THE CITY UNIVERSITY

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DESIGN OF A COMPUTER INFORMATION SYSTEM FOR THE ALGERIAN NATIONAL ARCHIVES

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We are reaching the stage where the problems we must solve are going to become insoluble without computers. I do not fear computers. I fear the lack of them.

Isaac Asimov

TABLE OF CONTENTS

Table of Contents..... 2
List of Figures..... 9
List of Tables..... 10
Acknowledgements..... 11
Declaration..... 13
Reproduction..... 14
Abstract..... 15
List of Abbreviations..... 16

CHAPTER 1: INTRODUCTION

1.1. Objectives and Outline of the Research..... 18
1.1.1. Objectives of the Research..... 18
1.1.2. Outline of the Research..... 19
1.2. Working Definitions..... 25
1.2.1. Developed Countries Versus Developing Countries..... 26
1.2.2. Information Technology Versus Information.. 27
1.3. Personal Interest in the Research..... 30
1.4. Research Constraints..... 30

PART I: COMPUTERS AND ARCHIVES..... 32

CHAPTER 2: OVERVIEW OF ARCHIVES

2.1. What are Archives..... 35
2.1.1. Archives Versus Records Management..... 36
2.1.2. Archives Versus Manuscripts..... 36
2.1.3. Archives and Records Office..... 37
2.1.4. Definition..... 38
2.2. Nature of Archives..... 40
2.3. Functions of Archival Institutions..... 41
2.3.1. Acquisitions..... 41
2.3.2. Conservation..... 42
2.3.3 Exploitation..... 42
2.4. Technological Implications..... 43
2.4.1. Machine readable Archives..... 44
2.4.1.1. Some Problems..... 45
2.4.1.2. Some Solutions..... 47
2.4.2. Implications on Archival Functions..... 49
2.4.2.1. Acquisitions..... 50
2.4.2.2. Appraisal..... 50
2.4.2.3. Conservation..... 51
2.4.2.4. Exploitation..... 51
2.5. Conclusion..... 52

CHAPTER 3: AUTOMATION

3.1.	Reasons for Automation	54
3.1.1.	Increased Workload	55
3.1.2.	Need for Greater Efficiency	56
3.1.3.	New Services	56
3.1.4.	Co-operation and Centralisation	56
3.2.	Characteristics of Computers	57
3.2.1.	Advantages of Computerisation	57
3.2.1.1.	Speed	57
3.2.1.2.	Storage	58
3.2.1.3.	Accuracy	59
3.2.1.4.	Versatility	59
3.2.1.5.	Automation	59
3.2.1.6.	Diligence	60
3.2.2.	Drawbacks of Computerisation	60
3.2.2.1.	Cost	60
3.2.2.2.	Hardware and Software Obsolescence	61
3.2.2.3.	Transition	61
3.2.2.4.	System's Failure	62
3.2.2.5.	Errors	62
3.2.2.6.	Frauds	63
3.3.	Conclusion	64

CHAPTER 4: COMPUTERISATION OF ARCHIVES: AN OVERVIEW

4.1.	Introduction	66
4.2.	Archivists and the Computer Revolution	67
4.3.	Areas of Computerisation	69
4.3.1.	Administrative Control	69
4.3.1.1.	PROSPEC	70
4.3.1.2.	PROMPT	72
4.3.2.	Intellectual Control	73
4.3.2.1.	SPINDEX	74
4.3.2.1.1.	The Control Number	74
4.3.2.1.2.	Fields	75
4.3.2.1.3.	Permuted Index	76
4.4.	Archives and Networks	77
4.4.1.	The Case Of PROSPEC-SA	79
4.5.	Archival Computer Applications Worldwide	80
4.5.1.	Britain	81
4.5.2.	Canada	82
4.5.3.	France	83
4.5.4.	Soviet Union	83
4.5.5.	United States	84
4.5.6.	Third World Countries	85
4.6.	Commercial Packages for Handling Archives	85
4.6.1.	Applications for Records Management	86
4.6.1.1.	ARMS	86
4.6.1.2.	CAR	87
4.6.1.3.	CMF	88

4.6.2. Applications for Archival Management..... 89
4.6.2.1. ASSASSIN..... 89
4.6.2.2. FAMULUS..... 89
4.6.2.3. GOS..... 90
4.6.2.4. STAIRS..... 91
4.7. Conclusion..... 91

PART II: BACKGROUND AND ANALYSIS 94

CHAPTER 5: SCIENTIFIC AND INFORMATION INFRASTRUCTURE IN THE ARAB WORLD

5.1. Background to the Arab World..... 97
5.1.1. Demographic and Cultural Aspects..... 98
5.1.2. Historical and Political Aspects..... 101
5.1.3. Economic and Social Aspects..... 102
5.2. Constraints to the Transfer of Technology to thee Arab World..... 103
5.2.1. Economic Constraints..... 105
5.2.2. Socio-Political Constraints..... 106
5.2.3. Demographic and Cultural Constraints..... 107
5.2.4. Lack of Qualified Personnel..... 109
5.2.5. Lack of Adequate Information Infrastructure..... 112
5.2.5.1. Lack of Information Resources..... 112
5.2.5.2. Lack of Current Awareness..... 113
5.2.5.3. Science and Technology in the Arab World... 115
5.2.5.3.1. Aspects of Current International Movement for Science and Technology Transfer..... 115
5.2.5.3.2. Weakness of Science and Technology in Arab Countries..... 116
5.2.5.3.3. Brain Drain..... 116
5.2.5.3.4. Research and Development..... 116
5.2.5.3.5. Gap Between Economic Activities and Scientific and Technological Activities.... 117
5.2.5.4. Scientific and Technological Information... 118
5.2.5.5. Telecommunications..... 119
5.2.5.6. Information Technology and Computers..... 121
5.2.5.6.1. Characteristics of Arabic Language..... 122
5.2.5.6.2. Recent Technological Developments..... 126
5.2.5.6.2.1. Hardware..... 128
5.2.5.6.2.2. Software..... 130
5.2.5.6.3. Links to On Line Databases..... 135
5.2.5.7. Information planning and information Policy..... 136
5.3. Conclusions..... 136
5.3.1. The National Level..... 137
5.3.2. The Regional Level..... 138
5.3.3. Relations with More Developed Countries.... 138
5.3.4. The Role of International Organisations.... 139

CHAPTER 6: BACKGROUND TO ALGERIA

6.1. Introduction..... 141
6.1.1. Climate..... 143
6.1.2. Demography..... 144
6.2. History..... 146
6.2.1. Arab Conquest..... 147
6.2.2. Turkish Conquest..... 147
6.2.3. French Colonisation..... 148
6.3. The National Economy..... 149
6.3.1. Agriculture..... 150
6.3.2. Industry..... 151
6.3.3. Planning..... 152
6.3.4. Trade..... 154
6.4. Home Affairs..... 154
6.4.1. Government..... 155
6.4.2. Administration..... 156
6.5. Foreign Policy..... 156
6.5.1. Algeria and the Maghreb..... 157
6.5.2. Algeria and Africa..... 158
6.5.3. Algeria and the Arab World..... 159
6.5.4. Algeria and the Non-Aligned Movement..... 160
6.5.5. Algeria and the Western Bloc..... 160
6.5.6. Algeria and the Eastern Bloc..... 162
6.6. Health..... 163
6.7. Education..... 164
6.7.1. Primary Education..... 166
6.7.2. Secondary Education..... 167
6.7.3. Higher Education..... 167
6.8. State of the Art of the Information Infrastructure and Services in Algeria..... 168
6.8.1. Lack of an Adequate Information Infrastructure..... 169
6.8.2. Lack of Qualified Staff..... 170
6.8.3. National Information Policy..... 176
6.8.4. Computerisation of Information Services.... 180
6.9 Conclusion..... 181

PART III: SYSTEM ANALYSIS & DESIGN 183

CHAPTER 7: THE ALGERIAN NATIONAL ARCHIVES

7.1. Introduction..... 187
7.2. The Algero-French Conflict over Archives... 188
7.2.1. Nature of the Archives Transferred..... 188
7.2.2. Origins of the Conflict..... 189
7.2.3. The Algerian Arguments..... 193
7.2.4. The French Arguments..... 197
7.2.5. Algerian Proposals..... 199
7.2.6. Future Prospect..... 200
7.3. Algerian Archival Legislation..... 202
7.4. Structure of the ANA..... 203
7.4.1. National Archives Direction..... 203
7.4.2. Central Repository of the ANA..... 203

7.4.3. Regional Archives Centres..... 205
7.4.4. General Inspection of the ANA..... 206
7.4.5. Advisory Committee of the ANA..... 206
7.5. Life Cycle of Records within the ANA..... 206
7.5.1. Transfer to a Records Centre..... 208
7.5.2. Transfer to the National Archives..... 214
7.6. Obstacles Facing the ANA..... 214
7.6.1. Shortage of Qualified Personnel..... 215
7.6.2. Lack of Adequate Repositories..... 215
7.6.3. Lack of Financial Resources..... 216
7.6.4. Impracticality of the Archives Legislation..... 216
7.7. Conclusion..... 217

CHAPTER 8: QUESTIONNAIRE ANALYSIS AND RESULTS

8.1. Introduction..... 219
8.2. Methodology..... 222
8.2.1. Mail Questionnaires..... 223
8.2.1.1. Advantages..... 223
8.2.1.2. Disadvantages..... 225
8.2.2. Interviews..... 227
8.2.3. Working on Documents..... 228
8.2.4. Observation..... 228
8.2.5. Own Experience of the ANA..... 229
8.3. Questionnaire Design..... 229
8.4. Questionnaire Overview..... 231
8.5. Questionnaire Results..... 233
8.6. Questionnaire Analysis and Discussion..... 234
8.6.1. Personnel..... 235
8.6.2. Nature of Archival Collections..... 237
8.6.3. Users and Users' Attitudes towards Services..... 241
8.6.4. General Attitude towards Automation..... 243
8.7. Conclusion..... 246

CHAPTER 9: DESIGN OF AN AUTOMATED ARCHIVAL SYSTEM FOR THE ALGERIAN NATIONAL ARCHIVES

9.1. Introduction..... 250
9.2. Need for an Automated System within the ANA..... 251
9.3. Proposal..... 253
9.4. Objectives of the System..... 254
9.4.1. Short and Long Term Objectives..... 254
9.4.1.1. Short terms objectives..... 255
9.4.1.2. Long Term Objectives..... 255
9.5. Outline of the Proposed System..... 256
9.5.1. The Headquarters..... 258
9.5.1.1. Local Archives Centres..... 259
9.5.1.2. Archival Regional Centres..... 259
9.5.1.3. Algerian National Archives Centre..... 263
9.5.2. Need for an Information Structure..... 263

