knowledge and creating new knowledge (Siemieniuch, 2005).

5. In the MHCB, because of the shortage in architects and engineers most technical staff had worked on many tasks in different technical sections. Although this forced rotation work system technique had contributed to increasing the knowledge, it had some negative effects on the work performance as architects and construction engineers were replaced by unqualified technicians, draftsmen and surveyors who had become decision makers (section 7.6.5). Statistical results (section 8.4.1) indicate that the rotation work system technique (movement of persons among many sections) was available to a limited extent in the MHCB as it obtained the 10th (per 15) rank of availability in the MHCB. However, scholars have identified the importance of rotation work system in “distributing tacit knowledge and skills, or human capital, across space and time” (Egbu et al, 2005a).

6. In the MHCB, some problems were solved by a trial and error technique. Statistical findings (section 8.4.1) indicate that the trial and error technique obtained the 1st rank of availability in the MHCB. Trial and error is a technique for acquiring experiences and creating knowledge from problems that were faced and treated in previous projects. A specialist in the field of HB conservation, Feilden (2004: 6), stated “It must be recognized that some problems are unique and have to be solved from first principles on a trial and error basis”. However, applying trial and error in HBs without care might cause problems in them. It was observed in the visual survey that repetition of mistakes in trials for treating HBs occurred in the MHCB’s technical staff such as using cement for plastering (appendix 3 D,E,F). However, knowledge could be acquired from previous experiences, even those that proved to be incorrect, if trial-and-error is applied with respect to HB conservation principles (honesty, exacting recording and reversibility).

In the MHCB work environment, it was reasonable to make mistakes (section 9.5.5); this shows the extent of acceptance of trial-and-error policy. However, according to some interviews, the debate still continues particularly between academics and practitioners regarding trial-and-error policy in conservation work (section 7.6.6). The practice of trial and error in the MHCB contradicts with the wider literature. For instance, CEC (2000) stated “Repairs to traditional buildings should always be carried out with care. Once part of the historic fabric is lost it cannot be replaced”. Also, ICOMOS (1999: 3) claimed that “The use of modern materials and techniques must be supported by firm scientific evidence or by a body of experience”. Also, Brereton (1991) and Lazarus (2007) call for adopting proven techniques either traditional or innovative.

The weakness in managing the MHCB’s knowledge is that there was no documenting or disseminating of the lessons learnt from solving problems by the trial and error technique, as these experiences had not become organizational knowledge (section 7.6.6). This is one of the KM limitations identified by Newell et al. (2006) and Egbu (2009) in terms of lack of systems and tools for reporting experiences and lessons learned. However, KM complies with conservation principles (section 3.6.2) regarding the necessity of exacting reporting experiences and lessons learnt (Dann et al (1999), Designation (2003), Feilden (2004) and Hume (2007).

7. New employees in the MHCB had sometimes been monitored by the heads of the sections that they were working in and had received some help from their workmates (section 7.6.9). Statistical results (section 8.4.1) indicate that the MHCB suffered from

not applying a monitoring technique as this technique obtained only the 14th rank of availability (per 15) in the MHCB. The wider literature has identified and presented the importance of monitoring technique for transferring knowledge (section 2.7.7). For instance, Al-Ghassani et al (2005:86) stated that mentoring is a “process where a trainee or junior member of staff is attached or assigned to a senior member of an organisation for advice related to career development”. However, there is an opportunity that retired employees or external consultants with knowledge of the internal operations of the MHCB could be employed for this task.

8. In the MHCB, reading was the 5th highest ranked (per 15) of KM techniques that were applied in the MHCB (section 8.4.1). Also, reviewing relevant documents was the 2nd priority when employees were facing problems in their daily work (section 8.4.2). Although some awareness regarding the importance of reading in the MHCB, reading faced constraints as was discussed in section 9.6.1. The literature in the field of KM mentioned self-reading as one technique for internalising knowledge, for instance when a new employee studies project documents. This relived explicit knowledge becomes part of an employee’s tacit knowledge (Beijerse, 1999). Also, KM supports access to existing information for reading, providing infrastructure and access that individuals can read and make personally meaningful any documented knowledge retrieved (section 2.7.8).

9. Attending conferences and symposia is a technique for exchanging knowledge. Conferences aim to generate conversation between conservators, theorists, practitioners, and historians. According to the head of national group for protecting Libyan architectural heritage, they are conducted locally, not only for solving special problems but also for disseminating knowledge on some topics by collecting specialists together to present their knowledge (section 7.6.8). The statistical results (section 8.4.1) indicate that attending local symposia and conferences obtained the 7th rank (per 15) of application in the MHCB. The interest in organizing symposia on special topics such as HB repair materials had increased among officials. However, conferences help young researchers to develop their research work and skills through constructive face-to-face interaction with experienced academics, and provide a platform for networking among seniors (WABER, 2012).

10. Contacting and observing the work of expert builders and craftsmen who have worked on HBs is a technique for acquiring knowledge. Although their knowledge should be explained scientifically, the benefit from their experiences is expected.

However, the findings demonstrated that individuals in the MHCB context were not interested in contacting them to acquire knowledge (section 8.4.1) as this technique obtained the 12th /15 rank of application in the MHCB.

11. The findings demonstrated that individuals in the MHCB context were not interested in contributing to the preparation of conference papers or journal articles. This technique obtained the 11th /15 rank of application in the MHCB. Some publications were done by historians and architects in the MHCB (table 7.2). Academically, publishing is essential for university staff or researchers to develop themselves. However, this was not the case between the employees.

9.6.3 Dealing with the External Knowledge in the MHCB

In the field of HB conservation, a variety of knowledge is important and external sources cover the shortage of internal ones. The local and foreign external HB conservation knowledge sources are experts and documents that may or may not belong to organizations.

Local experts include specialists in the field of HBs and their conservation, belonging or not to organizations or consultant offices. Observations in the MHCB context demonstrated that local experts who had knowledge regarding HBs conservation were scattered in different organisations. However, there was no database of their details and CVs available in the MHCB (section 7.5.1). The majority of interviewees in the MHCB considered the specialists (often university staff members) in the field of HB conservation to be a key source of knowledge. However, in the case of problems, employees often depended on themselves to identify and contact them informally. Current dealings with experts in the MHCB depended on the ad hoc method. This method did not insure the response of experts on time, particularly technical ones. Although the MHCB's policies and local regulations (section 5.4) did not prevent contract with consultants, no criteria for hiring them were applied. However, the wider literature presents the importance of the acquisition of external knowledge to cover the shortage of internal ones (section 2.3.4 and 2.7.9). For instance, the specialists in the field of HBs conservation, Dann and Wood (2004: 146), stated "There should be an understanding of the limits of specialist knowledge within the organisation". Also, Rowley (2001: 233) stated that:

"Knowledge acquisition is associated with the contracting of knowledge from outside the company. This may include the appointment of people, the purchase of reports or licences, or the strategic alliances that involve exchange of knowledge and competence".

The role of KM regarding acquiring external knowledge is to define and identify what experts should be provided and what knowledge should be carried.

Furthermore, local institutions such as universities (architecture, civil engineering, fine arts, archaeology and historical studies departments), research institutions, archaeology departments and local scientific societies are sources for experts and documents in the field of HB conservation (section 7.5.2). Cooperation with these organizations helps provide publications, training courses and consultants in some fields of HB conservation. Also, it fuses the knowledge of individuals from different organizations, as Davenport and Prusak (1998) stated:

“Fusion is knowledge created by bringing together people with different perspectives to work on the same project. The resulting projects represent more comprehensive expertise than possible if members of the team represented one perspective”.

The high rate of departure of architects and engineers could not be compensated for easily, and the lack of a sufficient number of architects and engineers in the MHCB combined with it becoming a more management-oriented organization, made it tend to hire external consultants. Dealing with external knowledge sources to provide consultation and performance work had become essential in the MHCB and required a balance of managing internal with external knowledge sources.

Finally, regarding international organisations in the field of architectural heritage, although Libya is a member of UNESCO, and this facilitates the acquisition of knowledge from such organisations, there has as yet been no sufficient benefit from this institution or its branches. This can be attributed to political reasons in the 1990s (section 7.5.2). Also, the main constraint in dealing with international organisations was local regulations. The MHCB had to deal with the ministry of foreign affairs as a mediator for any cooperation with international organisations, in addition to complex procedures for foreign training. The point that was added in this subject (international co-operation) is dictatorial regimes hamper communication with international institutions, leading to a lack of exchange of knowledge.

However, international heritage charters call for the dissemination of knowledge (ICOMOS, 1999). The opportunities for acquiring knowledge from international organisations could include: subscribing to their publications, conferences, and training courses. Also, relevant conferences could be arranged in Libya under the auspices of UNESCO; this will encourage the specialists in this field to share their knowledge in such conferences. Moreover, ICCROM organises regular training courses including architectural conservation courses. Other organisations, for instance the Royal Institute

of British Architects (RIBA, 2012), provides conservation courses specifically for architects who want to develop key practical knowledge and skills in the practice of conservation architecture (section 3.5.2). Finally, in the field of HB conservation reliability is required, whereas confidentiality and copyright are not often constraints against acquiring knowledge because this type of knowledge does not include any commercial or competition issues, as Davenport and Prusak (1998) stated: “originality is less important than usefulness in acquired knowledge”.

9.7 The Effect of Current KM on the MHC B’s Performance

The effects of current KM on the MHC B’s performance could be demonstrated in four issues attributed to in-effective KM: delay in conducting HB conservation work, delay in starting new projects, the effects of employee movement, and the repetition of mistakes in conservation work.

The delay in conducting HB conservation work can be attributed to delay in decision making regarding for instance intervention in HBs. When a problem is presented during the project period, the architect or engineer does not get the proper solution. For instance, the head of architectural studies stated that “I have faced difficulties in Abdul-Wahab Masjid project; presenting the problem has not provided me with a solution. This caused work delay” (section 7.6.3). However, wide literature (section 2.2.3) emphasizes the role of KM in decision making. For instance, according to Gupta et al (2000: 17) KM is “necessary for activities such as problem solving, dynamic learning, strategic planning, and decision making.”

Furthermore, the change of the MHC B to a management-oriented organization (see section 9.5.1) presents the need for some knowledge aspects such as: preparing project documents and tendering. The lack of knowledge regarding preparing project documents contributes to the delay in starting the MHC B projects because the governmental budget for these projects is conditional on the availability of full project documents. However, as mentioned in section 2.2.2, KM is a process that helps organisations to find and acquire knowledge and expertise (Gupta et al (2000). These processes enhance organisational learning and performance (Scarborough et al, 1999). Also, Murthy and Panchal (2011) stated that the goal of KM is to ensure that “people have the knowledge (right knowledge) they need, where (the right place) they need it, when (the right time) they need it”.

Moreover, regarding the effects of employee movement in MHC B performance, the MHC B’s administrative records (section 8.7.1) showed the high rate of technical employees’ departure. The majority of interviewees emphasized that it caused

knowledge leakage, non-continuity of knowledge transfer and some documents which were already done by them were lost. There was also the waste of time and the cost of rehabilitating them. However, as mentioned in section 2.9.6, KM efforts can help retain intellectual capital as employees' turnover in an organisation also; it contributes to reducing the training time for new employees (Vector, 2008). Furthermore, Serban et al (2002:7) stated regarding personal knowledge that:

“Organizations are increasingly recognizing that capturing and sharing these experiences and skills save them money, prevent or reduce interruptions in activities, and enhance their overall ability to cope with changes in personnel.”

Finally, inefficient KM caused the repetition of mistakes in restoration work which were achieved under the supervision of MHCb technical staff. For instance, one observed point during a visual survey (appendix 3-D, E, and F) is repetition of using cement mortar for plastering, and this caused dampness and other damage in HB walls. However, as mentioned in section 2.2.2, Davenport et al (2000), Rowley (1999), Macintosh (1999), Newman (1999), Tan et al. (2006) and Vector (2008) emphasize the role of KM in the maximization of organisations' knowledge, avoidance of reinventing the wheel and repetition of mistakes. For instance, Davenport et al (2000: 14) stated that:

“Managers in large corporations know how common it is to reinvent the wheel, solving the same problems from scratch again and again, duplicating effort because knowledge of already developed solutions has not been shared within the company.”

9.8 The Strengths, Opportunities, Weaknesses and Threats in Managing the MHCb's Knowledge

9.8.1 The Strengths and Opportunities for Managing Knowledge in the MHCb

The strengths and opportunities regarding managing knowledge in the MHCb context include issues relevant to: the MHCb headquarters location, the working places and ICT facilities, awareness of the MHCb's employees and collaborative climate, and the role of current management, regulations and policies, in addition to KM techniques and external sources of knowledge. However, some strengths and opportunities are intertwined.

1. The strengths that were derived from discussion of the key findings include numerous points. The MHCb is a Libyan governmental organisation where the care for HBs is the core business activity. The MHCb headquarters is a refurbished historic building in the middle of the old city of Tripoli; this location facilitates contacting HBs

easily. This makes employees in the MHCB coexist with HBs and have a good sense and knowledge of them. Also, staying in this HB provides a chance to observe what occurs in the building for periods of time after refurbishment. Another strength point is that the pattern of working places facilitated meetings and exchanging knowledge between the technical section's employees. Furthermore, essential ICT facilities such as computers and the database system were provided in addition to internet services. The documents were conducted digitally and some previous paper documents were transformed into digital form. This facilitates inputting relevant information into the data-knowledge system.

Moreover, explicit knowledge that is relevant to HBs and their conservation is available to some extent in the MHCB's documents in forms of books, regulations, journals, procedures, studies, reports, drawings, photos, audio and, video recordings. The procedures for conducting HB studies and the forms of collecting information were developed according to the experience of using them. Furthermore, the studies and reports (those prepared by architects or engineers, even those who had left the MHCB, with their knowledge) that are relevant to local buildings and contexts are useful for the juniors and new generations in the same job/context. They can get knowledge from them, not only about dealing with HBs but also how to develop such studies. Some of the MHCB's documents were stored formally in two places: Dar-Naeb which is the place for collecting the MHCB's documents and the MHCB library, which includes books, journals, regulations and the MHCB's publications. The library contributes to the dissemination of these publications and relevant references to the staff and interested people. Moreover, the local publications in the field of HB conservation provide indirect knowledge regarding details for the specialists in this field.

Finally, regarding the activities in the context of technical affairs department, one strength point is the collaborative climate for meetings and sharing knowledge. Technical employees share in the asking of questions regarding the work and sharing knowledge in formal/informal discussions events. Also, some activities contribute to developing knowledge in the MHCB. Training courses that are held in the MHCB's headquarters with local HBs as case studies to provide real practice and maximize the benefit. Furthermore, team work that has been applied in the MHCB in terms of architects, structural engineers, historians and surveyors have been ordered to conduct a comprehensive HB conservation study.