9.5.2.1. Standardisation Steps..... 264
9.5.2.2. Definition of an Information Structure..... 265
9.5.3. Telecommunications..... 268
9.5.4. Manpower of the System..... 268
9.6. Systems Specifications..... 269
9.6.1. Hardware Requirements..... 269
9.6.2.1. Special Requirements..... 271
9.6.2. Software Requirements..... 272
9.6.2.1. Reliability..... 272
9.6.2.2. Testability..... 272
9.6.2.3. Usability..... 273
9.6.2.4. Efficiency..... 275
9.6.2.5. Portability..... 276
9.6.2.6. Maintainability..... 276
9.6.2.7. Access Requirements..... 277
9.6.2.8. Retrieval Requirements..... 277
9.7. Action Plan for Implementation of the Proposed System..... 280
9.8. Conclusion..... 281

CHAPTER 10: DESIGNING AND USING THE PROTOTYPE SYSTEM

10.1. Prototyping..... 283
10.1.1. Major Benefits..... 284
10.1.2. Major Drawbacks..... 284
10.1.3. Steps for Prototype Development..... 285
10.1.4. Methods for Prototype Development..... 287
10.2. What is a Database..... 290
10.3. Database Management Systems (DBMS)..... 290
10.3.1. Types of DBMS..... 292
10.4. Software Selection..... 294
10.4.1. Why dBASE III PLUS?..... 298
10.4.2. dBASE III PLUS Drawbacks..... 299
10.4.3 dBASE III PLUS System Requirements..... 299
10.5. System Development..... 300
10.5.1. Defining the System's Database Structure... 300
10.5.2. Creating the Database..... 303
10.5.3. Indexing the Database..... 303
10.5.4. Programming the Database..... 304
10.5.4.1. Design Criteria..... 304
10.5.4.2. Structure of the System..... 306
10.5.4.3. Compiling the System..... 311
10.6. Using the Prototype System..... 312
10.6.1. Loading the Prototype System..... 313
10.6.2. Overview of the Prototype System..... 314
10.6.2.1. The Menu Bar..... 314
10.6.2.2. The Status Bar..... 315
10.6.2.3. The Action Line..... 316
10.6.2.4. The Message Line..... 316
10.6.3. Updating the Prototype System..... 316
10.6.3.1. Adding Records..... 317
10.6.3.2. Deleting Records..... 320
10.6.3.3. Amending Records..... 321
10.6.4. Querying the Prototype System..... 322

10.6.5. Printing Reports from the Prototype System..... 324
10.6.5.1. Class Lists Report..... 325
10.6.5.2. Department Lists Report..... 326
10.6.5.3. Review Schedule Report..... 327
10.6.5.4. Disposal Notification Report..... 328
10.6.5.5. Records Loan Report..... 329
10.6.5.6. Vacant Locations Report..... 330
10.7. Conclusion..... 331

CHAPTER 11: SYSTEM EVALUATION

11.1. Introduction..... 333
11.2. Testing Prototypes..... 334
11.3. Methodology..... 335
11.4. Results..... 337
11.4.1. ANA's Personnel Views on the Prototype System..... 338
11.4.2. Likely Effects of the Prototype System on the ANA..... 343
11.5. Prototype System Redevelopment..... 345
11.6. Conclusion..... 346

CHAPTER 12: SYSTEM IMPLEMENTATION AND MAINTENANCE

12.1 System Implementation..... 349
12.1.1. Staff Selection and Training..... 351
12.1.2. File Conversion..... 353
12.1.3. System Change-over..... 357
12.1.3.1. Ensuring a Smooth Change-over..... 359
12.2. System Maintenance..... 360
12.3. Conclusion..... 362

CHAPTER 13: CONCLUSIONS AND RECOMMENDATIONS

13.1. Summary and Conclusions..... 365
13.2. Recommendations..... 374
13.3. Recommendations for Further Work..... 376

APPENDICES

Appendix 1..... 377
Appendix 2..... 382
Appendix 3..... 386
Appendix 4..... 388
Appendix 5..... 390
Appendix 6..... 405
Appemdix 7..... 407
Appendix 8..... 409
Appendix 9..... 410

BIBLIOGRAPHY..... 412

LIST OF FIGURES

1.1. Interaction of Information Activities..... 28

5.1. Various Shapes of Arabic Script..... 123

5.2. Various Arabic Calligraphic Styles..... 125

5.3. A Sample Search Conducted on an Arabic File of NSTIC's Database Using the Arabic Version of STAIRS..... 132

6.1. Map of Algeria..... 142

7.1. Structure of the Algerian National Archives..... 204

7.2. Sample of Records Transfer Document Used by the ANA..... 209

7.3. Sample of Records Transfer Document Used by Regional Centres..... 210

7.4. Sample of Notification of Records Disposal..... 213

9.1. Scattering of Archival Regional Centres Throughout the Country..... 261

9.2. Requirements of a User-Friendly System..... 274

10.1. Software Structure of the ANA's Prototype System..... 307

10.2. ANA Entry Form..... 317

12.1. Implementation Stages..... 350

12.2. ANA Data Capture Form..... 355

LIST OF TABLES

5.1. Countries of the Arab World..... 99

5.2. Parameters Affecting the Transfer of Technology to Arab Countries..... 104

5.3. Illiteracy Rate in the Arab World..... 107

5.4. Institutions of Information Studies in the Arab World..... 110

5.5. R & D Expenditure in Selected Arab Countries As a Percentage of the Gross National Product..... 117

5.6. The CODAR-U/FD..... 127

6.1. Population of Algeria by Regional Unit..... 145

6.2. Education in Algeria..... 165

6.3. Scattering of Qualified Staff by Category of Institutions..... 171

6.4. Evolution of the Number of Graduates at the Department of Librarianship & Information Studies (Algiers University)..... 174

6.5. Effects of Computerisation on the Postal Check System in Algeria..... 180

8.1. Scattering of Personnel within Archival Regional Units..... 236

8.2. Types of Documents Preserved within Archival Regional Units..... 238

9.1. Scattering of Staff and Volume of Archives (in linear metres) per Regional Unit..... 260

9.2. Options Available for Acquiring Hardware..... 270

10.1. Comparison of Relational Database Management Systems..... 296

10.2. Structure of the ANA's Database System..... 302

10.3. Summary of the Prototype System Reports..... 325

11.1. Evaluation of the Prototype System: Breakdown of the Participants..... 335

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DECLARATION

No material contained in this Thesis has prevoiusly been used by the Author and responsibility for the study is entirely his.

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ABSTRACT

The main purpose of this project is to investigate the state of the art of the Algerian National Archives (ANA) so as to design an automated system that responds to the needs of this institution.

The concept of archives is defined. The effects of computerisation on archives are investigated. Some automated archives systems, around the world, are examined.

The various obstacles impeding the development of a technology capable of processing Arabic script are reviewed. Some solutions are also discussed.

The case of Algeria in the context of the Arab world is taken as an example. A number of problems hampering the transfer of technology are identified. The study is concentrated on the state of the art of the ANA. It is carried out using a variety of data collection techniques; including questionnaires, interviews, observation and the author's own experience of the ANA. Several problem areas are identified; including: the lack of resource sharing between the various institutions and the access speed to documents, to name just a few. The objectives of the system to be designed and implemented are identified.

A prototype user-friendly system, using the query language, dBASE III PLUS and Clipper, is developed to simulate some of the various tasks carried out within records management institutions. An explanation of how can the system be operated is provided.

An evaluation of the prototype system is carried out. A number of recommendations to improve the system are presented. Amongst these, is the necessity to provide a much faster system. The prototype system is thus redeveloped using, this time, Turbo Pascal. Apart from speed, no alterations or additions are introduced to the one developed using dBASE.

Because the project has not been taken to the last stages of the System Development Life Cycle (SDLC), a number of recommendations are made regarding the steps that the ANA should observe to ensure a smooth system inplementation and maintenance.

LIST OF ABBREVIATIONS AND SYMBOLS

ADP	Automatic Data Processing
ADPA	Automatic Data Processing in Archives
ALGACT	Algerie Actualite
AMARCH	The American Archivist
AN	Archives Nationales
BASIS	Bulletin of the American Society for Information Science
CCAN	Conseil Consultatif des Archives Nationales
CERIST	Centre de Recherche sur l'Information Scientifique
CISTTT	Centre d'Information Scientifique, Technique et de Transfert Technologique
CNEH	Centre National d'Etudes Historiques
DAC	Direction des Archives Communales
DAN	Direction des Archives Nationales
DAW	Direction des Archives de Wilaya
DCAN	Depot Cental des archives Nationales
DP	Data Processing
EDP	Electronic Data Processing
EM	El-Moudjahid
ESABULL	European Space Agency Bulletin
ESRO	East Sussex Record Office
GUA	Glasgow University Archives
ICA	International Council on Archives
IGAN	Inspection Generale des Archives Natonales
JASIS	Journal of the American Society for Information Science
JDOC	Journal of Documentation
JORA	Journal Officiel de la Republique Algerienne
JSA	Journal of the Society of Archivists
NARS	National Archives and Records Service (USA)
PRO	Public Record Office
REVADM	Revue Administrative
RM	Records Management
SAA	Society of american Archivists
SACODO	Systeme Automatique Conversationnel pour la Documenation
SINA	Systeme d'Information Normatif Automatise
UJISLAA	UNESCO Journal for Information Science, Librarianship and Archives Administration

CHAPTER I

INTRODUCTION

As the inheritors of several civilisations, and more particularly of three or four centuries of very intense and rapid growth and expansion of knowledge, we today are confronted with an intricate and constant development of knowledge and live in a world where the discovery and application of new technology has become essential to progress to even higher and better civilisation.

It is a well-known fact that as the total amount of published information grows, the more difficult and the less efficient it becomes for it to be processed manually.

In a study entitled: "the future information needs and resources of Less Developed Countries", Anderla warned that it would be possible for manually-operated information systems to cope with the exponential growth of information for a little while "but after 15 or 20 years the choice will be between automation and suffocation" (1973). This prediction was made seventeen years ago and there is probably some time for its veracity to be tested.

To keep pace with the various technological developments, Algeria is undergoing an intensive period of automation in all sectors including banking and education. Indeed, these institutions have started to introduce complex automated

systems to respond to the needs of modern life where efficiency has become a factor that can no longer be overlooked.

Just like the organisations listed above, in the last few years the Algerian National Archives (ANA) has also been undertaking studies to determine whether it is necessary to automate the existing manual system.

By and large, this project is aimed at describing the state of the art of the ANA, identify the main objectives of the system if it is ever to be automated, and detect possible problem areas. It should be noted that this research was limited to the heads of regional archives in Algeria, and that the bulk of the work was conducted in the period 1985 to 1988. The constraints relating to this delay are further discussed in Section 1.4.

1.1. OBJECTIVES AND OUTLINE OF THE RESEARCH

This section discusses the principal objectives of the research. A brief outline of the whole project is also presented.