2. The opportunities that were derived from discussion of the key findings include numerous points. The current accountability of the MHCB to the archaeology

department and the ministry of tourism might have a positive effect according to the relation or the integration of tourism and archaeology within the field of HB conservation. This provides opportunity for contact with specialists and access to relevant documents in these institutions. Another opportunity is that the governmental decision regarding establishing the MHCBC, and MHCBC policies might contribute to the development of knowledge, such as consigning an annual budget for buying references, providing a database, and organising conferences and training, in addition to permitting cooperation with experts. Moreover, the MHCBC's employees were aware to some extent that KM was needed formally in their institution, and achieving the goal of KM could be achieved by cooperation between the employees and their institution. This is supported by the keenness of the current management to provide training courses, ICT facilities and encourage discussions. These opportunities could contribute in developing KM in the MHCBC.

Furthermore, some activities provide opportunities for developing knowledge in the MHCBC. Because of a shortage of architects and engineers, most technical staff tried the work in many tasks in different technical sections. This provided an opportunity for sharing new knowledge. Also, there was an opportunity to benefit from knowledge and experiences that were obtained from solving problems by trial and error, even those that had been proven false.

On the other hand, external sources of knowledge provide an opportunity to cover the shortage of internal ones and a variety of knowledge in the field of HB conservation is important. Specialists in the field of heritage conservation, and local people, who are interested in HBs, are often willing to introduce their knowledge regarding the history of HBs, particularly the elders. This is also the situation for civil society groups interested in architectural heritage. Some beneficial activities from them were applied a little in the MHCBC. The opportunity of practising such activity could be achieved through, for instance, inviting them to attend and/or produce lectures to share knowledge in the MHCBC. Also, expert builders and craftsmen who have worked in the field of HB conservation can have their knowledge documented and explained scientifically for acquiring knowledge from their experiences. Finally, there is an opportunity to benefit from architects and engineers who have left the MHCBC after significant years of practice (particularly, those who have willingness to share their knowledge), such as by providing lectures, mentoring juniors and providing internal training courses.

At the level of the local institution, some universities (architecture, civil engineering, fine arts, archaeology, tourism and historical studies departments), research institutions and local scientific societies could be sources of experts and documents in the field of HBs conservation. In addition to acquiring knowledge through relevant documents from relevant institutions, there are opportunities for acquiring or exchanging knowledge from individuals separately or in agreement with their institutions. The co-operation with these local organizations will contribute to the exchange of knowledge and provision of publications, training courses and consultants in some fields of HB conservation, in addition to sharing in organizing symposia on special topics such as HB restoration materials.

Furthermore, at the level of international institutions, Libya is a member of UNESCO. The charters in the field of heritage conservation call for the dissemination of knowledge. This means an opportunity that knowledge can be acquired from such organisations according to this participation. Acquiring knowledge could include subscribing to UNESCO's publications, conferences, training courses and visiting. For instance, the branch ICCROM organises regular architectural conservation trainings courses. Also, conferences can be arranged in Libya under the auspices of UNESCO; this will encourage the international specialists in this field to share their knowledge in such conferences.

9.8.2 The Weaknesses and Threats to Managing Knowledge in the MHCB

The weaknesses and threats regarding managing knowledge in the MHCB context includes issues relevant to: the accountability and organisation structure, regulations and policies, working places, ICT, and, the individuals' movement in the MHCB, in addition to KM processes and techniques. However, some weaknesses and threats are intertwined.

1. The weaknesses that were derived from discussion of the key findings include numerous points. The organizational structure and relation between departments suffers from many weaknesses. Technical documents are stored and managed by the documentation section, which is accountable to the planning and historic studies department. Technical staff face difficulties when getting documents and information from this section; a routine and the condition of providing consent for acquiring documents lead to delay, no willingness to collaborate to hand over documents to this section and monopoly of some information. Furthermore, the personal interaction between technical staff and historians are in the minimum. Although team work, that includes technical staff and historians, is applied in the MHCB, a type of divergence

and lack of coordination happens during the work which contradicts sharing knowledge among the team members. This can be attributed mainly to restrictions that employees should not leave their departments and no coordination between departments. Moreover, there is no research and development (RD) section in the MHCB that should be responsible for creating particular knowledge regarding repair materials, and restoration work. Finally, no leader/s is assigned to manage knowledge in the MHCB's organisational structure.

Furthermore, the procedures for conducting technical studies and the forms of collecting HB information were not included, for instance the requirements to consult relevant previous studies, updating the studies to include how restoration work was done or the lessons learned in conservation work. The solved problems were not documented; these experiences have not become organizational knowledge. Also, most documents that include cumulated explicit knowledge is scattered in the MHCB and has not yet been used effectively. They are not organized, codified properly or disseminated. Employees often do not know where the required knowledge is available. This is not helpful for benefiting from knowledge in these documents. Another weakness in managing the MHCB's knowledge is that there is no encouragement for publishing in the MHCB in addition to limited use of the library which can be attributed to inefficient references. The library is also a separate building located outside the main headquarters of the MHCB.

Moreover, in the MHCB, information is vulnerable because computers are often prone to malfunction as there is no technical support for fixing them. Also, the MHCB's website is neither up-to-date nor connected to the MHCB's database system. There is limited benefit from search engines attributed to foreign language difficulty and communication problems in the MHCB. Also, e-mail and online discussion forums are rarely used in the MHCB. Moreover, the MHCB's database does not include previous solved technical problems and CVs for staff and others (specialists, contractors, suppliers, laboratories...) that indicate their special knowledge and details. However, the MHCB neither adopted ICT for communication nor using relevant computer programs for managing knowledge.

Finally, a gap in applying KM techniques occurred in meetings, lectures and presentations, mentoring new employees, external and internal training. This indicates that most KM techniques tend to occur informally in the MHCB. Meetings occurred rarely, as no meetings are scheduled or programmed in the MHCB. Also, the presentations occurred little and often included the achievements not the lessons

learned. Senior technical staff and historians were not motivated to produce lectures, and there was also a lack of inviting external experts for exchanging knowledge or producing lectures. Furthermore, the monitoring technique was only applied a little in the MHCb. Finally, the individuals in the MHCb context were not interested in contacting or observing expert builders and craftsmen for acquiring knowledge.

2. The threats that are derived from discussion of the key findings include numerous points. The changes of the MHCb's accountability to different governmental boards caused a type of instability, as the MHCb's responsibilities changed from implementation to management organisation. This shifted the required knowledge to perform work such as knowledge regarding contracting. Also, the administrative changes affected the organisational structure and led to a change of the MHCb's heads, while other technical staff left. The other causes for their departure are: the nature of work in terms of unhealthy and risky places in old buildings and disagreement between some employees and their heads in addition to insufficient motivation policies in the MHCb contributing to a significant number of technical staff leaving. However, the continued departure of technical staff is a threat might cause: knowledge leakage, non-continuity of knowledge sharing and, waste time and cost that were spent for habilitate them.

Furthermore, because of the limited number of architects and structural engineers, they were replaced by unqualified technicians who became decision makers. This rotation work that the MHCb was forced to apply might cause some threats against HBs. Furthermore, the trial and error technique which obtained the first rank of application in the MHCb might threaten HBs if applied without care. Moreover, the MHCb suffers from: limited local training courses in the field of HB conservation and a complex procedure for foreign training.

Finally, governmental regulations include constraints against contacting foreign institutions directly for consultations or training. The main constraint is that the MHCb has to deal with the ministry of foreign affairs as a mediator for any cooperation with foreign organizations. Also, the complex procedure for foreign training is the prevailing. Furthermore, dealing with local experts for consultation in the MHCb depends on an ad-hoc method. This method does not insure the response of experts on time and this causes delays in HB conservation work.

9.9 Developing the Theoretical Model for Studying KM in Organisations

The factors that were included in the proposed theoretical model for studying and understanding KM in organisations (figure 2.10) were identified according to reviewing

the wider literature in KM subjects and discussing different aspects relevant to KM in the organisation. These factors were considered in this investigation of KM in the MHCB context. However, many points emerged during the study which contributed to the development of the model.

Throughout the research it appears that both the main approaches, the people-based (tacit knowledge) KM approach, and the explicit knowledge-based KM approach, were essential for managing knowledge in organisations. This supports their position in this model. Furthermore, some factors appeared throughout the research which could contribute to the development of the model and which could be added as main factors or sub-factors. In particular, this includes the location of organisation headquarters, the organizations' accountability, the external sources of knowledge, and social factors.

The proximity of the HBs organisation to historic buildings was useful in facilitating work on the buildings and providing an easy platform for engaging between worksites. The location of the headquarters at a historic site provides the chance to observe what occurs in the refurbished buildings for periods of time. That the employees coexist with HBs makes them have a good common knowledge of them. This calls for the need to accommodate this factor in the theoretical model.

Furthermore, organisational accountability is a factor that can affect managing knowledge in organisations. The changes of organisation from implementation to management-oriented organisation according to the changes of its accountability led to the need for different knowledge, such as knowledge regarding contracting. According to the author's literature review, it seems that the effect of organizations' accountability in managing knowledge has not been studied previously. This calls for the need to accommodate this factor in the theoretical model.

Moreover, regarding the external sources of knowledge, another point of view emerged from the investigation of this point in the HB conservation organisation context. Organisations dealing with historic buildings use KM to highlight and preserve the cultural value of an HB rather than solely its economic value. Also, the value of architectural heritage overrides the country to be international heritage. This facilitates the chances for the exchange of knowledge between institutions locally and internationally.

Finally, regarding social factors, it was observed during the field research that the employees' working places in the MHCB were divided between male and female employees, and informal discussions tended to occur between each gender separately in their halls. The separation of working places of males and females can affect knowledge

sharing. This is attributed to social and religious reasons which should be considered as a sub-factor in the culture of organisations. This situation demonstrates that defining a community of practice not only includes norms of skills and knowledge that flow within the group, but also social norms.

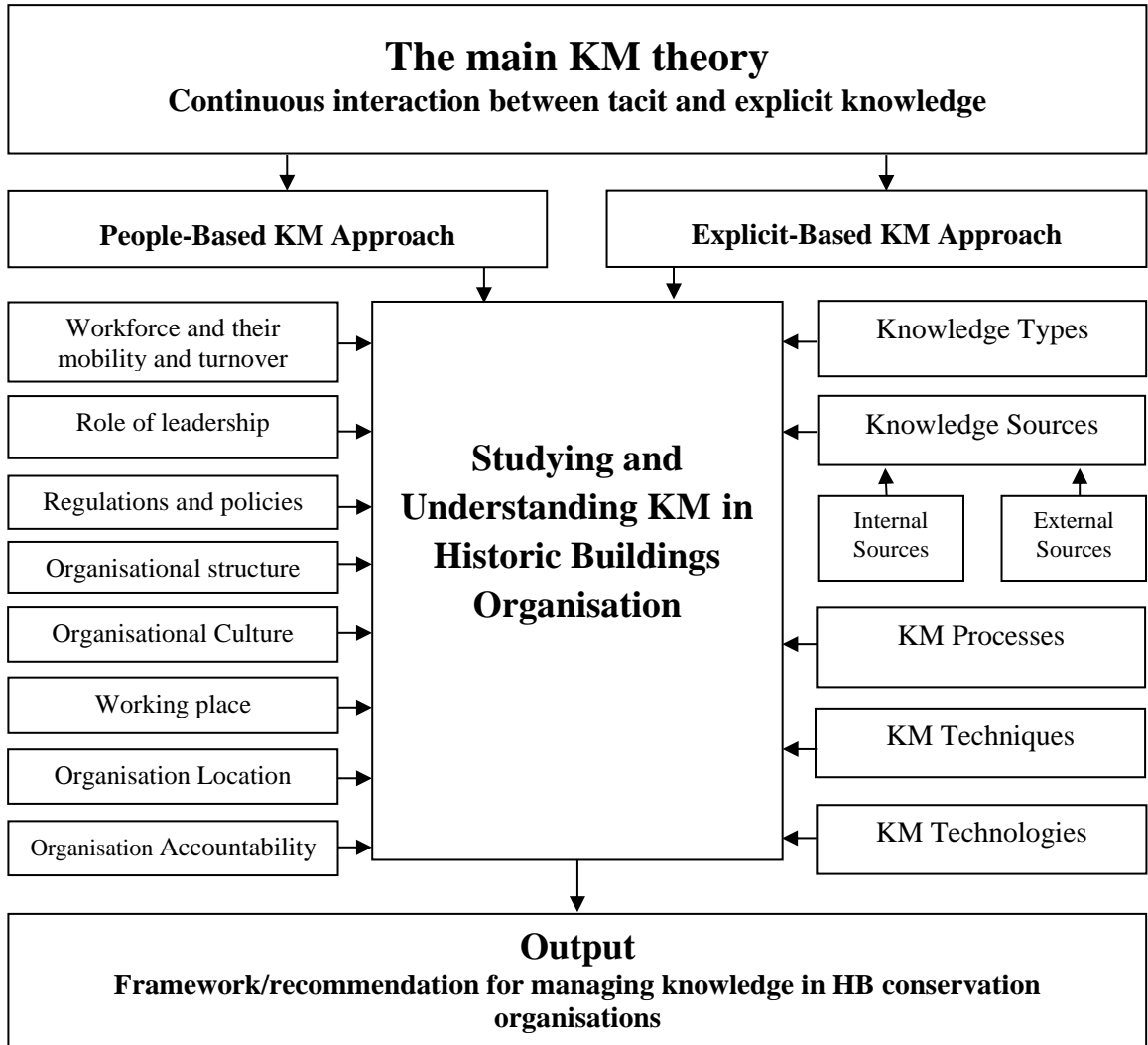


Figure 9.1: A theoretical model for studying and understanding KM in organisations

Chapter 10: the Key Conclusions and Recommendations

10.1 Summary of Research's Chapters

Chapter one included a background to the study and introduced the key areas of research. Furthermore, it presented the statement of the research problem, the research questions and the objectives. Moreover, this chapter discussed the scope and significance of the research. Finally, it demonstrated the organisation of the thesis.

Chapter two investigated the concept of knowledge management in organisations. It studied the objective of KM and its definition in addition to knowledge, and its types and sources. Also, KM theories and the main approaches to managing knowledge in organisations were discussed. Furthermore, this chapter highlighted KM processes and discussed KM techniques and technologies. Finally, the factors that affect KM in organizations were discussed and concluded in a proposed model for studying and understanding KM in organisations.