1.1.1. Objectives of the Research

In summary, the objectives of this thesis are as follows:

1. Review the literature related to the automation of information systems with an emphasis on archives;

2. Assess the various obstacles especially the technological obstacles facing the Arab World in developing adequate technology for arabic information handling;
3. Discuss the conflict between Algeria and France over the issue of the archives transferred in 1962;
4. Describe the organisation of the Algerian National Archives;
5. Examine the information needs of archivists in Algeria;
6. Present a conceptual design of the system that could eventually meet the needs of the ANA. This design would include software and hardware requirements; and
7. Design a prototype system using Ashton Tate's dBASE III PLUS software package.

1.1.2. Outline of the Research

This thesis consists of three principal parts:

Part I: Computers and Archives;

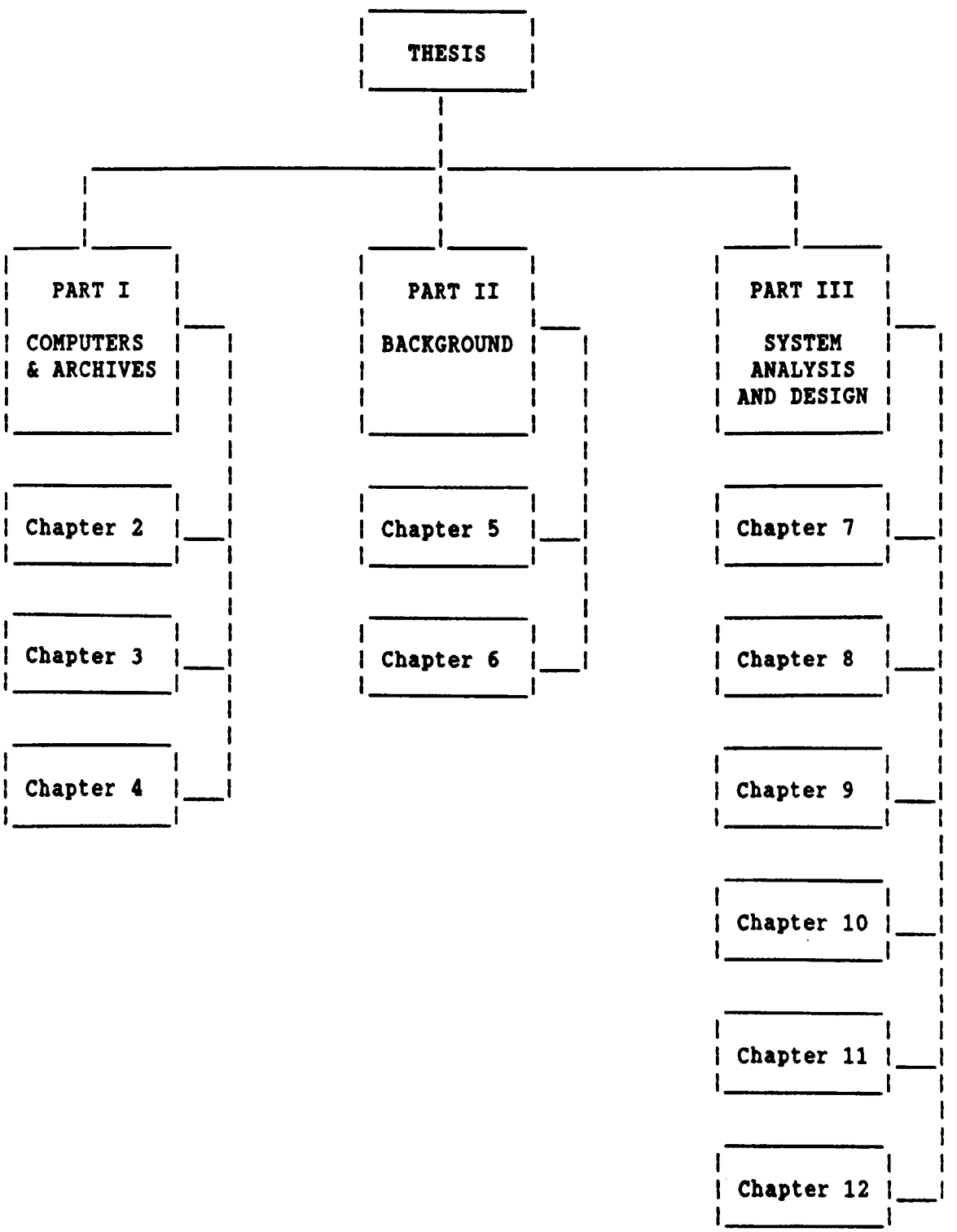
Part II: Background; and

Part III: System Analysis and Design.

These are, in turn, divided into a number of chapters. In total, this project consists of eleven main chapters, in addition to an introduction and a conclusion. Figure 1.1. illustrates the general layout of this research.

Part One of the study examines the world of archives and computers and describes some of the widely used automated archival systems in the world. The following is a breakdown

Figure 1.1. General Breakdown of the Thesis



of the content making up each of the three chapters included in this first part.

The first chapter of part I, Chapter Two, attempts to throw some light on the definition of the concept of archives. Indeed, this seems to be a source of confusion in that the term 'archives' is often used to mean records as when referring to records offices. By the same token, it is sometimes used to mean manuscripts. By comparing and defining all these terms, it is hoped that the confusion surrounding this definition will be overcome.

In addition, the most important archival functions are reviewed with an emphasis on those that are likely to be automated. Furthermore, this chapter investigates some of the problems emanating from records stored on magnetic media. Some solutions are also proposed.

Chapter Three investigates the main drawbacks of automation as well as the reasons that have compelled librarians, archivists and information scientists to automate their respective services.

Chapter Four of this study examines the various areas where archivists have contemplated automation. Some of the systems that have been developed for the purpose of administrative control (PROSPEC) and intellectual control (SPINDEX) are reviewed. The issue of networking from an archival point of view is also discussed. Finally, a brief overview of the

trend of automation of archives around the world will be given.

As mentioned earlier, the second part of this project provides a background introduction to the Arab World with an emphasis on the problems that are faced in as far as Information Technology is concerned. In addition a background to Algeria and the state of the art of computerisation is presented. This second part of the thesis consists of two detailed chapters, namely Chapter Five and Chapter Six.

Thus, Chapter Five aims to provide the potential reader with an introduction to the Arab world. The principal obstacles that hinder the development of a suitable information infrastructure in Arab countries is addressed. In addition to that, Chapter five discusses some major technological advances in so far as the development of appropriate hardware and software for Arabic purposes are concerned. This chapter also presents some recommendations to overcome some of the technological obstacles facing Arab countries.

Chapter Six, on the other hand, will shed some light on the case of Algeria. A brief description of the historical, political, economic, social, and educational background of the country is provided. The various obstacles facing the country are discussed. These include:

1. Shortage of qualified staff;
2. Lack of an adequate information infrastructure; and
3. Lack of a suitable information policy.

The final part of this research is divided into six main chapters. It is mainly to do with the analysis, proposal and design of a prototype system to suit the needs of the Algerian National Archives.

Chapter Seven will look closely at the Algerian National Archives, and its structure and will discuss its legislation and the problems and consequences resulting from the transfer, in 1962, of the Algerian archives to France.

Chapter Eight presents and analyses the results of the study carried out by the author between March and October 1986 to investigate the need of archivists in Algeria. The study is aimed at finding out about the nature of archives held in the various regional archives centres, the problems encountered, the nature of available archives, the kind of users, their attitudes towards the services and automation.

Five different data collection techniques are used. These are:

1. Mail questionnaires;
2. Interviews;
3. Working on documents;
4. Observation; and
5. Own Experience of the ANA.

Emphasis is, however, put on the mail questionnaire for reasons that will be explained in the methodology.

The questionnaire was addressed to 48 archives regional units in addition to the Central Repository of the ANA in March 1986.

Chapter Nine outlines of the objectives and requirements of the computer system that will eventually supersede the manual system. Not only the hardware requirements of this system will be defined but its software requirements as well.

Chapter Ten of this thesis complements the previous chapter by attempting to simulate some of the functions outlined in Chapter Nine. The program was developed using a query language known as dBASE III PLUS. Because the latter does not create an execution file, the application program was then compiled using Clipper.

Chapter Ten also presents the details that are necessary to run the prototype system. These are mainly to do with the following:

1. Loading the system;
2. Overview of the system;
2. Updating the system;
3. Performing various types of queries; and
4. Printing reports.

Chapter Eleven provides the potential reader with a brief summary of the evaluation, of the prototype system, carried out in Algeria between late December 1989 and early January 1990.

Chapter Twelve provides some guidelines to the management of the ANA to ensure a smooth change-over to a computerised system. Implementation will emphasise elements such as:

1. Staff training;
2. File conversion; and
3. System change-over.

Maintenance, on the other hand, will concentrate on the need to have within the ANA a system that can provide adequate maintenance. Indeed, even when the system is designed to perfection, it will always need maintenance to meet future user's requirements.

Finally, Chapter Thirteen concludes the study by summarising the various results attained by this study and attempts to make some recommendations for eventual future work in the area of automation of archives.

1.2. WORKING DEFINITIONS

Because of the controversies surrounding the definitions of some of the concepts used in this thesis, the author believes that it is of paramount importance to define these notions so as to clear any likely misinterpretations.

1.2.1. Developed Countries Versus Developing Countries

Throughout this project, the term developed countries is used in contrast to developing countries. Developed countries refer to the most advanced, industrialised and richest countries of the world.

Conversely, developing countries represent those countries which have not reached the level of the previous category in terms of industrialisation and development. The countries pertaining to this class are usually classified into two principal categories. On the one hand, those countries which have already completed the initial stage of industrialisation. On the other hand, those that are still to begin industrialisation. The second category can also be subdivided into two further sub-groups, namely those that possess very rich natural resources and those that are poor and which depend heavily on agriculture.

Despite some slight differences in meaning, throughout this study the concepts of developing countries, Less Developed Countries (LDCs) and Third World countries will be taken to refer to the same category.

Similarly, the terms Arab World or Arab countries will be used interchangeably. These countries which form an integral part of the developing countries are essentially made of Middle Eastern countries and North African countries. Their official language is Arabic. They include Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon,

Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen North and Yemen South.

In addition to sharing a common language, a common cultural heritage and a common history, these countries also share a common religion; namely Islam.