Chapter three studied the nature of Historic Buildings and the key issues in their conservation at the level of responsible organisations. It studied the concept of HBs and gave a definition. Also, the need for conservation management, the types of organisation in HB conservation, and the relevant individuals in the field of HBs conservation were discussed. Furthermore, it highlighted the regulations and principles of HB conservation and discussed the key HB conservation processes at the level of responsible institutions. Finally, it demonstrated the required knowledge aspects for conserving HBs in responsible organisations.

Chapter four identified and discussed the research methodology and strategies that are appropriate to answer the research questions. A mixed approach of qualitative and quantitative research for collecting and analysing data and information was adopted. Multi-methods were used for collecting data and information: literature reviews, interviews, questionnaires, observation and analysing organisational documents.

Chapter five provided the background to the research context and the institution that is responsible for conserving HBs in Libya, in addition to analysing the organisational issues that are relevant or that influence the management of knowledge in the MHCB. It demonstrated the location of the research context and its valuable architectural heritage, and discussed the management of HB conservation in Libya. Furthermore, it explored and analysed the current situation of the main the MHCB headquarters context in terms of its location, working places, accountability, financial resources, organizational structure, and awareness regarding KM and the effect of

leadership on managing knowledge. Moreover, the tasks of the departments were demonstrated according to governmental decision and knowledge aspects in technical sections. Finally, it analysed the regulations and policies that affect KM in the MHCB

Chapter six explored and analysed the knowledge aspects that are essential for conducting HB conservation work in the MHCB.

Chapter seven analysed the individuals in the MHCB context and their movement. Furthermore, it analysed the documents in the MHCB context, and HBs and their restoration process as a source of knowledge. Moreover, it analysed external knowledge sources. Finally, knowledge management techniques and information communication technology (ICT) in the MHCB were discussed.

Chapter eight analysed the quantitative data that was collected from the questionnaire and organisational records. It indicated the importance of conservation knowledge and its availability in the MHCB. Also, it analysed the extent of applying KM techniques in the MHCB. Furthermore, this chapter studied information technologies and their application in the MHCB. Moreover, it analysed the MHCB's circumstances and the factors that affect KM in the MHCB. Finally, statistical data regarding technical staff in the MHCB and their movement were discussed.

Chapter nine triangulated and discussed the key findings of the research against the wider literature on the subject. It investigated the current knowledge management in the MHCB and identified the key issues, strengths, opportunities, weaknesses and threats. Finally, the factors that affect KM in the MHCB were discussed and concluded in a model for studying and understanding KM in HB conservation organisations.

Finally, chapter ten includes the key conclusions and recommendations of the research and the limitations of the study. Also, it includes the contribution to knowledge and further research, and the author's final statements.

10.2 Limitations of the Study

This study has suffered from several limitations, and all possible efforts were made to avoid their influence on the research results. Some of the limitations that affected the data collection were mentioned in the methodology chapter (section 4.8). One was that employees feared that there might be an impact on their career; the other was how to conduct interviews with female interviewees in a conservative society. The major limitations could be outlined as:

- This research studies one case in depth, rather than multiple cases. The research investigates the MHCB in Tripoli, Libya. Studying one organisation did not permit

comparisons with other organisation/s as a bench mark. Also, it limited the generalization of results. However, this was because the MHCB is the only organisation responsible for managing historic buildings in Libya. The research results could be more generalized after research is conducted in numerous HB conservation organisations in similar contexts. Yin (2009: 6) stated that a single case study “can be the basis for significant explanations and generalizations.” Also, Routio (2007) stated that the accumulation of case studies that have been conducted by different researchers can provide a basis for generalising the research results.

- The event of the revolution and the war in the author’s home country during the period of research (2011) affected the performance of the research in terms of preventing the collection of more data in the research context, in addition to the psychological effect and minimum production during the event.

10.3 Research Conclusions

Several conclusions emerged throughout the investigation of managing knowledge in the MHCB. The conclusions to the research questions which were investigated in the MHCB are presented in this section under the following main headings:

- The essential knowledge at the level of the HB conservation organisations
- The factors that affect KM in HB conservation organisations
- The current condition of dealing with knowledge in HB conservation organisations

10.3.1 The Essential Knowledge and its Availability in the MHCB

Knowledge is created in a specific context and what has value in one context may not be the same in another. The most significant issue in responsible HB conservation organisations is conserving HBs through processes that include: assessing and documenting HBs’ values and conditions, deciding the level of intervention in these buildings, and contracting and supervising the maintenance and restoration work. The types of knowledge that are essential for conserving HBs and which need to be managed in relevant organisations include: HB values knowledge, HB conservation technical knowledge, and HB conservation management knowledge. However, the importance and the need for some knowledge aspects in organisations could be changed according to changes in an organisation’s circumstances and priorities of work (section 9.4). Insufficiency of knowledge regarding most aspects of HB conservation in the MHCB which affect its performance can be mainly attributed to inefficiency of KM. However, many factors affected KM in this organisation.

10.3.2 The Factors that Affect KM in Organisations

The main factors affecting KM that were investigated in the MHCb include accountability, organisational structure, governmental regulations and organization policies, the location of the headquarters and working places, KM technology, the culture of collaboration, the role of leadership and individuals in the organization's context.

The first factor that affects KM is the organisation's accountability. The importance of some knowledge aspects in organisations can be changed according to changes in organisational accountability. This change caused the MHCb to become a management-oriented instead of an implementation organisation and led to the need for different knowledge such as knowledge regarding contracting.

The second factor is the organisational structure. An inflexible organisational structure, such as employees not being able to leave their departments, restricted contact between different departments and led to limited sharing of knowledge. Furthermore, the unavailability of a research and development (RD) section in the MHCb negatively affected the creation of particular knowledge regarding conservation work.

The third factor is the organisation's policies and governmental regulations. They permit or support: providing ICT facilities, cooperating with local experts, organising conferences, and arranging workshops and training courses to develop national skills. However, a lack of staff motivation policies had led to dissatisfaction and a high number of technical staff had left the MHCb. Moreover, there were constraints in contacting foreign institutions for consultations or training.

The fourth factor is the headquarters and its location. The MHCb's headquarters is a refurbished HB in the middle of the old city of Tripoli; this is helpful for relevant employees to make contact with HBs easily. The employees in the MHCb coexist with HBs and this means they have a good common knowledge of them. Also, staying in this HB provides the chance to observe what occurs in the building for periods of time after refurbishment.

The fifth factor is information communication technology. In the MHCb, no specific computer programs were used to manage explicit knowledge, there was insufficient and inefficient use of internet services, and technical and communication obstacles led to ineffectiveness in their use for managing knowledge.

The sixth factor is the collaborative climate. Employees often tended to contact colleagues as a preference for obtaining knowledge when facing problems. However,

because of social and religious reasons, informal discussions tended not to occur across gender. This shows the impact of such reasons in managing knowledge in organizations.

The seventh factor is the role of leadership. The head of the MHCB contributed to providing ICT facilities, some specialized training courses and encouraging discussions. However, the lack of a specific person to lead knowledge management contributed to inefficient KM in the organisation.

The eighth factor is the employees' movement. It caused the leakage of knowledge obtained from years of work experience, and explicit knowledge they have or have access to. In comparison with other businesses, the loss of any seniors from an HB conservation organisation is an irreparable loss. This is because of a lack of specialists in this field. It caused the non-continuity of knowledge transfer and was a waste of both the time and money that was spent on developing their skills and knowledge. However, the reasons for the departure of technical staff were the administrative changes, and disagreements with their heads of department, in addition to dealing with old buildings being more risky than normal jobs.

10.3.3 The Current Condition of Dealing with Knowledge

Numerous KM schools and points of views can be summarized in two main approaches: the people-based (tacit knowledge) KM approach, and the explicit-based KM approach. Both are essential for the management of knowledge in organisations. The research investigated the current condition of dealing with tacit, explicit and external knowledge. These were applied in the MHCB through several KM techniques and processes.

A. Tacit knowledge was dealt with through the application of several techniques: trial and error, presentations and lectures, rotation work system, and training.

The debate still continues regarding the risk of applying trial and error technique in conservation work. Although knowledge can be created (acquired) from previous experiences, even those proven false, the MHCB did not document or disseminate these experiences and lessons learned. However, KM complies with conservation principles regarding the necessity of the precise reporting of any action relevant to HB conservation.

Regarding presentations and lectures in the MHCB, presenting the achievements not the lessons learned and not inviting specialists to attend or produce lectures and presentations was the norm in the MHCB. Also, senior technical staff and historians were not motivated to produce lectures and presentations. This contradicts the process of exchanging knowledge.

Moreover, because of the shortage of architects and engineers, the MHCB was forced to apply the rotation work system technique. Although it can contribute to increasing knowledge, it had some negative effects on work performance as in this case unqualified technicians became decision makers.

Finally, the constraints that faced training in the MHCB were: limited local training courses in the field of HB conservation, and a lack of knowledge regarding the details of required training courses and who provides them.

B. Dealing with explicit knowledge:

The procedures for conducting HB studies and the means of collecting information were developed to some extent in the MHCB according to the experience of using them. However, these did not include the requirement to consult relevant previous studies or update studies through articulating how restoration work was done, and lessons learned in conservation work.

Furthermore, regarding capturing knowledge process, there were no criteria for what was included or should be included in the MHCB's database. For instance, it did not include information about restoration processes, the lessons learned from previously resolved technical problems, or CVs for staff and others indicating their specialist knowledge.

Moreover, documents which included explicit knowledge were scattered in the MHCB and the cumulated explicit knowledge had not yet been effectively used. Documents were neither organized nor stored effectively and employees often did not know where to find documents that included required knowledge. This is not helpful for retrieving knowledge and wastes time and contradicts knowledge acquisition.

Regarding knowledge dissemination, relevant documents and up-to-date references in the organisation library contribute to disseminating relevant knowledge to staff in addition to interested people. KM supports the provision of infrastructure and access to individuals so that they can read and make personally meaningful any retrieved documented knowledge. In the MHCB, some local publications had been produced; however, most employees were not interested in contributing to the preparation of conference papers or journal articles. In comparison to university staff members or researchers, publishing is not essential for developing employees' careers. Reading and reviewing relevant documents was done by employees when they were facing problems in their work. However, the number of employees that used the library or archive was

very low. This could be attributed to most references being neither relevant nor up to date, and the difficulty of retrieving knowledge from the archive.

c. Dealing with external knowledge sources:

Similar to business organisations, knowledge management in the field of HB conservation is not an end in itself, but its advantages include enhancing performance, improving the capabilities of the organization's human resources, problem solving, learning, strategic planning and decision making within the organisation. However, commercial or competition issues are not KM advantages for HB conservation organisations; the advantages are mainly cultural instead of for business or profit. Accordingly, dependence on external knowledge sources is common. Also, the value of one country's architectural heritage can become of international heritage value. This facilitates the chance for institutions to exchange knowledge locally and internationally.

In the MHCB, the acquisition of external knowledge mainly covers internal shortages. However, local conservation experts were scattered and there was no database of their details and CVs. Current dealings with them depended on an ad-hoc method which does not insure the response of experts on time.

Furthermore, unique to the field of heritage conservation, there were retired employees and local people who were interested and often willing to share their knowledge regarding HBs. These external sources of knowledge should be managed.

Moreover, co-operation with local institutions such as universities, research institutions, the archaeology department and local civil society groups can contribute to the provision of publications, training courses and consultants in the field of HB conservation, in addition to fusing the knowledge of individuals from different organizations. However, there is no real co-operation between these institutions.

Regarding dealing with international organizations in the field of architectural heritage, there was no sufficient benefit from these organisations. This can be attributed to regulations and political reasons. The main constraint is that the MHCB has to deal with the Ministry of Foreign Affairs as a mediator for any cooperation. However, the opportunities for acquiring knowledge from international organisations could include: subscribing to their publications, conferences and training courses.

Finally, the effects of current KM in the MHCB's performance can be demonstrated through four issues: the delay in conducting HB conservation work, the delay in starting new projects, the effects of technical employees' departure, and the repetition of mistakes in conservation work.

Objectives	Key findings
Investigate the concept of knowledge management and develop a framework for studying and understanding KM in organisations	<p>The main components of KM are: people, process and technology. Numerous KM schools and points of views can be summarized in two main approaches: the people-based KM approach, and the explicit-based KM approach. Both are essential for the management of knowledge in organisations. Knowledge is created in a specific context and what has value in one context may not be the same in another. for studying and understanding KM in organisations three main items (divided into sub-items) should be investigated in organisation (chapter 2):</p> <ul style="list-style-type: none"> Essential knowledge and its sources and availability. Individuals and organisational factors influencing KM The current condition (processes and techniques) of dealing with knowledge.
Undertake a study of HBs and identify the key issues involved in their conservation at the level of responsible	<p>The most significant issue in responsible HB conservation organisations is conserving HBs through processes that include: assessing and documenting HBs' values and conditions, deciding the level of intervention in these buildings, and contracting and supervising the maintenance and restoration work. (chapter 3)</p>
Investigate the extent of the importance and availability of knowledge in the MHCB	<p>Three types of knowledge that are essential for conserving HBs and which need to be managed in relevant organisations: HB values knowledge, HB conservation technical knowledge, and HB conservation management knowledge. The importance and the need for some knowledge aspects in organisations could be changed according to the changes of organisation circumstances and priorities of work. (chapters 5,6,8,9)</p>
Study the factors affecting KM in the MHCB	<ul style="list-style-type: none"> - The changes of organisation from implementation organisation to management-oriented led to the need for different knowledge. - Inflexible organisational structure led to limitation of sharing knowledge - The regulations and organisation policies permit or support developing national skills. However, lack of staff motivation policies led to high rate of technical staff left the organisation. Moreover, regulations constraints contacting foreign institutions. - The headquarters and its location of HB conservation organisation in a refurbished HB in historic area are helpful for observing and making the employees have a good common knowledge of them. - Because of social and religious reasons, informal discussions tended not to occur across gender. This impacted on knowledge sharing in organizations. - Lack of assigning leader/s for managing knowledge contributes to inefficient KM. - The individuals' movement caused the leaking of the knowledge that they had obtained from years of work experience. The loss of seniors was an irreparable loss because of a lack of specialists in this field. It caused the non-continuity of knowledge transfer and wasted the time and money spent on developing skills and knowledge. (chapters 5,7,8,9)
Explore, analyse and evaluate the current conditions for dealing with knowledge in the MHCB context and its effect on performance	<ul style="list-style-type: none"> - Although knowledge can be created (acquired) from trial and error technique the debate still continues regarding its risk in conservation work. -Rotation work technique contributed to increasing knowledge. However, it has some negative effects on the work performance as in this case unqualified technician became decision makers. - In comparison to university staff members or researchers, publishing is not essential for developing employees' careers. - The lack of criteria for what should be included in the organisation's database contradicts KM processes. - For HB conservation organisations, the advantages of KM are mainly cultural instead of business or competition issues. Also, the value of one country's architectural heritage can become of international heritage value. This facilitates the chances for institutions to exchange knowledge locally and internationally. - The impacts of lack KM in HB conservation organisations can be demonstrated through four issues: the delay in conducting HB conservation work, the delay in starting new projects, the effects of technical employees' departure, and the repetition of mistakes in conservation work. (chapters 7,8,9)

Table 10.1: Summary of research objectives and findings

10.4 Research Recommendations and Further Research

10.4.1 Recommendations and Suggestions for Practising KM in the MHCB

1- For better use of the existing explicit knowledge there is a need to:

- Facilitate access to documents and encourage the employees to read to develop their knowledge and make personally meaningful any explicit knowledge retrieved
- Support existing ICT facilities with a technical team and relevant KM technologies
- Establish criteria for what should be included in the organisation's database
- Encourage online discussion of HB conservation issues to contribute to informal discussion and the sharing of knowledge between employees, in addition to others interested in this field

2. The high departure rate of architects and engineers calls for appropriate staff motivation policies goals to share knowledge, and aid staff retention

3. There is a need to update the procedures for conducting HB conservation studies to include the consulting of previous reports by the organization. Also, there is a need to document in written and visual forms the lessons learned, including the rich context data

4. The insufficient interest in KM techniques calls for:

- A revision of the organisational structure to promote more flexible communication and sharing knowledge.
- The organization of more formal/informal events for transferring and exchanging knowledge with respect to HB conservation principles
- Contact and observation of the work of expert builders and craftsmen who have worked on HB restoration, as a technique for acquiring knowledge.

5. The acquisition of external knowledge to cover the internal shortage requires:

- Identification of what experts should be provided and what knowledge should be carried
- Architects and engineers who have left the MHCB or retired after significant years of practical experience and local people (particularly, elders) who are willing to share their knowledge regarding HBs should be considered for developing employees' knowledge.
- The development of governmental regulations regarding co-operation with international organisations for consultancy or training.

10.4.2 Future Research

Throughout the discussion and analysis in this study, the issues and topics which have emerged suggest subjects for future research, as follows.

- The management of the process of dealing with the external sources of knowledge for a management-oriented organization.
- Consideration of the effects of gender separation in working places because of social and religious reasons and its impact on KM and organizations' performance
- Compliance with regulations regarding the disabled in historic buildings.

10.5 Contribution to Knowledge

It is believed that the thesis adds to the literature in the field of KM and HB conservation, as well as raising questions which require further consideration and investigation. Generally, the research has made the following contributions.

10.5.1 Contribution to Managing Knowledge in HBs and their Conservation

- This research could be considered as the start of studying knowledge management in HB conservation organisations. It has raised several issues concerning HB conservation and KM, and fills a gap in the literature and adds support to the previous KM researches.
- The findings and recommendations of this study provide guidelines for decision makers and others concerned with managing knowledge in HB conservation organisations.
- The national sources of knowledge in the field of HB conservation, even individuals who left the organisation still available but needs accessible. Due to the limited opportunities to provide their knowledge to other institutions, organisation can benefit from them without extra cost as organisation can employ them when need.

10.5.2 Contribution to Theory/Practice of KM in Organisations

- Developing a framework for studying and understanding KM in organisations.
- Motivation for applying KM in organisations is different from one to other organisation. For instance, the motivation for applying KM in organisations responsible for HBs conservation is cultural or political instead of fulfilment competitive and profit which are the goal of business organisations.
- Defining community of practice not only includes norms of skills and knowledge that flow within the group, but also, it can include social norms. According to

social/religious reasons, the separation of working places of males and females have an impact on sharing knowledge between the two genders in organisations.

10.6 Author's Final Statements

Having conducted this research, the author has final key statement. Successful conservation of Libyan historic buildings requires the co-operation of all officials, conservers, owners and local people. Knowledge dissemination should override the responsible organisation to all local people to create real awareness regarding this cultural heritage and its conservation.

List of References

- Abid, M. (2010) *Case studies approaches in social science*. Newcastle: Newcastle university.
- Abojenah, O. (2007) Using Maslow's theory for deriving strategic indications (social study) *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya Ghadames - Libya*, 27-29/10/2007.
- Abozbeda, A. (2002) *Dar Alghadi building (Hosh el Bashawat) in the old city of Tripoli*, Benghazi: national books house.
- Abozbeda, A. (2004) *The American consulate in the old city of Tripoli*, Benghazi: national books house.
- Abdul-Waris, K., S. Judge (2005) 'Architectural documentation of historical buildings in the digital revolution', *the Sixth International Conference of Architectural - The digital revolution and its impact on the architecture and construction* Egypt, 15 - 17 march 2005, pp. 41-56. Available at: www.araburban.net/news/605.html (Accessed: 25/5/2009).
- Abu-Khafajah, S. (2007) *Meanina and Use of Cultural Heritage in Jordan: Towards a Sustainable Approach*. thesis. Newcastle University
- Affairs, C. (2004) *Historic Buildings*. Available at: <http://english.cca.gov.tw/public/Attachment/411317323871.pdf> (Accessed: 13/3/2010).
- Akhavan et al (2006) 'Critical success factors of knowledge management systems: a multi-case analysis', *European Business Review*, 18(2), pp. 97-113
- Alavi, M. (2000) 'Managing Knowledge', in Zmud, R. (ed.) *Framing the Domain of IT Management*. Cincinnati, OH: Pinnoflex Educational Resources Ltd, pp. 15–28.
- Alavi, M.a.L. (1999) 'Knowledge Management Systems: Issues, Challenges and Benefits', *Communications of the Association for Information Systems*, 1(7), pp. 1–37.
- Albino, V., A. Garavelli, G. Schiuma (2000) 'A metric for measuring knowledge codification in organisation learning', *Technovation*, (21), pp. 413–422.
- Al-Ghassani, A., C. Anumba, P. Carrilo and H. Robinson. (2005) 'Tools and Techniques for Knowledge Management', in Chimay J. Anumba, C.E.P.C.e. (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 83 - 102.
- Alhashmi, E. (2004) the architectural style of the old city of Tripoli *Symposium under title: Conservation of old cities*, Benghazi – Libya, 8-9 December 2004.
- Alhassan, A. (2010) *Exploratory Research and Qualitative Analysis*. Available at: ocw.kfupm.edu.sa/.../Ch%2006%20Exploratory%20Research%20Methods.ppt (Accessed: 20/4/2010).
- AllPosters (2010) *Cathedral in Florence*. Available at: <http://imagecache2.allposters.com/images/CORPOD/DEU081.jpg> (Accessed: 19/4/2010).

- Anantatmula, V.S. (2008) 'Leadership role in making effective use of KM', *The journal of information and knowledge management systems*, 38 (4), pp. 445-460.
- Andrews, K., B.Delahye. (2000) 'Influences on knowledge processes in organizational learning: the psychosocial filter', *Journal of Management Studies*, 37(6), pp. 797- 810.
- Anumba, C.J., C. Egbu and P. Carrillo (2005) *Knowledge Management in Construction*. Oxford: Blackwell Publishing.
- APQC (2012) *Knowledge Flow Process Framework*. Available at: <http://www.apqc.org/annual-km-conference> (Accessed: 6/1/2013).
- Argote et al. (2003) 'Managing Knowledge in Organizations: An Integrative Framework and Review of Emerging Themes', *Management Science* 49, (4), pp. 571–582.
- Argote et al. (2011) 'Organizational Learning: From Experience to Knowledge ', *Organization Science* 2011 22, (5), pp. 1123-1137.
- Azlitni, B. (2004) The Renovation and Development of the Old Cities, *Conservation of old cities symposium*, Benghazi – Libya, 8-9 December 2004
- Bacalu, V. (2007) 'The value of a maintenance audit', *Industrial Maintenance and Plant Operation*, 68(12), pp. 24-36.
- Bano, S., M. Khan (2010) 'Study of factors that impact knowledge management fit in corporate sector of Pakistan', *Far East Journal of Psychology and Business*, 1(1), pp. 15-31.
- Bashemam, H. (2004) Methodology of HB Restoration: Case Study of Some Buildings in Assaraia Alhumra Tripoli, *Conservation of old cities symposium*, Benghazi – Libya, 8-9 December 2004
- Bashemam, H. (2007) Use of Advanced Technologies in HB Restoration Projects, *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya* Ghadames - Libya, 27-29/10/2007.
- Beijerse, R.P.u. (1999) 'Questions in Knowledge Management: Defining and Conceptualising a Phenomenon', *Journal of Knowledge Management*, 3(2), pp. 94 -109.
- BIFM (2012) *Facilities Management Introduction*. Available at: <http://www.bifm.org.uk/bifm/about/facilities> (Accessed: 7/11/2012).
- Birkenshaw, J. (2001) 'Why is knowledge management so difficult? ', *Business Strategy Review* 2(1), pp. 11-18.
- Bishop, J. (2009) *Managing Technical Knowledge to Enhance Organisational Best Practice*. Loughborough University [Online]. Available at: https://www.lboro.ac.uk/cice/research/theses/30_thesis.pdf
<http://www.lboro.ac.uk/cice/people/alumni.html> (Accessed: 29/07/2010).
- Bjork, B. (1999) 'Information technology in construction: domain definition and research issues', *International journal of computer integrated design and construction*, 1, (1), pp. 1-16.
- Blackler, F. (1995) 'Knowledge, Knowledge Work and Organisations: An Overview and Interpretation', *Organisation Studies*, 16(6), pp. 1201–1241.

- Bock, G., Zmud, R., Kim, Y., Lee, J. (2005) 'Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate ', *MIS Quarterly: Management Information Systems* 29(1), pp. 87-111.
- Bonaccorsi, A., et al (2006) 'Entry Strategies Under Competing Standards: Hybrid Business Models in the Open Source Software Industry', *MANAGEMENT SCIENCE*, 52(7), pp. 1085–1098.
- Bosiefi, Z. (2002) *Al-Kharuba Mosque in the old city of Tripoli*, Benghazi: national books house.
- Bosmans, T. (1986) 'self-management and construction in housing', *Open house international*, 11(3), pp. 60-63.
- Boumarafi, B., N. Jabnoun (2008) 'Knowledge Management and Performance in UAE business organisations', *Knowledge Management Research and Practice*, 6, pp. 233-238
- Brandon et al (1995) *Integrated Construction Information*. London: E&FN Spon.
- Brereton, C. (ed.) (1991) *The repair of historic buildings: advice on principles and methods*. London: English heritage.
- Brown, J., E. Gray (1995) 'After re-engineering: the people are the company', *FAST Company*, 1(1), pp. 78–82.
- Brown, J., P. Duguid (1991) 'Organizational learning and communities-of-practice: towards an unified view of working learning and innovation.', *Organizational Science*, 2(1), pp. 40-57.
- Bryman, A. (ed.) (2008) *Social Research Methods*. 3th edn. Oxford.
- BS7913 (1998) *Guide to the principles of the conservation of historic buildings*. British Standard Institution, London.
- Bukowitz, R., R. Williams (1999) *The Knowledge Management Fieldbook*. Upper Saddle River, N.J: Financial Times, Prentice Hall.
- Buston, K., W. Jones, M. Livingston, A. Bogan and, S. Wood (1998) 'Qualitative Research', *British Journal of Psychiatry*, (172), pp. 197-199.
- Cambridge, U. (2010) 'Cambridge Advanced Learner's Dictionary'. Cambridge: Cambridge University Press [Online]. Available at: <http://dictionary.cambridge.org/>. (Accessed: 2/4/2010).
- Cecil, C. (2010) 'Tripoli crossroads of rome and islam', *Saudi Aramco World*, 61(3).
- Channel 4 (2008) 'Unique Properties - Renovating A Listed Building' 23/05/2008 22/3/2010. channel 4. Available at: http://www.channel4.com/4homes/buying-selling/buying-property/unique-properties/listed-buildings-08-05-23_p_1.html.
- Chassiakos, A. P. (2001) *Information Management for the Construction Industry: A Review*. [Online]. Available at: http://www.saxe-coburg.co.uk/pubs/contents/sl01_03.htm (Accessed: 25/5/2009).