1.2.2. Information Technology Versus Information

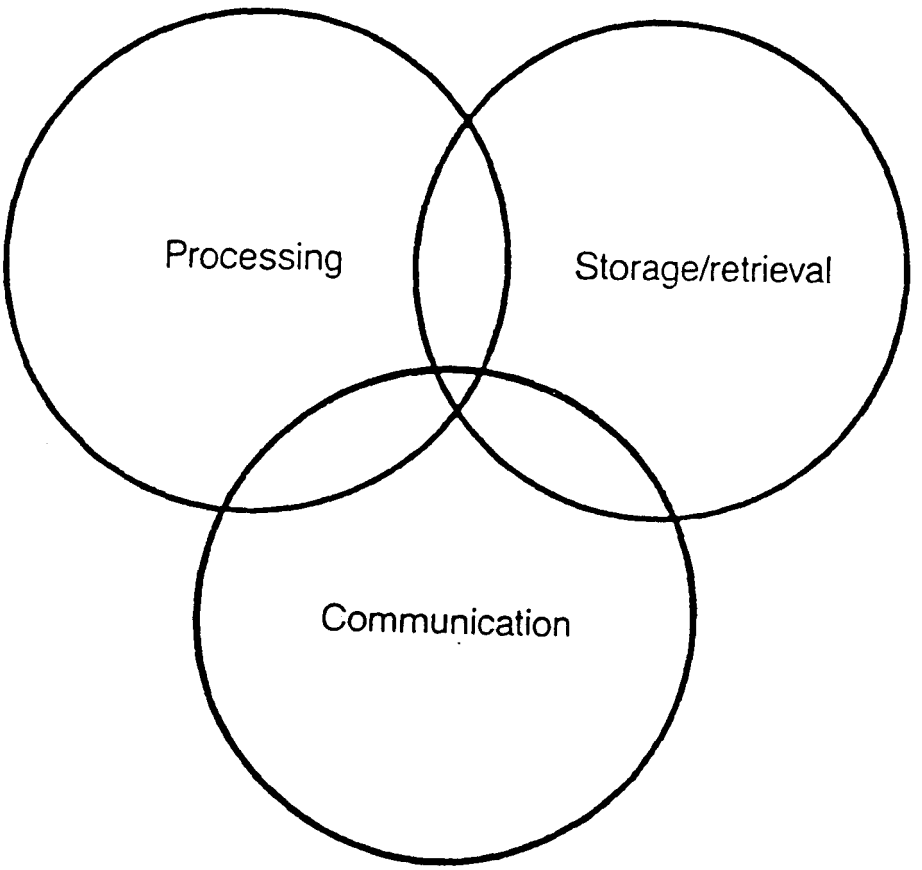
Because of its rather recent origin, no definition of information technology has yet emerged as the universal definition. Several reports and authors have indeed suggested various definitions. Hubbard (1984), for instance, defines IT as consisting of:

> "Information handling -the storage and retrieval of information; communications technology- the transmission of information; information transformation - the manipulation of information; putting into a form in which it is usable for a particular purpose".

Zorkoczy (1985) states that IT had "its origins in the technologies related to a restricted view of information: the generation, processing and distribution of representations of information". Figure 1.1. illustrates this interaction in graphical form.

It stems from the above definitions that in one way or another IT is the result of the combination of three main functions, namely storage and retrieval, communication

Figure 1.1. Interaction of Information Activities



and processing. In fact Gillman, (1984) also emphasises that an acceptable definition of IT is the one that encompasses the acquisition, storage, processing, retrieval and display of information by electronic means.

Since IT is concerned with manipulation of information, it is desirable, if not necessary, to present a definition of the term "information". One should, however, point out that If the definition of IT seems to present no problem since most authors agree on its specific meaning, that of information is a highly debatable issue. Indeed, all the definitions that have been proposed relate to the background of the authors in question.

Davis (1974), for example, relates information to the field of information systems and accordingly defines it as the: "data that has been processed into a form that is meaningful to a recipient and is of real or perceived value in current or prospective decisions".

Keren (1977), on the other hand, views the term information from another point of view and defines it as follows:

> "Information (scientific, technological, other) is the knowledge in any form it can be transferred, in other words information can assume any format or mode. As long as the basic requirement that a message is passed through an identifiable channel is fulfilled, the use of the term is justified".

1.3. PERSONAL INTEREST IN THE RESEARCH

The author's interest in this research originated from his experience as a part-time staff at the Algiers archive regional centre in 1980-1981 and then as a full-time research assistant at the National archives between September 1981 and September 1982. The latter position involved teaching, training and supervising students taking the B.Sc. degree in librarianship and information studies at Algiers University.

As a result of this short but useful experience, the author was able to observe the poor state of archives. Despite the fact that the archives centres that existed at that moment had very important archives, these remained poorly stocked and organised because of the lack of qualified personnel.

1.4. RESEARCH CONSTRAINTS

The project began officially in October 1985. The first four months were spent reading appropriate material in the area in order to get acquainted with the topic of research. Then a questionnaire was designed in order to gather information necessary to undertake the project. The questionnaire was sent to the various archives centres in Algeria (ie 48 centres in addition to the Central Repository of the Algerian National Archives (ANA).

The rest of the period was spent analysing the questionnaire, developing a package for records management using Ashton Tate's dBASE III PLUS software and finally writing up the thesis.

One of the major obstacles encountered when carrying out this study relates to the lack of co-operation of the various algerian archival institutions making up the ANA. Indeed, despite the fact that a letter explaining the objectives of the project was sent together with the questionnaire and a letter from the Ministry of Higher Education in Algeria authorising the author to conduct such a research, only 24% (that is 12 out 49) archive centres effectively responded to the study after the third attempt.

It should be noted that this low response rate is due to the fact that, as will be seen later, most of the archival institutions included in this study have been created quite recently.

In addition to this is the fact that the author's sponshorship from the Ministry of Higher Education in Algeria lasted only for two years because of falling oil prices. This has made it impossible for the author to carry out the study within the scheduled time.

PART I

PART I

ARCHIVES AND COMPUTERS

The recent technological developments in data processing and telecommunications have greatly enhanced timely access to information. Because, it has become almost impossible for many librarians and archivists to do without this technology, the latter have been forced to join with computer professionals to carry out their duties more efficiently. Hence, the main objective of this part of the project: study the likely effects of computerisation on archives.

Basically, Part One consists of three main chapters:

Chapter Two is devoted to the subject of "archives". Its aim is to discuss the controversies surrounding the concept of archives, describe the functions assigned to archives offices and assess the implications resulting from the introduction of new computer technologies. A case in point is indeed the use and effects of machine readable media on archive offices.

Just like Chapter Two, Chapter Three will focus entirely on the theme of computerisation. We shall consider the main advantages and disadvantages evolving from the introduction of computers.

The last chapter in this part, Chapter Four, is in fact a combination of the previous two chapters in that it proposes to emphasise the introduction of computers in archives; particularly the use of networks. We shall try to highlight some of the reasons compelling archivists and records managers to automate their services, describe some of the famous systems developed for administrative and intellectual control of archives. Finally, we shall look closely into the state of the art of archival automation around the world.

CHAPTER II

OVERVIEW OF ARCHIVES

It cannot be denied that History as it is understood nowadays relies solely on archives. Indeed, new varieties, such as Personal Narrative and Political History, and so on have been added to it. However, no authoritative historical work can be published without relying on verifiable manuscript sources (Jenkinson, 1966).

If this fact is accepted, then one can easily understand why the preservation of the archives of the past and the making of those of the future are of paramount importance in the eyes of potential users.

This chapter is mainly concerned with the definition of the term "archives", the controversies surrounding it, the principal functions of archives offices and the technological implication on these very same functions. Moreover, this chapter will also examine the various problems caused by the introduction of machine readable media in the archive environment. A number of solutions to these problems will also be discussed.

It must be stressed, however, that no attempt will be made to provide an in-depth study of archives, their nature, appraisal standards, disposition and conservation practices, principles of arrangement and description practices (i.e.

finding aids). Readers interested in these theoretical aspects of archives are kindly referred to well-known books by famous authors in this field, including: Cook (1977), Jenkinson (1966) and Schellenberg (1964).

2.1. WHAT ARE ARCHIVES?

According to Schellenberg (1964) Archival institutions had their origins in the times of the ancient Greek civilisation. Indeed, Athenians used to keep their valuable documents in the temple of the mother of the Gods in the public square in Athens. The temple in question housed treaties, laws, minutes of the popular assemblies and other important documents. These included writings of popular Greek philosophers such as Socrates.

Although the origins of archives goes as far back as the ancient Greeks, there has always been too much confusion about the meanings of the concepts of archives, archives offices, records management and manuscripts. Indeed, the boundaries between these concepts are not clearly defined. As a result, it is found that people tend to use them interchangeably. In the following, a definition of each of these terms is presented in an attempt to overcome such confusion. To this end, the distinctions made by Cook (1977) are listed below.

2.1.1. Archives Versus Records Management

In English, the difference between records management and archives is not very clear. Indeed, records refer to paper (and other media of recorded information) which are drawn in the course of business by any continuing organisation, are kept for reference, and are in use in conducting that business. Archives, on the other hand, constitute a specialised category of records in that they represent those that have passed the stage of currency and which have been kept after being appraised and selected in order to exploit their use in research, or perhaps have been kept because they are believed to have valuable importance in research.

It can be said in summary that records management and archival administration are functionally, if not intellectually, related. While records management is concerned with the life cycle of documents from their creation to their final disposal, archive administration strives to preserve and provide access to those documents that are deemed to possess long-term informational or research value.

2.1.2. Archives Versus Manuscripts

Similarly, archives are often confused with manuscripts. It can be said that anything that is handwritten, or by extrapolation typewritten is a manuscript. However, because of the type of information that it contains or the

historical value that it might have, this document might be kept in a library or an archive office. Another characteristic of manuscripts is that they are individual documents, or more or less arbitrary collections of documents, which are of interest for research, but which do not have the the essential feature of archives or records.

Stated another way, unlike archives or records, manuscripts are not associated with the conduct of some kind of business. It follows that manuscripts can be held in an archive office, a library, or even in an interested person's home for the benefit of research. Conversely, archives can only be kept by the institution that brought them into existence.

2.1.3. Archives and Records Office

Another confusion with which one is faced daily, especially in French speaking countries, is the distinction between archives (ie. the records or documents) and the archives (ie the building which stores the records).

To overcome this confusion, throughout this project, the term archives will refer to documents that are associated with the conduct of business and which have been kept because of their research and historical potential. On the other hand, the term records office will refer to the building or repository that stores these records.

2.1.4. Definition

Several definitions of the term archives have been stated. Perhaps, the most comprehensive definition available is that of Jenkinson (1966) who defines a document that belongs to the class of archives as a document that:

> "was drawn up or used in the course of an administrative or executive transaction (whether public or private) of which itself formed a part; and subsequently preserved in their own custody for their own information by the person or persons responsible for that transaction and their legitimate successors".

From the above definition, two common characteristics pertaining to any type of archival document can be distinguished: impartiality, on the one hand, and authenticity, on the other.

Impartiality because archives are consulted by users solely for the light they shed on the history of a particular matter at a specific time. Thus, provided that the user properly understands their administrative significance, he/she can learn nothing, but the truth on the subject he/she is trying to investigate (Jenkinson, 1966).

Authenticity because archives can only be preserved in official custody for official information only. Provided that the documents in question have not been forged or tampered with, archives are considered to be entirely free of any kind of suspicion or prejudice.

It must be stressed, however, that forgery or falsification of documents should be regarded as being exceptional amongst archives, although live examples of situations do exist. As pointed out by Jenkinson (1966), this can only be possible in cases where:

a) Custody has been violated though the fact is unknown; and
b) Archives are not the production of a single body, but is made by one person or body and preserved by another.

If the above definition and characteristics of archives point out to anything, they should highlight the tremendous burden and duties of archivists to serve the future generations to the best of their abilities. Thus, the archivist should be concerned with the quality of documents he receives from a government office. He should also strive to preserve the integrity of the records he acquires (Schellenger, 1964), namely:

a) That the records of a given agency should be kept together as records of that specific agency;
b) That these records should be kept, as far as possible, under the arrangement that was initially given to them in the agency where they were produced; and
c) That the records are kept in their entirety, without mutilation, alteration or unauthorised destruction of parts of them.

2.2. Nature of Archives

As with the definition of archives, the nature of archives is also subject to controversy. According to Schellenberg (1964), archivists of different countries tend to define the nature of archives in a way that is applicable to the documents they are concerned with. It seems therefore impossible to arrive at a definition that is universally acceptable to all archivists. He believes that archives should include:

> "All books, paper, maps, photographs, or other documentary materials, regardless of physical form or characteristics, made or received by any public or private institution in pursuance of its legal obligations or in connection with the transaction of its proper business and preserved or appropriate for preservation by that institution or its legitimate successor as evidence of its functions, policies, decisions, procedures, operations, or other activities or because of the informational value of the data contained therein".

Schellenberg's definition of the nature of archives shall be used for the purpose of our research as it complies with that of the Algerian National Archives as defined in its decree promulgated in March 1977. As such all types of documents that have been mentioned in the above definition; including plans, maps photographs, microfilms, and so forth shall all be considered as pertaining to the category of archival documents.

2.3. FUNCTIONS OF ARCHIVAL INSTITUTIONS

To preserve their historical and research significance, it is of paramount importance for archival documents to be arranged and kept in the way they have originally been produced.

Unlike, libraries and museums where books and manuscripts are classified as completely independent and distinct units; in archives offices, records are kept and classified according to what is known as the "principle of provenance", that is in accordance to the administration that has originally produced them.

Basically, the objectives of an archives office can be categorised into three main classes (Cook, 1977):

1. Acquisition;
2. Conservation; and
3. Exploitation.

2.3.1. Acquisitions

There would be need to acquire all important material that is to be found within the records of the institution. This implies that the office will:

1. Seek to uncover the contents of the records of the employing institution;
2. Devise efficient systems of selection and appraisal to the records in questions; and

3. Assume responsibility for all records that are deemed to be worthy of treatment as archives.

The last element constitutes the corner-stone of an ideal archival institution as it will enable eventually the use of records in future research.

2.3.2. Conservation

This objective entails the physical preservation of acquired documents from physical deterioration. This is another professional duty of every archivist. Indeed, the method he or she might use to locate the documents, the place they are allotted and the method of description that is actually used will undoubtedly have an effect on their original purpose and their importance within the originating administration (Cook, 1977).

2.3.3. Exploitation

If the documents that have been acquired have been properly stored, they should become available for reference and research when the retention period has elapsed. It must be made clear that this objective might be very remote since some documents can only be used after very long periods. Hence the need for adequate repositories.

2.4. TECHNOLOGICAL IMPLICATIONS

Computers have become an integral part of our society. The rapid development of computer technology in this area is producing more efficient and economical computing power. With the need to conserve energy and increase productivity, computers can only play an even more prominent role in the future.

As computers continue to be applied to information collection, transmission and storage, there will be a considerable increase in the production of computer readable material. For this reason, it is of the utmost importance for archivists to become acquainted with this technology in order to preserve their archives. Indeed, the last few decades have witnessed a major explosion in the use of computer technology, particularly word processing which has won wider acceptance, as a means of producing office letters, reports and memoranda. Thus more and more of the documents that used to arrive to the archive office in the form of boxes will arrive in machine readable media such as disks and tapes. Already many government departments in developed countries such as USA, Great Britain, France and Germany produce some of their documents using these types of media without accompanying them with a hard copy.

Although the utilisation of such media does not imply a radical change in the way that archives are traditionally treated, changes to handle the new machine readable media

are, however, a necessity. In the following, the author purposes to address the issue of machine readable archives by discussing some of the problems that arise from their use as well as some solutions. Next, the main implications that this technology will have on archival functions will also be examined. Special emphasis is put on three major functions, namely:

1. Acquisitions;
2. Appraisal;
3. Conservation; and
4. Exploitation.

2.4.1. Machine Readable Archives

A principle acceptable to all information professionals is that documentary material should be archived for use by later generations whose requirements and needs cannot always be predicted. So far, all that has been published in paper form, even when a machine readable version of it is also available, has been kept ensuring a more or less permanent record for archival purposes. With more material stored in only machine readable form on reusable media, the question of integrity becomes more acute.

The world, particularly the developed countries, are moving towards what is usually referred to as the "paperless office" which has profound implications for many institutions including not only writers and publishers, but

also libraries, information services and consumers of information.

If the introduction of such systems has been very rewarding for the society as a whole in that it has been the key element to the provision of better services at all levels, it has, on the other hand, had some negative effects on the profession of archivists.

2.4.1.1. Some Problems

The use of computers and the reliance on machine readable records has grown in the last decade at a staggering rate. Despite the numerous benefits that evolved from the computer revolution, this trend has, however, led to some problems as far as archivists are concerned. Of these problems, the most important ones can be summarised as follows:

1. Erasure of older versions of records once a new generation of updated records has been created. Thus, short term research and may be long term research value is lost forever;
2. Obsolescence of electronic Data Processing hardware;
3. Changes in magnetic storage technology;
4. Ease with which EDP storage media can be erased and reused;
5. Cost of EDP storage media; and

6. Costs of storing and processing magnetic tapes since they require (Cook, 1980; and Kesner 1984):

   a) A steady temperature;

   b) A steady humidity; and

   c) A dust free environment.

The factors listed above show that there are valid economic reasons for prompt disposal of machine readable records. British Telecom, for instance, made it clear that it will not accept responsibility for archiving the material appearing in Prestel. What is more, magnetic tapes do not have the permanency of the printed page. Therefore, yesterday's information might have already been lost.

Since the cost of maintaining machine readable records is too high, it is no surprise that the well-established programs to date are those available in Canada, Great Britain and the United States.

Conversely, it is logical that profit-based organisations would neglect an area that is both very expensive and unremunerative in the short term. Above all, few of these organisations are compelled to provide public access to their machine readable records. Moreover, they also know that only a small residue of records will possess sufficient value to justify the cost of long term preservation.

However, one hopes that the widespread of machine readable records and their ever increasing importance will soon dictate a change in policy.

2.4.1.2. Some Solutions

To prevent the disposal of machine readable records, archivists must become involved in the generation of machine readable information. In order to overcome these difficulties, records managers as well as archivists should keep abreast of new developments in automatic data processing in order to fully assume their responsibilities and respond as a result to users needs.

The records manager is concerned with current and non-current documents whereas the archivist focuses his attention on documents of long term research value.

While the processing of traditional paper records raises a considerable number of questions for the archivist, the administration of machine readable files necessitates even greater attention (Kesner, 1982, 1983 and 1984):

1. By definition, magnetic records require machine assistance;
2. The user should possess appropriate software tools to access electronically stored information; and
3. Even with the availability of suitable computer equipment, operating systems and application packages to read the stored data from the tape, it

would still be difficult to process it if there is no code for translating the stored magnetic information into humanly recognisable characters.

Therefore, if the machine readable records are to be preserved, one should have proper storage and retrieval facilities.

An appraisal process based firmly on the completeness of machine readable records documentation and the physical quantity of the medium is an essential element in the successful resolution of the task. For a good preservation program, fluctuation in temperature, humidity and exposure to electromagnetic radiation should be avoided.

With the development of EDP equipment, the records office sooner or later will find that its magnetic media will no longer run on any EDP equipment available. To overcome this problem of outdated techniques, archives administrations have two options, that is standardisation of storage media and reformatting of tapes. It is therefore necessary for the archives office to impose a standard on all machine readable files. A tape specification form will provide the archives with all pertinent information in order to ease the task of archivists (Cook, 1981 and 1983; and Kesner, 1982, 1983 and 1984).

With the data on the tape specification form, archivists will have all the required information to reformat the tape or convert it for use within their institution. Indeed, when

a tape does not conform to the established standard, the archives will have the option of converting it since this technology is now widely available.

Therefore, with standardisation of archives storage media and the reformatting techniques, archivists should be able to overcome the difficulties rising from technological changes. The only way to make sure that EDP obsolescence does not overtake the holdings in machine readable files is to keep abreast of new technological developments (Kesner, 1984).

Central governments, for instance, have been forced to look seriously at this issue because so many important records are now stored in machine readable records. Failing to take necessary action would be an irretrievable mistake as it would indeed result in the nation's memory being destroyed for ever.

2.4.2. Implications on Archival Functions

Having explored the problems resulting from the use of information technology, especially machine readable media, and the various solutions available, let us now look at the impact of such technologies on archival functions.

2.4.2.1. Acquisitions

It has already been stated that with the widespread use of computers in offices, it is expected that archival offices will unceasingly receive documents in the form of tapes or disks rather than paper. To preserve the historical patrimony of the nation, archivists will have to act quickly and work jointly with offices.

Indeed, given the fact that a recording medium like a tape has the characteristic of being able to be erased and re-used, offices will see this as a means of saving money and therefore disregard the long-term benefit of safeguarding the records for the generations to come. It is therefore imperative for archivists to work with their respective administrations as they establish record retention priorities (Cook, 1981; and Kesner, 1983 and 1984).

One significant advantage that will result from the use of machine readable media for archival purposes is, however, the possibility of transferring archival documents through telephone lines between two remote places.

2.4.2.2. Appraisal

Despite the fact that there is another important advantage in using machine readable media to store archival documents in that they represent a great reduction in the bulk problem, there will be need for appraising them in the usual way. This task which characterises the archival work

from the library's work will in fact become even more difficult and delicate to achieve because of the nature of media on which these documents will be stored.

2.4.2.3. Conservation

One significant advantage of preserving archives in machine readable form is undoubtedly the little space they will require in comparison to archives in paper form.

The factor that would, however, make the conservation of archives in machine readable form prohibitive is undoubtedly cost. Indeed, these types of media require a steady temperature and humidity as well as a dust free environment.

2.4.2.4. Exploitation

Users will no longer have to go through very lengthy catalogues or finding aids to locate the records they are looking for. Instead, this will be achieved through the use of an online system which will provide them with an instantaneous answer.

Hopefully, the various terminals will be linked to the various store rooms and as soon as a document is requested, it is put at the disposition of the user so long as it is available for consultation.