- Choo, C. (1996) 'the knowing organisation: how organisations use information to construct meaning, create knowledge and make decisions', *International Journal of Information management*, 16(5), pp. 329-340.
- CHSD (2007) 'Qualitative Research Methods', *Information Bulletin*, (1).
- Clarke, G. (2010) *Restoration Man*, Directed by Channel 4 [on line]. UK. Available at: <http://www.channel4.com/programmes/the-restoration-man/4od#3053991> (Accessed: 11 April 2010).
- Commission, L. (1990) *Planning (Listed Buildings and Conservation Areas) Act 1990*. Available at: <http://www.legislation.gov.uk/ukpga/1990/9/contents> (Accessed: 19/11/2012).
- Community, E. (1995) *The European Handbook of Management Consultancy. Strategic Innovation*. Dublin: Community European
- Consortium, E. (2007) *Notes on the conservation/restoration of architecture (buildings, monuments and sites)*.
- Cook, S., J. Brown (1999) 'Bridging Epistemologies: The Generative Dance between Organizational Knowledge and Organizational Knowing', *Organization Science*, (190), pp. 381–400.
- Cooper, C. (2002) 'Knowledge Management and Research Commercialisation Agendas', *Current Issues in Tourism*, , 5, (5), pp. 375-377.
- Council, N.B. (2007) *Listed Buildings* Available at: www.newcastle-staffs.gov.uk/Documents/Environment/Planning/Listed%20buildings%20and%20conservation%20areas.doc (Accessed: 21st January, 2009).
- Crowley, B. (2000) 'Knowledge Management for the Information Professional', in Koenig, K. (ed.) *Tacit Knowledge and Quality Assurance: Bridging the Theory-Practice Divide*. Medford, N.J: Informational Today Inc.
- Daft, R., K. Weick (1984) 'Towards a model of organisations as interpretation system', *Academy of management Review*, 9(2), pp. 284-295.
- Dann, N., S. Wood (2004) 'Tensions and omissions in maintenance management advice for historic buildings', *Structural Survey*, 22(3), pp. 138 - 147.
- Dann, N., D. Worthing (2005) 'Heritage organisations and condition surveys', *Structural Survey*, 23(2), pp. 91-100.
- Dann, N., D. Worthing, S. Bond (1999) 'conservation maintenance management Establishing a research agenda', *Structural Survey*, 17(3).
- Dann, N., S. Hills, D. Worthing (2006) 'Assessing how organizations approach the maintenance management of listed buildings', *Construction Management and Economics* 24 (1), pp. 97–104.
- Daryl R. et al (1996) 'Public perception of food allergy- a quota sample', *Journal of Allergy and Clinical Immunology*, 97, (6), pp. 1247-1251

- Davenport, T., Prusak, L. (1998) *Working Knowledge: How Organizations Manage What They Know*. Boston: Harvard Business School Press.
- Davenport, T., Prusak, L. (2000) 'Working Knowledge: How Organisations Manage What They Know', [Online]. Available at: http://wang.ist.psu.edu/course/05/IST597/papers/Davenport_know.pdf (Accessed: 14/1/2012).
- DCLG (2007) Revision to Principals of Selection for Listing Buildings, *Communities and Local Government Circular*, Department of Communities and Local Government: London Available at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/324058.pdf>
- De Jarnett, L. (1996) "Knowledge the latest thing", *Information Strategy*, The Executives Journal, Vol. 12, pt 2, pp. 3-5
- Demerest M. (1997) 'Understanding knowledge management' *Journal of Long Range Planning* 30(3), pp. 374–384.
- Desanctis, G., R. Gallupe (1987) 'A foundation for the study of group decision support systems', *MANAGEMENT SCIENCE*, 33(5), pp. 589-609.
- Designation, M.H. (2003) *Heritage Conservation Program Information*. Available at: <http://vancouver.ca/commsvcs/planning/heritage/Fact8.htm> (Accessed: 13/3/2010).
- De Vaus, D.A. (ed.) (1990) *Surveys in Social Science Research* 2nd edn. London: Unwin Hyman.
- Dewoolkar, M.M., Porter, D. and Hayden, N.J. (2011) 'Service-Learning in Engineering Education and Heritage Preservation', *International Journal of Architectural Heritage*, 5(6), pp. 613-628. [Online]. Available at: <http://www.tandfonline.com/doi/abs/10.1080/15583051003792864> DOI: Preview (Accessed: 13 Jan 2012).
- DOCOMOMO (2013) *international committee for documentation and conservation of buildings, sites and neighbourhoods of the modern movement*. Available at: <http://www.docomomo.com/mission.php#> (Accessed: 2/9/2013).
- Dougherty, D. (1992) 'Interpretative barriers to successful product innovation in large firms.', *Organization Science*, 3(2), pp. 179-202.
- Earl, J. (ed.) (2003) *Building Conservation Philosophy*. 3 edn. UK: Donhead.
- Edvinson, L., M. Malone (1997) *Intellectual Capital*. New York: Harper Collins.
- Egbu, C. (1995) 'Perceived degree of difficulty of management tasks in construction refurbishment work', *Building Research & Information*, 23, (6), pp. 340 — 344.
- Egbu, C. (1999) 'Skills, Knowledge and Competencies for Managing Construction Refurbishment Works', *Construction Management & Economics*, 17, (1), pp. 29-43.
- Egbu, C. (2004) 'Managing Knowledge and Intellectual Capital for Improved Organisational Innovation in the Construction Industry: an Examination of Critical Success Factors', *Engineering, Construction and Architectural Management (ECAM) Journal*, 11(5), pp. 301-315.

- Egbu, C., H. Robinson (2005a) 'Construction as a Knowledge-Based Industry', in Anumba, J., C. Egbu and P. Carrillo (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 31-49.
- Egbu, C., M. Arif, O. Alom, and M. Khalfan (2009) 'Measuring knowledge retention: a case study of a construction consultancy in the UAE', *Engineering, Construction and Architecture Management*, 16, (1), pp. 92 - 108.
- Egbu, C., S. Hari, S. Renukappa (2005b) 'Knowledge management for sustainable competitiveness in small and medium surveying practices', *Structural Survey*, 23(1), pp. 7 - 21.
- El-Belazie, J. (2004) *The role of heritage tourism in the regeneration of the historic core of Tripoli (Libya)*. Ph.D thesis. University of Newcastle upon Tyne.
- El-Fituri, F. (1993) 'Othman Bash School - Architectural study', *Atar Alarab* (6) pp. 89-94
- English Heritage (2004) 'Building Regulations and Historic Buildings'. Available at: <http://www.english-heritage.org.uk/publications/building-regulations-and-historic-buildings-balancing-the-needs/> (Accessed: february 2010)
- ESDS (2003) *exploring diverse interview types*. Available at: <http://www.esds.ac.uk/qualidata/support/interviews/intro.asp> (Accessed: 22/4/2010).
- Ewings, P., R. Powell, N. Scott, A. Barton, C. Pritchard (2012) *Qualitative Research Methods*. Peninsula Research & Development Support Unit (RDSU), Available at: <http://www.chnri.org/resources/1.%20Learning%20Resource%20Material/Qualitative%20Research/Monographs/Qualitative%20research%20methods.pdf>
- Feilden, B. (1982) *Conservation of Historic buildings*. Oxford: Butterworth.
- Feilden, B. (2004) *Conservation of Historic Buildings*. London: Architectural Press.
- Fellows, R., A. Liu (ed.) (1997) *Research Methods for Construction* 1st edn. London: Blackwell publishing
- Fellows R., A. Liu (ed.) (2003) *Research methods for construction* 2nd edition ed Oxford: Blackwell.
- Fong, P. (2005) *Knowledge Management In construction – Building a Knowledge Sharing Culture in Construction Project Teams*. Oxford, UK: Blackwell Publishing Ltd.
- Frost, A. (2010) *Knowledge Management*. Available at: <http://www.knowledge-management-tools.net/>.
- Fruchter, R., P. Demain (2005) 'Corporate Memory', in Chimay J. Anumba, C.E.P.C.e. (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 170-194.
- Gamble, P., J. Blackwell (2002) *Knowledge Management*. London: Kogan Page Limited.
- Garcia, R. (2006) *A Knowledge Management Model and its Implementation*, Available at: www.km.nasa.gov/ppt/146001main_nasa3.ppt (Accessed: 20/2/2010).

- Gergen, K. (1994) *Realities and relationships: soundings in social construction*. Cambridge, Mass: Harvard University Press.
- GHEU (2009) *MANAGING HERITAGE ASSETS*. London: English Heritage. *Revision to principles of selection for listing buildings*.
- Ghmati, A. (2007) Architectural composition in the old city of Tripoli, *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya* Ghadames - Libya, 27-29/10/2007.
- Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, M. Trow (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage.
- Glen, M. (2001) *the application of information modeling to the conservation of historic buildings*. thesis. Newcastle University. Newcastle.
- Glendinning, M. (2013) *The Conservation Movement: A History of Architectural Preservation - Antiquity to Modernity*. USA: Routledge.
- Goodman, P., E. Darr (1998) 'Computer-aided systems and communities: mechanisms for organizational learning in distributed environments', *Management Information Systems Quarterly*, 22(4), pp. 417–440.
- Gould, F. E. and Joyce, N. (2000) *Construction project management*. Upper Saddle River, N.J.: Prentice Hall.
- GPC (1985) *Libyan Governmental Implementation decision number 3 regarding the establishment of the project for the organisation and management of the old city of Tripoli (IOMOCT)*. Tripoli, Libya
- GPC (1994) *The Libyan administrative law number 3 about the protection of historic cities, neighbourhoods and historic buildings and its implementation acts*. Tripoli, Libya
- GPC (1995) *Libyan Governmental Implementation decision number 152 regarding how to deal with historic cities and buildings*. Tripoli, Libya
- GPC (2006) *Libyan Governmental Decision number 125 regarding establishing the MHCB*, Government printers, Tripoli, Libya
- GPCT (2006) *Libyan Government Decision number 2 regarding the organisational structure of the MHCB*. Tripoli, Libya
- Grix, J. (2002) 'Introducing Students to the Generic Terminology of Social Research', *POLITICS*, 22(3), pp. 175–186.
- Gupta, B., L. Iyer and J. Aronson (2000) 'Knowledge management: practices and challenges', *Industrial Management & Data Systems*, 100(1), pp. 17 - 21.
- Gyampoh, R., R. Moreton, D. Proverbs (2003) 'Implementing informaton management in construction: establishing problems, concepts and practice", *Construction Innovation: Information, Process, Management*, 3(3), pp. 157-173.
- Hamed, S. (1993) 'Some missing Islamic buildings in the city of Tripoli – historic study', *Atar Alarab*, (6), pp. 83 - 88.

- Hahn, J., Subramani, M.R. (2000) 'A framework of knowledge management systems: issues and challenges for theory and practice', *Knowledge Management Systems*, pp. 302-312.
- Hall, E. (2011) *planning a research project*. Centre for Learning and Teaching – Newcastle university.
- Hamel, G., C. Prahalad (1994) *Competing for the Future*. Boston, MA: Harvard Business School Press.
- Hansen, M.T. (1999) 'The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits', *Administrative Science Quarterly*, 44(1), pp. 82-111.
- Hanush, H., Pyka, A. (2007), *Elgar Companion to Neo-Schumpeterian Economics*, Edward Elgar, Cheltenham,
- Harper, D. (2010) 'Photography as Social Science Data', in Flicker U., E.K., I. Steinke (ed.) *A Companion to Qualitative Research*. London: SAGE.
- Harris, C. (1975) *Dictionary of Architecture and Construction*. New york: Mc GRAW-Hill BOOK COMPANY.
- Hashem, A. (1999) 'Architectural arts of Tripoli city', *Atar Alarab*, (11, 12), pp. 56 – 65
- Hasnien, A. (1999) 'Features of in the old city of Tripoli: complex of Darghot', *Atar Alarab*, (11, 12), pp. 81 - 87.
- Hay, C. (2002), *Political Analysis. A Critical Introduction*, Basingstoke: Palgrave.
- Hayward, S. (2000) 'Choosing Wisely: Technology for Knowledge Management', *the Gartner Symposium ITXPO*. Orlando, Oct. 16–20.
- HECC, (2010) *Factors affecting the Site (WHS)*. Available at: <http://www.cornish-mining.org.uk/status/factors.htm> (Accessed: March 13, 2010).
- HELM (2010) 'Refurbishment historic school buildings. Available at: <http://www.helm.org.uk/upload/pdf/Schools-refurb.pdf?1264410159> (Accessed: february 2010).
- Hildreth, P., Kiimble, C. and Wright, P. (2000) 'communities of practice in the distributed international environment.', *Journal of knowledge management*, 4(1), pp. 27-38.
- HLF, (1998) 'Conservation Plans for Historic Places'. Available at: <http://www.english-heritage.org.uk/> (Accessed: february 2010)
- Holm, M. (2000) 'service management in housing refurbishment: a theoretical approach', *construction management and economics*, (18), pp. 525-533.
- Horn, C. (2002) *Docomomo Saving Modern Monuments – France*. Available at: <http://urbanplanet.info/architecture/saving-modern-monuments-france/> (Accessed: 20/8/2013).
- Hsu, S. (2007) *Towards a critical approach to knowledge management framing a new paradigm*, Thesis. the University of Newcastle upon Tyne.

- Hu, J., K. Huang, K. Kuse, G. Su and K. Wang (1998) 'Customer information quality and knowledge management: a case study using knowledge cockpit.', *Journal of Knowledge Management*, 1(3), pp. 225-236.
- Hume, I. (2007) 'the philosophy of conservation engineering', in Forsyth, M. (ed.) *Structure & Construction in Historic Building Conservation*. Oxford: Blackwell Publishing Ltd, pp. 12- 18.
- ICA (2005) *Presentations and lectures*. Available at: <http://www.ica-sae.org/trainer/english/p15.htm> (Accessed: 22/11/2011).
- ICCROM (2005) *International centre for the study of the preservation and restoration of cultural property*. Available at: http://www.iccrom.org/eng/00about_en.shtml.
- ICOMOS (1990) *Guide to Recording Historic Buildings*. London: Butterworth Architecture.
- ICOMOS, A. (1999) 'the Burra Charter for the Conservation of Places of Cultural Significance'. Australia. Available at: <http://australia.icomos.org/>.
- Ismail, W., S. Shamsuddin (2005) 'The old shophouses as part of Malaysian urban heritage: the current dilemma', *8th International conference of the Asian planning schools association* 11-14 september 2005. pp. 1-18.
- Itaiem, M. (2007) Developing historic cities - Tripoli old city as a case study, *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya, Ghadames, 27-29/10/2007*
- Jelavic, M. (2011) 'socio-technical knowledge management and epistemological paradigms: theoretical connections at the individual and organisational level', *interdisciplinary journal of information, knowledge, and management*, 6, pp. 1-16.
- Jonathan, G. (2002) 'Introducing Students to the Generic Terminology of Social Research', *POLITICS*, 22(3), pp. 175–186.
- Jubran, M. (1997) 'Suqs (old Markets) in the city of Tripoli – historic study', *Atar Alarab*, (9, 10), pp. 114 - 125
- Jubran, M. (1999) 'The old hotels in Tripoli – historic study ', *Atar Alarab*, (11, 12), pp. 66 – 80
- Jubran, M. (2005) *French consulate in the old city of Tripoli* Benghazi: national books house.
- Jubran, M. (2007) Law number 3 regarding HBs conservation (1994) between theory and practice, *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya Ghadames - Libya, 27-29/10/2007*.
- Jubran, M. (2010) *the old Hotels of Tripoli*, Benghazi: national books house.
- Jubran, M. (2010) *the old Suqs (markets) in Tripoli*, Benghazi: national books house.
- Jurina, L. (2001) 'Pre-stressed steel cables and bars in consolidation of monumental buildings', [Online] (Accessed: 30/6/2012).