2.5. CONCLUSION

This chapter was concerned with the definition of archives, the nature of archives, the principal functions of an archive office as well as the implication of information technology on this very same functions. The definition of the term archives stressed the fundamental characteristics of archival documents in that no record could be considered as pertaining to the category of archives if the conditions of 'impartiality' and/or 'authenticity' are not satisfied.

Finally the basic functions of manual archival institutions were described. Light was shed on the impact of information technology on these functions. Emphasis was put on the problems evolving from the advent of machine readable archives. Appropriate solutions to thwart these problems were also discussed.

CHAPTER III

AUTOMATION

One of the most significant themes in the history of civilisation is our increasing use of tools to shape and control the world surrounding us. Until recently, most of the tools invented by man have served to extend the powers of our bodies rather than those of our minds.

No doubt that one of the mind tools that man has invented is the computer. The idea of an automatic computing machine can be traced back to mid-nineteenth century. But it was only in the 1940s, when electronics was applied to the task of automatic computing, that fast, reliable computers became possible (Silver & Silver, 1986; and Sanders, 1981).

The first computers were used solely for mathematical calculations. In the 1950s, however, businesses, government bureau, and universities started to use computers to process data such as orders, invoices and personnel records. Since then, the use of computers has continued to expand at a staggering rate, but remained large in size and more importantly expensive. So, only large organisations were able to afford them.

As a result of recent developments in the area of microelectronics, the computer has become the sort of tool that could be afforded not only by small institutions, but

also by individuals at home. This breakthrough was made possible by the ability to build complex electronic circuits on tiny silicon chips, which could be manufactured in large quantities at very low cost (Silver & Silver, 1986).

Computer chips have made possible compact, low-cost microcomputers or personal computers. The use of computer chips has not been restricted to computers only, but has further been extended to tools, such as washing machines, microwave ovens, television sets, and so forth.

The enormous changes in the use of computers made possible by microelectronics is widely known as the 'microelectronics revolution' or the 'information technology revolution'. In what follows, the author will try to review the reasons that have urged archivists, information scientists, librarians, and indeed other businesses and organisations to consider automation. The main advantages and disadvantages of introducing computers will also be discussed.

3.1. REASONS FOR AUTOMATION

In an ideal world, the obvious reason for computerising an information system is the result of an observation that the existing system is performing with decreasing efficiency while the volume of the library increases steadily. This would lead to delays, backlogs, errors, staff dissatisfaction and a high rate of staff turnover.

Meanwhile, users of the system would be suffering through the failure of the system to provide them with the needed material on time.

Thus, once a feasibility study has been carried out, one of the decisions that could have been opted for would be to introduce a computer system to improve the current situation of the manual system.

However, this is not an ideal world. Furthermore, archives, information centres and libraries are not identical. Indeed, it is possible to identify further reasons that might prompt the switch towards an automated information system. In what follows, the author will attempt to contain some of the reasons that have, in the past, encouraged archivists, librarians and information scientists to consider automation. These reasons can be fitted into one of the following categories:

3.1.1. Increased Workload

Such an increase can be the result of several different factors (Tedd, 1984; Rowley, 1980; and Kimber, 1974):

- Overall increase of the library or archives stock;
- Need to cover a wider subject area; and
- Need to provide a larger number of users with an adequate service.

3.1.2. Need for Greater Efficiency

Computerisation can also result in a great saving in terms of staff, time and/or money. Moreover, the records held in a computer may be more accurate, and more accessible than their manual counterparts. As a consequence of automation, work flow can become more rapid and systematic.

3.1.3. New Services

Automation of information systems is also seen as means to provide the users with new services at little extra costs. Indeed, once all of the data has been stored in the computer, it is easy to re-arrange or select records to offer special listings such as union serial lists, current awareness service, finding aids and statistics for decision making.

3.1.4. Co-operation and Centralisation

The existence of another system which has made a success of an automation programme is sufficient to attract the interest of other information systems managers. But the advantages of automation can be far more reaching. One major benefit is indeed centralisation which gives the opportunity to share records and some of the burdens of planning, designing and cost of adequate system provided that the interests of the various parties in the co-operative do not conflict with each other. Shared software should be considerably cheaper with possibly greater sophistication

than an independently developed system. Stated another way, centralisation or co-operation may be the cheapest alternative to automation (Tedd, 1984; & Rowley, 1980).

3.2. CHARACTERISTICS OF COMPUTERS

Having explored the main incentives for automation amongst library professionals, information scientists and archivists, this section will discuss some of the benefits as well as some of the drawbacks that can result from implementing a computer system in any organisation.

3.2.1. Advantages of Computerisation

First of all, let us examine the main benefits that could evolve from opting for a computer system.

3.2.1.1. Speed

One of the most important characteristics of computers is undoubtedly the speed of processing. Indeed, the computer was originally invented as a high-speed calculator. This has enabled the materialisation of several scientific projects which in the past were virtually impossible to accomplish. Amongst these, one can list the control of moon landing, weather forecast, flight reservations, and so forth (Sanders, 1981).

Electrical pulses travel at incredible speeds and because the computer is electronic its internal speed is practically instantaneous. Thus the ability to get answers fast enough so that one can take action on them (or to make alternative plans as in the case of airline reservations) makes real-time computing a reality.

3.2.1.2. Storage

The speed with which computers can process large quantities of information has led to the generation of new information on a large scale, in other words, the computer has compounded the information explosion.

As a human acquires new knowledge, the brain subconsciously selects what it feels to be important and retains it in its memory and relegates less important details to the back of the mind or just forgets them.

Similarly, the internal memory of the CPU is only large enough to retain a certain amount of information. However, unlike human beings, computers have secondary or auxiliary storage devices where data can be kept for eventual uses. Thus small sections of the data can be accessed very quickly by the CPU and brought into the main internal memory when required for processing.

3.2.1.3. Accuracy

Computers' accuracy is consistently high. Errors in machinery can occur, but due to increased efficiency in error detecting techniques, these seldom lead to false results. Almost, without exception, the errors in computing are the result of humans rather than technological weaknesses that is, the results of imprecise thinking by the programmer, inaccurate data or poorly designed systems (Silver & Silver, 1986).

3.2.1.4. Versatility

Computers seem capable of performing almost any task, provided that the task can be reduced to a series of logical steps. For instance, a task such as preparing a payroll can be broken down into a logical sequence of operations.

3.2.1.5. Automation

A computer is much more than a simple adding machine, calculator or check-out till, all of which require human operators to press necessary keys for the functions to be performed. Indeed, once a program has been stored in the computer's memory, the individual instructions are then transferred, one after the other, to the control unit for execution. The CPU follows these instructions until it meets an end statement. In fact, when Babbage claimed that his analytical engine would be automatic, he meant that once the

process had started, it would continue without human intervention until completion (Burns, 1984).

3.2.1.6. Diligence

The computer is also diligent and reliable. Because it is a machine, it does not suffer from human traits of tiredness and lack of concentration. Indeed, as soon as a program has begun execution, operation is automatic, and no further human intervention will be needed. if, for example, three million calculations have to be performed, it will perform the last operation with exactly the same accuracy and speed as the first one. This is may be the reason why people whose jobs are highly repetitive consider computers as a potential threat.

3.2.2. Drawbacks of Computerisation

As well as being fast, versatile, flexible, diligent and reliable, and accurate, the computer also carries with it numerous drawbacks.

3.2.2.1. Cost

Of these, cost is certainly the most important factor in deciding whether to introduce a computer within an organisation. Indeed, the costs of purchasing a computer are very high. In addition to that are the costs of the staff which also have to be met. It follows that before a computer

is purchased, it is imperative that a careful and in-depth study of the system to be acquired be undertaken.

3.2.2.2. Hardware and Software Obsolescence

Another problem that faces our modern society is the fact that our age is the age of technology where computer technology especially is moving at a very fast pace. Accordingly, there is always a risk of losing money as the hardware and/or software that is acquired might become obsolete after a very short period of time.

3.2.2.3. Transition

Whenever a computer system is introduced in a given institution, disruption is expected to follow. Indeed, in order to fit in with the new system, new methods of work will have to be adopted. This problem is aggravated by the fact that it will be several years before the computerised tasks are taken on by the staff since a computer system can never be fully designed developed, tested and implemented over a short period of time. During this transition period, the management should expect all kinds of problems (job being reduced to repetitive tasks, loss of decision-making responsibilities, fear of redundancy, etc...) (Licker, 1987).

3.2.2.4. System's Failure

Once an organisation invests heavily in computing facilities, it automatically becomes vulnerable to a failure in hardware and/or software. So whenever this situation arises, it will be impossible to revert to the manual system as this will have been discontinued. It is therefore wise for such institutions to make standby arrangements to meet and overcome these eventualities (Shooman, 1983).

3.2.2.5. Errors

No matter how careful the work of the systems analyst and programmers, who designed, developed, tested, and implemented the system might be, there is always a possibility of errors. When such errors creep into an automated system, they often prove very difficult to detect. Similar errors can also be made by the data processing staff when running the system. For safety reasons, it is therefore absolutely necessary to keep duplicate copies of master files at remote locations.

Unlike manual systems where minor, and even complex, changes to the system of work can be quickly and cheaply dealt with, an automated system becomes inflexible once it has been fully implemented. It follows that even small alterations will need to be specified, programmed, developed, tested, documented and implemented (Licker, 1987; and Shooman, 1983).

3.2.2.6. Frauds

New technologies present new opportunities for criminals, and computing is no exception. With most financial statements being stored on computers, criminals can steal large sums of money with a few taps on a computer keyboard and transfer it into different accounts. So, computer enthusiasts (hackers as they are referred to) have disgraced their hobby by making illegal use of computer systems belonging to other people, sometimes destroying vital data or obtaining confidential information in the process.

Unauthorised access has become much more common since the microcomputers and modems needed to commit these crimes have become widely available. Most unauthorised accesses are the result of poor security system rather than that of the cleverness of the perpetrators (Sanders, 1981).

Added to the above crimes and frauds is the illegal copying of software programs by computer users. The latter have demonstrated that they will make unauthorised copies of software if not somehow prevented from doing so. Unauthorised copying is particularly prevalent in coprporations, schools, and computer clubs. Yet most current copy protection techniques present serious risks for honest users.

It is therefore recommended that considerable caution be exercised when designing a new automated system or when introducing it within an organisation. When buying ready

made systems, it is also imperative that a careful study be carried out to detect any system's shortcomings.

3.3. CONCLUSION

Computers are now used in so many areas ranging from science, engineering, and industry to the office and the home. Indeed, it is almost impossible to think of an area where computers have had no application. As a result, the computerphobia (irrational fear of computers) that used to prevail when computers started to invade offices in the beginning of 1970s is vanishing gradually.