- Kamara, J., A. Chimay, P. Carrillo. (2002a) 'A Clever Approach to Selecting a Knowledge Management Strategy', *International Journal of Project Management* 20, (3), pp. 205-211.
- Kamara, J., C. Anumba, P. Carrillo (2005) 'Cross - Project Knowledge Management', in Anumba, C., C.Egbu, P. Carrillo. (ed.) *Knowledge Management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 103-120.
- Kamara, J., C. Anumba, P. Carrillo (2002b) 'Knowledge management in the architecture, engineering and construction industry', *Construction Innovation* 2(1), pp. 53-67
- Kartam, N. (1996) 'Making Effective Use of Construction Lessons Learned in Project Life Cycle.', *Journal of Construction Engineering & Management*; , , 122, (1), pp. 14-21
- Khairul F., S. Zulkarnian, M. Abdulrahman (2009) 'Comparative Study on Refurbishment Project Process of Government and non Government Organisation in Malaysia', *ERES conference* Stockholm, Sweden, 24-27 June 2009. pp. 1-15.
- Khatwa, A. (2007) *World heritage - examining the threats*. Available at: <http://www.teachingexpertise.com/articles/world-heritage-examining-the-threats-1776> (Accessed: 17/3/2010).
- Kidwell, J., V. Linde, S. Johnson (2000) 'Applying Corporate Knowledge Management Practices in Higher Education', *EDUCAUSE Quarterly*, 4, pp. 28–33.
- Kindred, B. (2004) 'Maintaining value through maintenance', *Context* (85), pp. 21-22.
- Kohler, N., U. Hassler (2002) 'The building stock as a research object', *Building Research & Information*, 30(4), pp. 226-236.
- Kometa, S. (2010) SPSS training course, training centre, Newcastle University, Newcastle
- Krogh, G., J. Roos, and K. Slocum (1994) 'An essay on corporate epistemology', *Strategic Management Journal*, 15((Special Issue)), pp. 53-71.
- Laudon, K., P. Laudon (ed.) (2000) *Management Information Systems-Organization and Technology in the Networked Enterprise*. 6th edn. New Jersey: Prentice Hall.
- Lave, J., Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Lavy, S., D. Bilbo (2009) 'Facilities maintenance management practices in large public schools, Texas', *Facilities*, 27(1/2), pp. 5-20.
- Lazarus, D. (2007a) 'Maintenance of heritage architecture: implementation and practice', *WIT Transactions on The Built Environment*, 95, pp. 319 - 328.
- Lee, H., B. Choi (2003) 'Knowledge management enablers, process, and organizational performance: an integrative view and empirical examination', *Journal of Management Information System*, 20(1), pp. 179-228.
- Lee, P., N. Gillespie, L. Mann, A. Wearing (2010) 'Leadership and trust: Their effect on knowledge sharing and team performance', *Management Learning*, 41(4), pp. 473–491.

- Lourenco, M., P. Roca (2005) 'Structural analysis of historical constructions - possibilities of numerical and experimental techniques'. London: Taylor & Francis Group, [Online] Available at: <http://books.google.co.uk/books?hl=en&lr=&id=0Di6O3ya8d8C&oi=fnd&pg=PA313&dq=historic+buildings+restoration+project+ppt&ots=0hXA2yg4H9&sig=U-b8NYP71Y6QmXTu3eTbpF0IMMM#v=onepage&q&f=false>.
- Lucey, T. (ed.) (2005) *Management Information System*. 9th edn. London: Thomson Learning.
- Luders, C. (2010) 'Field observation and ethnography', in Flicker U., E.K., I. Steinke (ed.) *A Companion to Qualitative Research*. London: SAGE.
- Macintosh, A. (1999) *Knowledge management* Available at: <http://www.aiai.ed.ac.uk/~alm/kamlnks.html#approach> (Accessed: 9/2/2010).
- Macintosh, A., et al (1999) 'Knowledge management techniques: teaching and dissemination concepts', *Int. J. Human-Computer Studies*, (51), pp. 549-566.
- Macky et al (2012) 'Resources for the on-going care for heritage housing in New Zealand - a public proposal for the private realm', *3rd International Conference on Heritage and Sustainable Development*. Porto, Portugal, June 19-22. Green Lines Institute for sustainable Development, pp. 1923-1929.
- Madi, F. (2007) the effect of environment on architectural spaces *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya Ghadames - Libya*, 27-29/10/2007.
- Malone, D. (2002) 'Knowledge management: A model for organizational learning', *International Journal of Accounting Information Systems*, 3(2), pp. 111-123.
- Malta, H. (2011) *Works Tender for the execution of Emergency restoration and conservation works at Fort St Angelo, Birgu*. Available at: http://www.heritagemalta.org/projects/callfortenders/documents/HM_1_11_Final%20Tender.pdf (Accessed: 31/5/2011).
- Mansfield, E. (1985) 'How rapidly does new industrial technology leak out?', *J. Indust. Econom.*, 34(2), pp. 217-223.
- Marakas, G., R. Johnson, and, J. Palmer (2000) 'A Theoretical Model of Differential Social Attributions toward Computing Technology: When the Metaphor Becomes the Model', *International Journal of Human Computer Science*, 4, pp. 719-750.
- McAdam, R., S. McCreedy (1999) 'A critical review of knowledge management models', *The Learning Organization*, 6(3), pp. 91 - 101.
- McCallum, D. (2009) 'Why the historic environment is at the heart of sustainable development', *English Heritage*. Available at: <http://www.architecture.com/Files/RIBAProfessionalServices/Regions/SouthWest/Events/2009/Conf2009EnglishHeritage.pdf>.
- McCarthy, G. J. (2009) *Knowledge Management Within a Multinational Knowledge Led Company* thesis. University of Glasgow
- MHCB (2004) 'Tripoli, history and civilization'. Benghazi: Dar Kuteb al-Watania.

Milstead, T. (2007) 'Housing, Heritage & the Evolving “Cultural/Urban Landscape” of an Ex-Soviet, European Capital', *History, Heritage & Regeneration conference Sibiu Romania*. INTBAU. Available at: <http://www.intbau.org/SibiuConferenceEN.htm>.

Minbaeva, D., K. Makela, L. Rabbios (2012) 'Linking HRM and Knowledge Transfer via Individual-Level Mechanism', *Human Resources Management*, 51(3), pp. 387-405.

Modena, L.R. (2005) 'Structural analysis of historical constructions - possibilities of numerical and experimental techniques', in. London: Taylor&Francis Group, p. pp. 713 [Online]. Available at: <http://books.google.co.uk/books?hl=en&lr=&id=0Di6O3ya8d8C&oi=fnd&pg=PA313&dq=historic+buildings+restoration+project+ppt&ots=0hXA2yg4H9&sig=U-b8NYP71Y6QmXTu3eTbpFOIMMM#v=onepage&q&f=false>.

Moorman, C., A. Miner (1997) 'The Impact of Organizational Memory on New Product Performance and Creativity', *Journal of Marketing Research*, 34, pp. 91–106.

Moorman, C., A. Miner (1998) 'Organizational Improvisation and Organizational Memory', *Academy of management Review*, 23(4), pp. 698–723.

Mousaui, H. (2007) Damp and the method to minimize its impact on historic buildings *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya Ghadames - Libya, 27-29/10/2007*.

Mullins, L.J. (ed.) (1986) *Management and Organisational Behaviour*. 2th edn. London: Pitman Publishing Limited.

Murthy, G., S. Panchal (2011) *A presentation on comprehensive project on knowledge management*. Available at: <http://www.scribd.com/doc/74667358/8/the-core-components-of-km#page=35> (Accessed: 28/12/2011).

Nachmias, C. (ed.) (1996) *Research Methods in Social Investigation*. edn. Arnold.

Naoum, S. (ed.) (2008) *Dissertation research & writing for construction students*. London: Elsevier.

Nelson, R. and S. Winter (1982) *An Evolutionary Theory of Economic Change*. Cambridge: Bellknap.

Newell, S. and R. Galliers (2006) *HICSS '06. Proceedings of the 39th Annual Hawaii International Conference on, " System Sciences, 2006. , vol.7, pp. 149*. Hawaii 04-07 Jan. 2006. Available at: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1579594&isnumber=33367>.

Newell, S., M. Bresnen, L. Edelman, H. Scarbrough, J. Swan (2006) 'Sharing Knowledge Across Projects Limits to ICT-led Project Review Practices', *Management Learning*, 37(2), pp. 167–185.

Newman, B., K. Conrad (1999) 'A Framework for Characterizing Knowledge Management Methods, Practices, and Technologies', [Online]. Available at: <http://www.km-forum.org/KM-Characterization-Framework.pdf> (Accessed: 25/5/2010).

- Nicolini, D., M. March (1995) 'The social construction of organizational learning: conceptual and practical issues in the field', *Human Relations*, 48(7), pp. 727-746.
- Nonaka, I., H. Takeuchi (1995) *The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovations*. Oxford, UK: Oxford University Press.
- Nonaka, I. (1994) 'A dynamic theory of knowledge creation', *Organ. Sci.*, 5(1), pp. 14-37.
- Nonaka, I., R. Toyoma (2003) 'The knowledge creating theory revisited: knowledge creation as a synthesizing process', *Knowledge Management Research and Practice*, 1, pp. 2-10.
- Nowotny, H., P. Scott, M. Gibbons, (2003) 'Introduction 'Mode 2' Revisited: The New Production of Knowledge', *Minerva*, (41), pp. 179-194.
- Oea (2010) *hotels of the old city of Tripoli* . Available at: <http://www.oelialbya.com/oea-sections/tourism/6332-2009-09-09-23-41-39> (Accessed: 5/5/2010).
- Orange, G., Burke, A. and Boam, J. (2000) 'The facilitation of cross organisational learning and knowledge management to foster partnering within the UK construction industry'.
- Origlia, F. (2010) *Cathedral of Santa Maria del Fiore*. Available at: www.britannica.com/EBchecked/topic-art/297474 (Accessed: 19/4/2010).
- Quah, L. (1992) 'Comparative Variability in Tender Bids for Refurbishment and New Build Work.' *Construction Management & Economics*, 10, (3), pp. 263-269
- Quintas, P., Lefrere, P. and Jones, G. (1997), 'Knowledge management: a strategic agenda', *Journal of Long Range Planning*, Vol. 30 No. 3, pp. 385-91.
- Quintas, P. (2005) 'The Nature and Dimension of Knowledge Management', in Anumba, C., C. Egbue, P. Carrillo (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 10-30.
- Quryna (2010) *The issuance of the document to protect the old city of Tripoli*. Available at: http://www.quryna.com/detail.php?a_idx=5384 (Accessed: 8/5/2010).
- Patel, J., J. Angus (1999) *knowledge management*. Available at: http://searchdomino.techtarget.com/sDefinition/0,,sid4_gci212449,00.html (Accessed: 25/07/2009).
- Pathirage, C.P. (2007) *A structured approach to manage the tacit knowledge of construction employees* University of Salford [Online]. Available at: <http://ethos.bl.uk/OrderDetails.do?did=33&uin=uk.bl.ethos.490431>.
- Perng, Y., Y. Hsia, and H. Lu (2007) 'A Service Quality Improvement Dynamic Decision Support System for Refurbishment Contractors.' *Total Quality Management & Business Excellence*, 18, (17), pp. 731-749
- Pickard, R. (2001) *Management of Historic Centres*. London: spon press.

- Porter, M., S. Stern (1999) *The New Challenge to America's Prosperity: Findings from the Innovation Index*, Council on Competitiveness, Washington, DC
- PRG (2009) *knowledge life cycle*. Available at:
<http://www.processrenewal.com/files/def-km.doc> (Accessed: 23/07/2009).
- Rghei, A., Nelson, J. (1994) 'The Conservation and Use of the Walled City of Tripoli', *The Geographical Journal*, 160(2), pp. 143-158.
- RIBA (2011) *Royal Institute of British Architects*. Available at:
<http://www.architecture.com/FindOutAbout/Home.aspx> and
<http://www.architecture.com/JoinTheRIBA/ConservationRegister/ConservationRegister.aspx> (Accessed: 12/6/2012).
- Robertson et al (1996) *Looking into Housing: A Practical Guide to Housing Research*. Coventry: Chartered Institute of Housing Policy and Practice Series.
- Robinson, H., P. Carrillo, C. Anumba, A. Al-Ghassani (2005) 'Knowledge management practices in large construction organisations', *Engineering, Construction and Architectural Management*, 12(5), pp. 431-445.
- Romanelli, B. (1923) 'Vecchie Casa Arabe Di Tripoly', *Architettura arte Decorative Rivista D'avte di Storia*, pp. 193-211
- Rosentiel, L. (2010) 'Organizational Analysis', in Flicker U., E.K., I. Steinke (ed.) *A Companion to Qualitative Research*. London: SAGE.
- Routio, P. (2007) *Case Study*. Available at:
<http://www2.uiah.fi/projects/metodi/171.htm> (Accessed: 11/4/2010).
- Rowley, J. (2000) 'From learning organisation to knowledge entrepreneur', *Journal of Knowledge Management*, 4(1), pp. 7-15.
- Rowley, J. (2001) 'Knowledge management in pursuit of learning: the Learning with Knowledge Cycle', *Journal of Information Science* 27 (4), pp. 227–237.
- Ruggles, R. (1997) *knowledge management tools*. Butterworth, Heinemann. Available at:
http://books.google.co.uk/books?id=CXgDUMS9fi8C&printsec=frontcover&source=gb_s_navlinks_s (Accessed: 21/07/2009).
- Ruikar, k., C. Anumba, C. Egbu. (2007) 'Integrated use of technologies and techniques for construction knowlede management', *Knowledge management research & Practice*, 5, pp. 297-311.
- SAH (2012) *Conservation, Restoration, and Architectural History*. Available at:
<http://www.sah.org/home> (Accessed: 2/6/2012).
- Salama, O. (2007) Conservation of historic and architectural heritage. *Symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya* Ghadames- Libya, 27-29/10/2007.
- Scarborough, H., Swan, J. and Preston, J. (1999) *Knowledge Management: a literature review*. London: Institute of Personnel and Development.

SCTA (2012) *National Built Heritage Centre - Saudi Commission for Tourism and Antiquities* Available at: <http://www.nbhf.org.sa/english/NBHCenter.aspx> (Accessed: 2/6/2012).

Seeley, I.H. (ed.) (1987) *Building Maintenance*. 2nd edition edn. London: Macmillan Education.

Semple, K. (1996) *Conservation plans for places of European significance*. Sydney: NTNSW.

Serban et al (2002) 'Overview of Knowledge Management', *New directions for institutional research*, (113), pp. 5-16.

Services, O. B. (2008), *Document Process Management: The Compelling Case for an Integrated Lifecycle Strategy*. Oce Business Services Available at: <http://www.findwhitepapers.com/whitepaper2289> (Accessed: 28/7/2009).

Shah, P. (1998) 'Who are employee's social referents? Using a network perspective to determine referent others', *Academy of Management Journal*, 41(3), pp. 249-268.

Shariq, S. (1998) 'Sense Making and Artifacts: An Exploration into the Role of Tools in Knowledge Management', *Journal of Knowledge Management*, 2(2), pp. 10–19.

Shawesh, A. (2004) Analysis study of architectural heritage *symposium under title: Conservation of old cities*. Benghazi – Libya, 8-9 December 2004.