This chapter was concerned with the main reasons that have, in the past, stimulated the introduction of computer systems amongst archivists, information scientists and librarians. Some of these included the following:

1. Increased workload;
2. Need for greater efficiency;
3. Introduction of new services; and
4. Co-operation and centralisation.

Then, the author went to consider the main advantages and disadvantages evolving from the introduction of computers. The advantages included: speed, storage capacity, diligence, versatility, and so on. The shortcomings, on the other hand, included: cost, possibility of fraud and errors,

problems arising from system's failure, hardware and software obsolescence, etc.

In line with what was discussed in this chapter, Chapter Four will look more closely at automation. Special emphasis will be put on the archives environment. Indeed, not only the reasons compelling archivists and records managers to automate will be examined, but also some of the famous systems developed for administrative and intellectual control of archives will be described. In addition, the state of the art of archival automation around the world will be reviewed.

CHAPTER IV

COMPUTERISATION OF ARCHIVES: AN OVERVIEW

4.1. INTRODUCTION

As our modern technological society grows more complex and sophisticated, the control and efficient management of it becomes a significantly human activity. Traditionally, archivists, and records managers have contributed to information services within their sphere of activity. The emerging technological revolution, however, has drastically altered the context within which these professionals operate.

Chief amongst these drastic changes is the type of documents with which archivists are to deal. Until the beginning of the 1960s, archivists and records managers used to deal mainly with documents in paper form. In the new technological era, they are more likely to acquire, and appraise documents stored in magnetic forms.

Distributed computing, on line bibliographic data bases and automated library services have created a generation of experienced, knowledgeable, and extremely demanding users. Because this new generation of users has become accustomed to the timely and accurate responses of these systems, it is no surprise to note a concomitant rise in their expectation

when they relate to archives and records management institutions. These expectations will become even stronger with the future advances in microelectronics and software engineering which will further modify the more traditional approaches to information handling.

In this chapter, the author will examine the areas that archivists have attempted to automate. We shall look more specifically to some of the systems that have been developed for the purpose of administrative control (PROSPEC) and intellectual control (SPINDEX). Then, the issue of networking from an archival point of view will be explored. Thereafter, a description of the various systems that have been developed to handle both records management and archival management will be reviewed. Finally, a brief overview of the trend of automation of archives around the world will be given.

It should be noted that a great deal of the material included in this chapter is based on studies by Cook (1977, 1979, and 1981) as well as a report by Cook and Bartle (1983).

4.2. ARCHIVISTS AND THE COMPUTER REVOLUTION

Archivists have been relatively much slower than other information professionals in introducing new technology in their services. In fact, it is only in the late 1960s and beginning of 1970s that serious experiments started seeing

the light of the day. Amongst the reasons which prevented archivist from getting involved in computer technology are:

1. Innate conservatism within the archival profession;
2. Difficulty to obtain the financial benefits that are available, for instance, to librarians in computerising their acquisitions, cataloguing, etc.;
3. Difficulty to justify a large-scale automation; and
4. Difficulty to develop appropriate data descriptions.

Nonetheless, in the last decade, notable efforts have been made by countless archivists in order to study the feasibility of introducing computers within their institutions. Cook and Bartle (1983), for instance, found that there were about 20 records centres which have operational automated systems and 20 others were planning such systems in the UK alone. Nearly all these systems were developed after 1979. The major reasons that compelled archivists to consider such an alternative are:

1. Wide availability of the required technology;
2. Relative failure of some of the traditional archival institutions;
3. Increase in the size of holdings;
4. Increase in the number of users (PRO, for instance, has an average of 1,500 to 2,000 daily users (Roper, 1982));
5. Automation is seen as a key solution to the problem of under use of archives;

6. Ability to produce various types of finding aids, which would otherwise be very tedious to construct, once the system is operational;
7. Increase of data available in machine readable form has, in one way or another, contributed towards automation of archival institutions. Otherwise, these institutions would be limited to archives of the ancient regime.

4.3. AREAS OF COMPUTERISATION

In attempting to computerise the holdings of their institutions, archivists have concentrated on two main objectives. On the one hand, administrative control. On the other, intellectual control.

4.3.1. Administrative Control

The application of computers to archives concentrated more on the physical control of the holdings than on the intellectual side. Cook (1981) defines administrative control as the:

> "set of aims held by an archivist when he sets out to construct finding aids intended primarily to allow him to regulate the physical processes which archives must undergo: they must be accessioned, stored, described, boxed, and retrieved, and to ensure that these processes are carried out in due order demands administrative control instruments".

From this definition, it follows that the chief objectives of the systems devoted to administrative control are to:

- Access records;
- Provide up-to-date and accurate listings of holdings;
- Identify and locate records;
- Facilitate the efficient use of storage space; and
- Notify archivists about event dates such as appraisal, destruction or transfer to archives in case of records centres.

Indeed the more extensive the holdings, the greater the justification for such a system. Although the applications of such techniques have been common in records centres (management of current and semi-current records) they are more obvious in National Archives. The most important systems devoted to the administrative control of archives are indeed the ones developed in the United States and Britain known as Nars and PROSPEC respectively. The following is a brief account of the system known as PROSPEC and developed at the Public Record Office (PRO).

4.3.1.1. PROSPEC

Just like Nars, PROSPEC is a computer-assisted rather than a computer-based system. Also both systems operate at series level which means that they can be readily updated as new series or classes are accessioned or additions are made to existing ones.

PROSPEC is an adaptation of INSPEC produced by the Institute of Electrical Engineers. Generally speaking, it is aimed at producing (Cook, 1981; and Simmons, et al., 1972):

1. A variety of finding aids (including printed and published guides); and
2. Location lists for some part of the service.

As already pointed out, PROSPEC is based on the description of archives at the series level. Each class consists of 11 fields:

01 Group and class code. *
02 Last piece number. *
03 First date. *
04 Last date. *
05 Physical characters of pieces in this class.
06 Class title.
07 Class description.
08 Index terms. *
09 Cumulative foot-run of shelving. *
10 Location. *
11 Means of reference in the searchroom. *

The fields marked with an asterisk (*) have built-in verification allowing the system to reject any input that does not conform with the agreed field description. The chief advantage of this facility is that it reduces the stress of proof-reading. Development work and data input are handled by an agency while data preparation is done in-house (Cook, 1981).

Each class is preceded by an administrative history which is necessary for the support of research and use by records managers who have the duty of reorganising classes of records and fitting them into their administrative context.

The costs of PROSPEC are based upon processing which is carried out partly internally and partly externally. As already stated, the completed input material is sent to INSPEC for processing. This is charged on the basis of on-line time plus services. It was estimated in 1983 that the costs of PROSPEC, including the pilot project, amounted to approximately 5,000 pounds. The running costs, on the other hand, were estimated to approximate 1,450 pounds sterling a year (Cook, 1983).

4.3.1.2. PROMPT

In addition to PROSPEC, the Public Record Office operates another system commonly known as PROMPT. The principal objective of this system is to control the issue of documents for consultation to users of its new records office situated at Kew. It is estimated that this system adds about 20% to the functional capacity of the office. It is, however, questionable whether such a system would be justified with a level of demand lower than that of the PRO (2,000 documents produced and returned every day (Roper, 1982)).

4.3.2. Intellectual Control

As mentioned earlier, most of the computer applications available today within archival institutions are devoted to the administrative control of the holdings. Only few systems are oriented towards intellectual control. This is mainly due to the fact that subject indexing in archival environments continues to be seen as an extremely difficult area to tackle.

Intellectual control can be defined as the objective an archivist is seeking:

> "when constructing finding aids intended primarily to retrieve and exploit the information contained within the text of the archives concerned. This will normally require very full inventories or even calendars together with an index of names and subjects. These finding aids may be distinguished from those aimed at administrative control, although in practice a good deal of coincidence is possible between the two. In computer terms there is a strong distinction, since intellectual control will normally entail on-line searching and elaboration of indexes whereas administrative control may well be content with updated print-out lists" (Cook, 1981).

One of the most complex and successful system devoted to this purpose is that developed by the National Archives and Records Services (NARS) namely SPINDEX of which 3 versions are now available.

4.3.2.1. SPINDEX

SPINDEX is a good example of purpose designed system for archival description and indexing at high level. It originated in the Library of Congress Manuscripts Division and NARS in the late 1960s. There is also a network of participating archival institutions. One of the most important characteristics of SPINDEX is its flexibility. Indeed, SPINDEX was conceived to control archives at both macro and micro levels, that is at group and item levels by any large or smaller institutions at a reasonable cost (Cook, 1981).

Perhaps, the only disadvantage is that SPINDEX has been programmed in IBM Assembler languages which restricts its circulation mainly to the USA. All three SPINDEX versions are, however, mutually compatible. The second shortcoming is to do with the absence of on-line searching facilities. The flexibility of SPINDEX is achieved by three devices (Cook, 1981):

1. The control number;
2. The variable usable fields; and
3. The permuted index.

4.3.2.1.1. The Control Number

The control number enables the system to be used for any level of archival accumulation. It consists of (Cook, 1981):

a) 3-character repository code

b) 18-character identifying subfield number

c) 1-character record action code.

To illustrate the flexibility of the control number field, let us look at the following example cited by Cook (1981):

State	2 char	Arizona	04
City	3 char	Phoenix	04550
Institution	3 char	Historical Society	04550630/1
Collection	4 char	John Butler papers	045506300005/2
Series	1 char		0455063000054/3
Box	1 char		04550630000546/4
Folder	1 char		045506300005462/5
Item	1 char		0455063000054626/6

From this formulation, it is possible to get selective printouts of all repositories within a state. The availability of such a facility enables SPINDEX to describe archives accumulations no matter what the size or complexity might be, not only within one single repository but between several of them as well (Cook, 1981).

4.3.2.1.2. Fields

SPINDEX consists of the following twelve fields:

000 Control field (control number)
100 General heading (for general and unspecific title)
110 Subject title
120 Personal names title (e.g. personal papers)
150 Index cross-reference
200 Supplied subject entries
210 Alternative personal name entries
250 Span dates (first and last)
300 Quantity of material
400 Collection identification: the name of the collection of which the entry is a part
410 Inclusion box number
900 Abstract

4.3.2.1.3. Permuted Index

Despite the fact that SPINDEX was primarily devised as an indexing system, in its first two versions (SPINDEX I and II), this aspect did not seem to have enjoyed as much success as has its flexibility in constructing fields. Indeed, it is only with release of SPINDEX III in 1978 that this limitation was eradicated. Since then, it has become possible to generate index terms showing both the primary and qualifying keywords (Cook, 1981).

Index entries are system-generated. They are sorted under primary keywords according to the chosen field. The permutation capability allows as many entries as there are indexable terms, each keyword being subsequently followed by the other terms in the string (Cook, 1981).

Finally, it should be noted that SPINDEX is also distinguishable by its ability to accept a variety of input formats. These include: punched cards, punched paper tape and magnetic tape.