Sheehan, T., D. Poole, I. Lyttle and C. Egbu (2005) 'Strategies and Business Case for Knowledge Management', in C. Anumba, C. Egbue and P. Carrillo (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 50-64.

Shin, M., T. Holden, R. Schmidt (2001) 'From knowledge theory to management practice: towards an integrated approach', *Information Processing and Management*, (37), pp. 335-355.

Siemieniuch C., M.S. (2005) 'Organisational readiness for Knowledge Management', in Chimay J. Anumba, C.E.P.C.e. (ed.) *Knowledge management in Construction*. Oxford: Blackwell Publishing Ltd, pp. 65-81.

Śledzik, K. (2013), Knowledge Based Economy in a Neo-Schumpeterian Point of View. *Contemporary Issues in Economy – Growth Perspectives in Europe* (ed.) Adam. P. Balcerzak, Polish Economy Society Branch in Toruń, Institute of Economic Research, Toruń 2013. Available at SSRN: <http://ssrn.com/abstract=2257765> or <http://dx.doi.org/10.2139/ssrn.2257765>

Smith, B. (2010) *Conserving period buildings and lime* Available at: <http://www.countrylife.co.uk/news/article/475248/Conserving-period-buildings-and-lime.html> (Accessed: 15/2/2011).

Snowden, D. (1999) 'Liberating Knowledge', in Reeves, J.E. (ed.) *Liberating Knowledge*. London: Caspian Publishing, pp. 6-19.

Song, M., H. Bij, and M. Weggeman (2005) 'Determinants of the Level of Knowledge Application: A Knowledge-Based and Information-Processing Perspective', *Journal of Product Innovation Management*, 22(5), pp. 430–444.

- Soy, S. (1997) *The case study as a research method*. Available at: <http://www.ischool.utexas.edu/~ssoy/usesusers/l391d1b.htm> (Accessed: 11/4/2010).
- Steven, T., taner Oc, Tim Heath (ed.) (2001) *Revitalizing historic urban Quarters*. oxford: architecture press.
- Stewart, D., and Kamins M. (1993) *Secondary Research: Information sources and methods*. 2nd edn. Sage.
- Sun, M., R. Howard. (2004) *Understanding I.T in Construction*. London: Spon Press.
- Swan, J., Newell, S., Scarbrough, H., and Hislop, D. (1999) 'Knowledge management and Innovation: Networks and Networking', *Journal of Knowledge Management*, 3(4), pp. 262-275.
- Swed, E. (1992) 'Al-Nagha mosque in the old city of Tripoli – architectural study', *Atar Alarab*, (4), pp. 112-121.
- Sweetser, S. (2002) *Roofing for Historic Buildings*. Available at: <http://www.nps.gov/tps/how-to-preserve/briefs.htm>
<http://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm> (Accessed: 10/3/2010).
- Tan, C., P. Carrilo, C. Anumba, J. Kamara, D. Bouchlaghem, C. Udejaja (2006) 'Live capture and reuse of project knowledge in construction organisations', *Knowledge Management Research and Practice*, 4(2), pp. 149-161.
- Tarhuni, S. (1992) 'Bank of Roma - Architectural study', *Atar Alarab*, (5), pp. 123 -128.
- Teerajetgul, W., C. Charoenngam (2006) 'Factors inducing knowledge creation: empirical evidence from Thai construction projects', *Engineering, Construction and Architectural Management*, 13(6), pp. 584 - 599.
- Trimarchi, M. (2004) 'Regulation, Integration and Sustainability in the Cultural Sector', *International Journal of Heritage Studies*, 5, pp. 401–415.
- Trovit (2012), *Restoration job*. Available at: http://jobs.trovit.co.uk/index.php/cod.frame/url.http%253A%252F%252Fwww.edenbrown.com%252Fdisplay_job%252F64961%252F/id_ad.1cQ131I1u1-1EN/type./what.historic%20building%20conservation/pos.1/org.1/pop.1/publisher_id./referer_id.1/t.1.
- Tsoukas, H. (1996) 'The firm as a distributed knowledge system: a constructionist approach', *Strategic Management Journal*, 17(Winter Special Issue), pp. 1-25.
- Unit, P.M. (2011) 'Municipal Administration Modernisation'. 18/7/2011. Demascus. Available at: http://www.mam-sy.org/?p_name=news_item_view&id=70. .
- Unknown (2002) 'Tripolis: the Three Cities' 2nd. Misurata: Dar-al-Anies.
- University of the West of England, B. (1996) *The Statutory and Policy Context for Maintenance*. Available at: <http://www.maintainourheritage.co.uk/pdf/mod1section2.pdf> (Accessed: 24/3/2010).

- Vector, S. (2008) *Knowledge Management* Available at: http://www.vectorstudy.com/management_topics/knowledge_management.htm (Accessed: 25/1/2011).
- Vellinga, D.A.O.M. (2007) 'Teaching architectural regeneration: a multi-disciplinary and cross-cultural approach', *history, heritage & regeneration*. city of Sibiu Romania, 23 - 25 September 2007. INTBAU Available at: <http://www.intbau.org/>
- Vijay (2007) *Business Dictionary*. Available at: <http://www.businessdictionary.com/disclaimer.php> (Accessed: 23/07/2009).
- WABER (2012) *the West Africa Built Environment Research Conference*. (24-26 July) Abuja, Nigeria.
- Wafa, L. (2007) Architectural heritage conservation: the purposes and the principles, *The 1st symposium under title: towards general strategy of architectural and urban conservation for historical cities in Libya* Ghadames- Libya, 27-29/10/2007.
- Waheed, Z., S. Fernie (2009) 'Knowledge based facilities management', *Facilities*, 27(7/8), pp. 258-266.
- Walker, A. (ed.) (2007) *Project Management in Construction*. Fifth Edition ed Oxford: Blackwell publishing.
- Walsh, J., G. Ungson (1991) 'Organizational memory', *Academy of Management Review*, 16(1), pp. 57-91.
- Wang et al (2010) 'A multi-objective decision-making process for reuse selection of historic buildings', *Expert Systems with Applications*, 37(2), pp. 1241-1249.
- Watt, S. (1996) *Surveying Historic Buildings*. UK: Donhead Publishing.
- Weber, F., M. Wunram, J. Kemp, M. Pudlatz, B. Bredehorst (2002) *UNICOM Seminar "Towards Common Approaches & Standards in KM"*. London.
- Weggeman, M. (1997) *Knowledge management: Organization and management of knowledge-intensive organizations*. Schiedam.
- Wehmeier, S. (1993) *Oxford wordpower dictionary*. Oxford: Oxford University Press.
- Weick, K., K. Roberts (1993) 'Collective mind in organizations-heedful interrelating on flight decks', *Administrative Science Quarterly*, 38(3), pp. 357-381.
- Wiig K., R. Hoog, R. Spek (1997) 'Supporting Knowledge Management: A Selection of Methods and Techniques', *Expert Systems With Applications*, 13, (1), pp. 15-27.
- Wlgen, A. S. (1962) 'Trabulus garpto Turgut Reis Minari Manzumesi', *Vakiflar Dergisi - Ankara* pp. 87-92
- Wolff, S. (2010) 'Analysis of Documents and Records', in Flicker U., E.K., I. Steinke (ed.) *A Companion to Qualitative Research*. London: SAGE.
- Yin, R. (ed.) (2009) *Case Study Research: Design and Methods*. 4th edn. London: Sage Ltd.
- Yin, R. (1984) *Case study research: Design and methods.*: Newbury Park, CA: Sage.

Young, B., Egbu, C. (1993) 'The characteristics and difficulties associated with refurbishment and the need for education and training from a management perspective', *9th annual conference of the association of researchers in construction management(ARCOM)*. UK, 14-16 sept. Oxford university, pp. 338-350.

Appendices

Appendix1: Questionnaire

Salem Tarhuni is a PhD student at Newcastle University. The questionnaire is about management of knowledge in the field of historic building conservation. Any information you have given will be used only for academic purposes.

Within this research knowledge means the advanced phase of information absorption in the field of historic buildings conservation, and it can be one of the following forms:

-Explicit knowledge (paper or electronic) can be organised, stored, retrieved and re-used.

-Tacit knowledge (ex. know-how or experience) exists in individuals' minds, and could be traded among individuals, but it is difficult to be converted completely into documentary form.

Knowledge management is management processes enable organisations to identify the available and required knowledge, capturing and sharing it for effective use to achieve organisational objectives and create new knowledge.

Personnel details:

Your job:

Place of work:

How long is your experience (your work or interest) in the field of historic building conservation?

< 5 years

5-10 years

>10 years

1- Do you think that the continued development of employees' knowledge in the field of HB conservation is a personal or organisational responsibility?

Organisational responsibility

Personal responsibility

Shared responsibility

2- Identify the degree to which it is important that knowledge should be available in the Management of Historical Cities Bureau (MHCB)?

knowledge regarding:		Its importance				
		← low		high →		
		1	2	3	4	5
Assessing and Documenting the existing situation of HB	Architectural Values of historic buildings (HB)					
	Historical Values of historic buildings					
	Economical Values of historic buildings					
	Environmental Values of historic buildings					
	Social Values of historic buildings					
	Architectural survey and preparing drawings of HB					
	Diagnosis the existing structural situation of HB (conditional survey)					
Other , specify						
Deciding the level of intervention in HB (action plan regarding physical effect)	Identify the required treatment that should be done in HB.					
	Rehabilitation and re-use of historic buildings including alteration or re- design.					
	Principles of dealing with historic buildings (such as minimum intervention and using like for like materials).					
	Regulations those are relevant to Historic buildings.					
	Other , specify					
Contract management	The preparation of project documents and contracting					
	CVs for institution's human resources and, specialists, contractors, construction materials traders and craftsmen (include their special knowledge in HB conservation and their contact details).					
	Managing and supervising HB conservation work					
	Other , specify					
Restoration operational processes	Old construction methods that were used to build HB					
	Treatment processes (maintenance, repair or refurbishing)					
	Old construction materials that were used to build HB					
	Current (common) construction materials					
	Recent repair materials that are used in HB					
	The equipment and machines that are used in HB conservation work processes (maintenance, repair or refurbishing)					
Other , specify						

3- To what extent is knowledge available in the Management of Historical Cities Bureau (MHCB). Please answer according to your knowledge if you are employee in or have worked for the MHCB previously.

knowledge regarding:		Its availability				
		← low		high →		
		1	2	3	4	5
Assessing and Documenting the existing situation of HB	Architectural Values of historic buildings (HB)					
	Historic Values of historic buildings					
	Economic Values of historic buildings					
	Environmental Values of historic buildings					
	Social Values of historic buildings					
	Architectural survey and preparing drawings of HB					
	Diagnosis the existing structural situation of HB (condition survey)					
Other , specify						
Deciding the level of intervention in HB (action plan regarding physical effect)	Identify the required treatment that should be done in HB.					
	Rehabilitation and re-use of historic buildings including alteration or re- design.					
	Principles of dealing with historic buildings (such as minimum intervention and using like for like materials).					
	Regulations those are relevant to Historic buildings.					
Other , specify						
Contract management	The preparation of project documents and contracting					
	CVs for institution's human resources and, specialists, contractors, construction materials traders and craftsmen (include their special knowledge in HB conservation and their contact details).					
	Managing and supervising HB conservation work					
Other , specify						
Restoration operational processes	Old construction methods that were used to build HB					
	Treatment processes (maintenance, repair or refurbishing)					
	Old construction materials that were used to build HB					
	Current local construction materials					
	Recent repair materials that are used in HB					
	The equipment and machines that are used in HB conservation work processes (maintenance, repair or refurbishing)					
Other , specify						

4- Identify to what extent each of the following techniques is applied in the MHCB? Please answer according to your knowledge if you are employee in or have worked for MHCB previously.

Techniques		its apply				
		← low			high →	
		1	2	3	4	5
Level of institution	Internal training (On-the-job-training): Seniors train juniors within organisation					
	External training: courses managed by professional organisations or experts					
	Community of practice (group task)					
	Lectures about previous experience (storey telling)					
	Rotation systems: employee works for period of time in one section, then transfer to another to learn the work in all sections.					
	Conferences, seminars and Workshops					
	Mentoring assigning experienced mentors for providing guidance and support to new employees.					
	Post Project review meeting/ lessons learned					
	Constructive brainstorming meetings for problem solving					
Level of individuals	Trial-and-error-policy					
	Self-Reading (books, journals, other publishes)					
	Asking for help during daily work					
	Discussion with others					
	Contact and observe old builders					
	Contribution in Prepare a conference paper or a journal article					
	Other, please specify:					

5- Identify the degree of importance to which information technologies contribute in managing information and knowledge in MHCB? Please answer according to your knowledge if you are employee in or relevant to the MHCB.

Contributions of IT	its importance				
	low ←			→ high	
	1	2	3	4	5
Reduce the use of paper forms.					
Save time of retrieving and reviewing					
Provides secure records					
Helpful tool for preparing historic buildings drawings					
Provide a platform that individuals can have access and share knowledge at anytime from anywhere.					
Provides relevant information					
Provides online discussion forum					
Other contributions, please specify					

6- How do you store your work documents?

- Paper form
- Electronic form
- Both, paper and Electronic forms together

7- To what extent do you use internet services in your work?

	always	often	sometimes	rarely	never
E-mail					
MHCB website					
Search engines					
Online discussion forum					
Other, please specify					

- **What benefits have you received from the internet services in your work?**

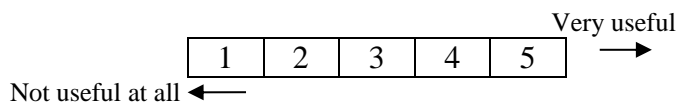
8- What are the main obstacles to the use of IT in the MHCB that you have faced? Select many as possible.

Viruses & penetration	Fire and Electrical problems
Hardware failure	Telecommunication problems
Software failure	Program changes
Theft of data and equipment	Other, please specify:

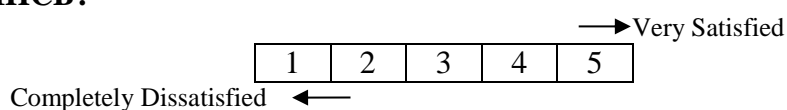
9- How often your absorption abilities is high from these learn tools?

Learn technique	absorption abilities				
	← low			high →	
	Rarely	Occasionally	Some times	Often	Usually
Reading	2	6	10	13	4
Attending lecture or conference	1	6	15	12	1
Attending Training course or workshops	0	2	7	15	11
Discussing with others	0	6	11	14	4
Experience from working on site	0	2	6	17	10
Other, specify					

10- To what extent do you think that the MHCB's library provides for your needs for useful knowledge that helps you to conduct your work?



11- To what extent are you satisfied with the quality of knowledge that is shared in the MHCB?



12- To what extent do you think that you have knowledge regarding historic buildings and their conservation?

Very low knowledge ←	1	2	3	4	5	→ Very high knowledge
----------------------	---	---	---	---	---	-----------------------

13- Have you faced any difficulties when you contact employees in other departments in the MHCB? always sometimes never

- If always or some times, what type of difficulty?

14- Have you faced any difficulties when you need documents from other departments in the MHCB? always sometimes never

- If always or some times, what type of difficulty?

15- Do you agree/ disagree that in your work environment,

a) It is acceptable to ask for help

Agree.	Tend to agree	neither	Tend to disagree	disagree
--------	---------------	---------	------------------	----------

b) It is reasonable to make mistakes

Agree.	Tend to agree	neither	Tend to disagree	disagree
--------	---------------	---------	------------------	----------

c) It is possible to share lessons in a culture of continuous improvement

Agree.	Tend to agree	neither	Tend to disagree	disagree
--------	---------------	---------	------------------	----------

d) Individuals in your job actively seek and apply new learning

Agree.	Tend to agree	neither	Tend to disagree	disagree
--------	---------------	---------	------------------	----------

e) Senior employees have been transferring their knowledge to junior employees

Agree.	Tend to agree	neither	Tend to disagree	disagree
--------	---------------	---------	------------------	----------

16- To what extent do you think that the absence of senior employees (who have left the MHCB) has negatively affected the work?

Low effect ←	1	2	3	4	5	→ High effect
--------------	---	---	---	---	---	---------------

17- What do you often do to get knowledge to solve a problem that you face in your work? Write the priority of each choice.

Choices	1 st	2 nd	3 rd	4 th	5 th		
Contact your manager							
Contact your work colleagues							
Review relevant documents							
Read a reference							
Use internet							
Other, please specify							

18- To what extent are you interested in the need for formal knowledge management (explained in the 1st page) at the MHCB?

Very Interested	Interested	neither	Not interested	completely not interested
-----------------	------------	---------	----------------	---------------------------

19- Identify the effect of influencing factors on developing knowledge management (explained in the 1st page) in the MHCB.

influencing factors		Its effect				
		← negative		positive →		
		1	2	3	4	5
Organisational factors	Vision of leadership.					
	Organisation structure and coordination between departments					
	Org. policies regarding pay for knowledge					
	Org. policies regarding staff motivation and retention them.					
	Suitable Places for discussing and sharing knowledge					
	Information communication technology (ICT)					
Individuals factors	Corporate culture (collaboration)					
	Personal experience					
	Competence of individuals					
	Individuals' absorption abilities (Assimilation)					
	Other, please specify					

Thank you for your participation

Name (option):

Age: <30 30-45 >45

Email or mobile number (option):

Appendix 2: Semi-structured Pro-forma Interview

Salem Tarhuni is a PhD student at Newcastle University. The Pro-forma is about management of knowledge in the field of historic building conservation. Any information you have given will be used only for academic purposes.

The research aims to investigate the current knowledge management in the MHCB and to identify the key issues that contribute to the finding of solutions that will enable effective KM in the MHCB

The interview regarding the topics listed below with the option to explore other issues may arise during the interview. The expected time for the interview is one hour.

1. HB conservation knowledge aspects:

- a) What is the main knowledge that is essential for you when dealing with HBs?
- b) From which sources have you obtained knowledge when dealing with HBs (for instance, for solving problems)?

2. Knowledge management aspects:

What are the enablers and constraints (individuals, documents, repositories, IT, MHCB structure, regulations and context, external knowledge...etc.) that face, and how they affect the process of:

- Knowledge capturing from individuals, written sources and HBs themselves
- Knowledge organising and storing in the MHCB
- Knowledge dissemination or sharing between individuals and reusing it in the field of HB conservation.

Appendix 3: Visual survey and observations in restoration and maintenance projects in Tripoli, Libya (2010)

Visits to historic buildings restoration projects and others refurbished previously were conducted in Tripoli between 20/9/2010 and 30/11/2010. Note taking, asking questions and getting photographs were helpful tools for conducting the visual survey.

A set of observations led to identify:

- Main problems that HBs in Tripoli suffer from
- Mistakes that occurred in previous restoration work.
- Some issues that comply or contradict with HBs conservation principals.

A. Arts and crafts school, Tripoli

This historic building was built in 1902. It was refurbished under supervision of archaeology department



Reinforced concrete was used to consolidate the foundations

B. Al-Mushat Mosque, Tripoli

It was refurbished under supervision of National Group for Protecting Libyan Architectural Heritage

According to the label near the main entrance, this mosque was built in the 15th century and the minaret was built in 1670.



Consolidation of the walls is required during restoration work in HBs to avoid their failure during the refurbishment work



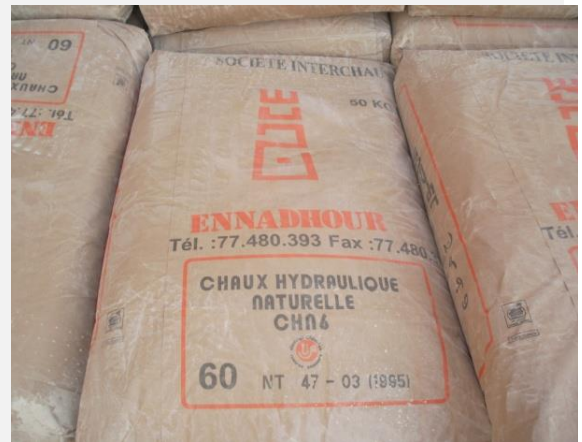
Monitoring the cracks is an essential process for HB restoration; expansion of the crack indicates foundation or wall problems that should be repaired, whereas the stability of the crack indicates that the situation is not dangerous and treatment for the plaster layer is required.



Red brick and lime stone are common old materials used in the old city of Tripoli



Restoration work in walls and ceilings depends on removing all the plaster layers both internally and externally. If previous plastering has to be removed, this should avoid the rainy season, as the rain negatively affects the uncovered walls and domes.



Hydraulic lime and lime are repair materials used for plastering. They are imported from Tunisia



Trial of different lime mixtures for plastering: A hydro carbonate lime mixture and other similar mixtures that included 10% white cement were tested before the start of re-plastering with the correct one.

C. Islamic Museum, Tripoli



This historic building was built in the Ottoman era (16-18th century) in Tripoli, Libya.

It was refurbished under the supervision of the archaeology department

The treatment of the cracks in an HB's walls was conducted after checking the movement of the walls by monitoring the extent of the cracks



Solvent materials were used to identify the original layers of paint; six layers of paint were found



Underground services include water supply, sewage systems and central conditioning.



Pre-stressed metal was used to prevent horizontal forces in arches



Some original special features in the Islamic museum



Some of the restoration materials that were used in the Islamic museum project

- KB 13 EN 998-1 general purpose rendering mortar for internal /external use
- B 550 M Fibre reinforced mortar for repairing walls
- S 641 Cement-based rendering for restoration
- Gypsum lime plaster
- Metal mesh and fibre mesh

D. Former British consulate, Tripoli
It was refurbished under the supervision of the MHCB

According to the label near the main entrance, this building was built in 1744.



Exaggerated use of reinforced concrete for repairing cracks

the incorrect use of reinforced concrete and cement mortar

The former repair works were based on Portland cement in terms of reinforced concrete for cracks and cement mortar for plastering



One main defect is dampness in walls. Plastering the walls with cement mortar (instead of porous materials) caused the continuity of the same problem.



The wrong type of metal was used to support arches, causing cracks

E. Former French Consulate, Tripoli

It was established between the 16th and 17th century. This historic building was restored in 2001. It was under maintenance in 2010. Under the supervision of the MHC.B.



Restoring the original wood work Compliance with conservation principles and conservation of the original wood work.

Compliance with conservation principles: old and new materials should be distinguished. The photo shows how old and new ceramics can be distinguished.



Electrical wires in walls

An old building method: a wood structure was used in the internal wall to prevent failure.

Re-plastering some areas that were suffering from dampness



F. Former Bank of Rome in the old city of Tripoli

According to the label near the main entrance of the bank, the date of establishing this building goes back to the second Ottoman Era (1835-1911). It was used after 15/4/1907 as a seat for the Bank of Rome, which took on the operations of import and export and all other trade operations.

The building was refurbished between 2001 and 2004 under the supervision of the MHC. It is now used as a branch of the al-Umma Bank (Libyan bank). Alterations occurred in this building so that it would comply with its new function.



The elevation of the Bank of Rome was restored according to old pictures



Although refurbishment works were conducted in 2004, this building suffers from a high level of dampness in its walls, attributed to the continuous repetition of plastering the walls with cement mortar (instead of porous materials)



For safety reasons, modern materials were used to cover the internal court

Appendix 4: Data Collection Form for Historic Building

It was prepared by the staff in the MHC B’s technical affairs department. The form is a survey of HBs’ existing situation and includes 12 sections. The form includes multiple choice questions with a description of some items. It was prepared to collect information for preparing technical reports about HBs. This form is a helpful tool for documenting the existing situation of HBs and articulating technical reports. However, it does not provide deep information because assessing HBs’ value and condition for deciding the level of intervention in HBs needs more investigation than answering multiple choice questions or deciding in the same time.

1. Brief historic background about the building						
2. Description of the building’s location and areas						
HB location:	City		Street		number	
	Nearest known point:		Is Site drawings:	Available () not available ()		
Areas	Site area:		Building area		Number of floors:	
The Borders of the building		North				
		South				
		East				
		West				

Sketch of site plan:							
3. HB original and current use (history of its use)							
Original use of building:							
Current use:	Vacancy	commercial	education	religious	tourism	industry	Other:
4. HB style and type							
Building's style:	Local	Ottoman	European	Other:			
Building type:	courtyard surrounded with columns		courtyard without columns		small building	other:	
5. Building components							
Ground floor							
First floor							
Second floor							
Third floor							
Roof							

6. Building condition (walls, roofs, water and sewage system)				
A. excellent condition	No need for maintenance	Maintenance of facades	Regular maintenance	other
B. good condition	Some maintenance for floor	Some maintenance for doors and windows		
C. medium condition	Some fractures in walls needs re-plastering	Damage in water and drainage system		
D. bad condition	some roof/floor failures and cracks in walls	some roof/floor failures and cracks in upper walls		
E. collapsed	Full collapse (walls, roof, floors)	Part collapse: % of building that is not suitable for use	Some collapse and can be used partly	
Other:				
7. Building condition evaluation				

8. Building value							
Historical value							
Architectural value							
9. Architectural details							
Columns and arches							
Floor ceramics							
Wall ceramics							
Decorations in:	internal walls	ceilings	floors	external walls			
Other:							
10. Construction system and materials							
Construction system	Wall bearing		columns and beams		mixed system		other
Wall type	Sand stones	lime stone	Maltese stone	brick	clay		other
Roof type	dome	vault	steel beams and wood	steel beams and brick	steel beams and concrete	concrete	other
Floors	marble	Maltese stone	concrete	cement tiles	mosaic	ceramic	other
11. Building high							
Ground floor		First floor		Second floor		Third floor	
Stair case on the roof		Parapet wall					
Minaret high		Dome high		Dome diameter			

12. Technical notes and Intervention decision

Name of information collector		date:	Sign:
-------------------------------	--	-------	-------

Appendix 5: The Details of the Research Interviewees

	Initial	Interviewees' description/ Qualification / Years of experience	Date/time/place of interviews	Gender	Duration	Voice recording
1	A.J	Head of institution, M.Sc.(Architect), 10 years faculty staff member and 1 year in the MHC B	23/11/2010 – 11 am in MHC B	M	46	No
2	R.M	Director of technical department, in charge temporarily (technician), 20 years in the MHC B	16/9/2010 – 12 PM in MHC B	M	36	No
3	Y.K	Director of documentation and historic studies department (Liberian), 25 years in the MHC B	7/11/2010 – 10 am in MHC B	M	94	Yes
4	B.S	Head of design and technical studies section (Architect), 10 years in the MHC B	20/9/2010 - 2pm & 28-10-2010 12pm in MHC B	F	72	Yes
5	A.H	Head of supervision and implementation section (Technician), 16 years in the MHC B	22/9/2010 – 1 pm in MHC B	M	44	No
6	A.B	Head of historic and social studies section (Fine arts), 17 years in the MHC B	15/11/2010 – 2 pm in MHC B	M	42	No
7	E.R	The director of MHC B library (Librarian), 18 years in the MHC B	11-10-2010 10 am in MHC B's library	M	45	Yes
8	K.R	The director of the MHC B's historical and technical archive, in charge temporarily (Librarian), 12 years in the MHC B	14/10/2011 in Dar-Naeb for documents in MHC B at 2 pm	M	45	No
9	A.M	Senior employee (Civil engineer) 20 years in the MHC B	12/9/2010 – 11am in MHC B	M	38	No
10	T.W	Senior employee (technician), 20 years in the MHC B	24/10/2010 –1pm in MHC B	M	46	Yes
11	S.H	Senior employee (technician), 20 years in the MHC B	18/11/2010-11am in MHC B	M	40	No
12	N.R	Senior employee (Civil engineer) 12 years in the MHC B	25/11/2010 -2 pm in MHC B	F	37	No
13	J.L	Previous architectural employee -11 years at the MHC B, and 9 years consultant architect	30-9-2010 at 9 pm at his private office	M	109	Yes
14	A.S	Previous architectural employee -12 years at the MHC B, and 8 years as a consultant architect	7/10/2010 - 9pm at his office	M	78	Yes
15	H.B	Coordinator of national group for protecting Libyan architectural Heritage (NGPLAH), 25 years consultant civil engineer	25-10-2010 – 7 pm at his private office	M	50	Yes
16	T.E	Islamic museum restoration project's supervisor, 20 years as a consultant architect	30/10/2010 – 2 PM restoration site	M	48	No
17	F.F	Previous architectural employee, 15 years in the MHC B, and 5 years as a consultant architect	2/11/2010 – 12pm at her work	F	54	Yes
18	H.T	Archaeologist (civil engineer) 20 years at the archaeology department	3/11/2010 –11am restoration site	M	30	Yes
19	S.A	Previous architectural employee, 10 years at the MHC B, and 12 years as a consultant architect	9/11/2010 – 12pm at her work	F	44	Yes
20	A.E	Faculty staff member, 25 years, Former architectural consultant in the MHC B for 12 years	27/11/2010 - 1 pm at his office	M	48	No