Similarly, a number of output formats, are also acceptable, including the modification of the print position on the page, shortening or lengthening the print lines, electronic photocomposition of up to twenty-five data field type from each SPINDEX inventory level (Cook, 1981).

4.4. ARCHIVES AND NETWORKS

Another benefit of computerisation is undoubtedly the ability to request and access on line the holdings of a particular record office or archive administration from a very remote terminal.

In the last ten years or so, the concept of networks in the area of archives, library and information science has undergone a significant development. Several different factors have led towards this trend.

Of most significance is perhaps the desire to serve as many users as possible. This desire is explained by the fact that in the last few decades the number of users has not only undergone a dramatic increase, but also their interests have become more diverse. To keep pace with the growth and diversity they are confronted with, libraries, information services, and at a lesser degree archival institutions, have been compelled to adopt strategies that enable them to expand and widen their coverage. This aim seemed achievable through the development of network systems.

These desires have become more feasible with the recent developments in information and communications technologies. Indeed, until the advent of computerised networks, it was only possible to plan co-operative endeavours within prescribed geographic limits. The introduction of computers and telecommunications, however, has considerably

contributed to the interdependence of previously autonomous libraries and information services and to the relaxation of time and distance constraints on information exchange among these institutions (Kesner, 1983).

Of greater importance, as far the developments of networks is concerned, is probably the financial stringency of these institutions. Indeed, libraries, archives and informations services are confronted daily with tighter budgets and higher costs for materials. As a result, they have looked for ways to stretch the value of their budgets through the sharing of resources which enables the library to acquire what is needed by the users. Furthermore, it enables the institution to depend on the network for the specialised material it may need for its occasional readers.

Unlike libraries where financial constraints have led to joint adventures, in the archives environment, the outcome was totally different. Indeed, most archives institutions that contemplated automation were often under strong pressure from their parent organisation to make use of in-house computer facilities. This fact led to:

1. Development of numerous archival systems (especially in UK and USA) where there is no unified archival system with central direction;
2. Duplication of effort; and
3. Conception of systems of limited portability.

SPINDEX represents a partial exception in that it has been fairly widely used, but still has not prevented the proliferation of other systems in the United States.

4.4.1. The Case Of PROSPEC-SA

The possibility of developing PROSPEC further and indeed extending it to archival institutions outside the PRO was felt as essential from the outset. Thus in a study performed by the PRO, a questionnaire was sent to 173 heads of records offices to find out whether they would like to see PROSPEC further developed to include these institutions. However, only 65 (37.5%) of the total records offices returned the questionnaire. The results of this study were as follows (Roper, 1977):

- 08 (12.3%) answered yes;
- 24 (36.9%) answered possibly; and
- 33 (50.7%) answered no

Despite the disappointing results, the committee in charge of the study decided to go ahead in November 1975 since almost 50% of those who answered the questionnaire were at least interested. As a result, an informal meeting with INSPEC was held in February 1976 to discuss the possibility of adapting PROSPEC to the needs of the records centres interested in the experiment. The modified system was given the name of PROSPEC-SA (which stands for Society of Archivists). The new system resulted in three major modifications (Cook, 1981, Roper, 1977):

1. Use of INSPEC's sub-record facility in order to describe separately discrete parts of series or collections;
2. Addition of three fields for local reference codes; output selection codes and the source of transfer or deposit; and
3. Option of ordering output by local codes or output selection codes instead of PROSPEC class codes.

Amongst the obstacles which prevented the adoption of PROSPEC-SA by all records offices in the UK are:

- Financial constraints; and
- Difficulty of encouraging very large-scale participation.

In 1975, a pilot project was undertaken to test an adaptation of PROSPEC to produce guides to the holdings of a wider range of archives. Although the technical feasibility was demonstrated, intellectual problems such as those related to vocabulary control prevented the institutions taking part in this experiment from adopting the system. So the lack of co-ordination between archival institutions and the absence of data standards and a data interchange format for archives seem to be the major drawbacks to co-operation between archives institutions.

4.5. ARCHIVAL COMPUTER APPLICATIONS WORLDWIDE

A number of computer applications have been developed around the world. The following is a selective analysis of the most significant ones.

4.5.1. Britain

In addition to the system developed at the Public Record Office (PROSPEC), a number of small scale applications have also been developed by individual record offices throughout Britain.

Several papers have attempted to survey the state of the art of computer applications in British archives (Roper, 1975; Bell, 1975 and and Cook, 1981). The most comprehensive of them all was probably that conducted by Michael Cook in conjunction with his colleague Rachel Bartle (1983) at Liverpool University Archives between September and December 1982.

The survey's main purpose was to identify archives services where computerisation has been launched or about to be launched and assess the viability of the system being used or to be used.

Out of the 90 questionnaires that were sent, 81 were returned. Amongst these services, 32 were automated; 19 of which were using commercial packages and 13 using in-house applications exclusively or in conjunction with MARC.

4.5.2. Canada

In addition to Britain and the United States, Canada is another country where successful programmes for the handling of archives and records have been developed. A case in point is RECODEX (Records Management Control and Indexing) which was developed by the Canadian Public Archives. Another system is known as CODOC (also known as the Guelph Document system), which is a system that was originally developed for the University of Guelph Library's collection of government documents. It was hoped to adapt the use of this system for archival collections with minimal programming alterations. As already stated, CODOC is a system for organising documents by mnemonic country code number and other codes to various areas of bibliographic data so as to provide quick sorting capabilities (Sadek, 1982).

CODOC for archives does achieve some measure for automated access for archival collections. It provides all the advantages of quick sorting capabilities and good level of subject approach through KWOC. Another advantage of CODOC resides in its flexibility. The nature of archival documents in various depositories can vary considerably with the organisation depending on the special knowledge of the custodian with regard to material and potential use. It seems that the various fixed fields in the CODOC system can easily be tailored, if necessary, to meet the needs of a particular archival service (Sadek, 1982).

4.5.3. France

In France, an automated records management system, PRIAM (Prearchivage Informatise des Archives des Ministeres) was started in 1972. This system was developed in-house by a team of computer programmers of French National Archives. Input is based on a transfer list while output includes (Cloulas, 1975 and Cook, 1981):

a) Master list of documents transferred;
b) Lists of documents allocated to the three retention categories;
c) Cummulation of data on the operation of the service;
d) Selected and general thesauri generated from the indexes; and
e) A KWIC index of keywords in the system.

4.5.4. Soviet Union

In the USSR, great significance is attached to the preservation and use of archive documents which in the eyes of the law constitute a public property. All documents belonging to the state which have a political, scientific, economic or cultural significance are assembled in the state archival collections of the USSR.

To respond to the growing requirements of researchers, a computer-based information retrieval system, known as AIPS, was introduced in 1975. Computerisation is carried out along two main lines (Kurantov, 1979 and Dolgih, 1983):

a) Development of a computer-based system on the basis of the central catalogue kept by the Chief Directorate of Archives of the USSR Council of Ministers, containing information on each of the assemblages comprising the archival collections;

b) Development of a computer-based system for those individual subject fields that are of sterling importance because of their economic and political significance, and in great need by users.

4.5.5. United States

The United States is undoubtedly the country where most of the research on archives and records management has been accomplished. In fact, automation in the USA dates back to 1968. Since then, significant achievements have been made and very successful systems have been implemented. Of paramount importance are probably: SPINDEX discussed earlier on in this chapter, NARS A-1 which is operating in the US National Archives, and PARADIGM developed at the University of Illinois, to name just a few. A detailed discussion of all these systems is, however, beyond the scope of this study.

Additionally, very rigid programmes for the control and handling of machine readable archives have also seen the light of the day.

4.5.6. Third World Countries

With the exception of Ivory Coast, computerised archival and records management systems in Third World countries remain a complete novelty. The lack of trained archivists, records managers and computer specialists, together with the lack of financial resources have severely impeded the development and implementation of such applications.

The one in operation at the National Archives of Ivory Coast is based on a French system, namely MISTRAL. Input is carried out in batch mode via punched cards, while access to the data base is on-line. However, due to financial constraints, the VDU is available for only one or two hours a week, compelling the users to make their searches in batch mode. The package is believed to be severely limited as it consists of only 9 fields (Cook, 1981).

4.6. COMMERCIAL PACKAGES FOR HANDLING ARCHIVES

Several different commercial applications have been developed in order to handle archival holdings. The following is a selective description of some of the packages that have gained wide reputation amongst archivists. These packages can be categorised into two main divisions: applications for records management, on the one hand; and applications for archival management, on the other.

4.6.1. Applications for Records Management

The aim of these systems is to monitor the flow of records into the institution, the identification of records that are likely to be of interest to the potential users, the circulation of these records and finally the identification of those records that have no permanent informational or research value. Among the applications devoted to this aspect of records management, the following are of the utmost importance:

4.6.1.1. ARMS

ARMS is a computer system developed at Tyne and Wear Archives Department. Initially, it was operating on ICL 1900 computer series, but was then transferred to an ICL 2900 computer series (Cook, 1983). The package has been developed by a team of in-house programmers in conjunction with the county's computer unit, and has been in operation since 1978. ARMS is considered to be a very elaborate and complex system. Its input form consists of the following fields (Cook, 1981):

a) Class number;

b) Departmental Reference Mode (DRM);

c) Action code;

d) Retention period;

e) Access code; and

f) Class title or description. This field is itself subdivided in six sub-fields.

ARMS is able to provide 18 different types of reports, 5 of which are for service use, while the rest are used for housekeeping activities.

4.6.1.2. CAR

CAR is a computer system based on a series of computer programs written in the widespread language of COBOL. It runs on an ICL 1904 computer series. CAR has been developed in-house by a programmer at Dyfed Record Office and has been running successfully since February 1977. Despite some similarities with ARMS, CAR is considered to be fairly basic as it includes only 4 main fields; namely (Cook, 1981):

a) Document reference;
b) Document description;
c) Dates, including the code and date of action; and
d) Location of the document within the record office.

As can be seen, this system is extremely limited especially that there is no indexing facilities, but seems to respond to the needs of the record office.

4.6.1.3. CMF

CMF is a computer program developed at Liverpool University It consists of three COBOL computer programs running on an ICL 1904 machine. It has been developed within the university by the staff of the archives staff and a computer programmer funded by the MSC (Manpower Services Commission). The system is available for academic use throughout the university and can be accessed via a user-code and password system.

A short demonstration was given to the author while visiting the university in the course of the academic year 1985/86. The system is very simple to use and provides the user with three different sets of output (Cook, 1981):

a) A master list of records, classified by document reference code under the name of each department;
b) A list of records organised chronologically by date of disposal; and
c) An alphabetical list of subject index keywords.

Numerous other organisations have introduced computers to improve the management of their records. These include big companies such as BP and ICI in Britain. Likewise, automated records management systems have been implemented in countries like USA, Canada and France. In Canada, for instance, a system known as RECODEX (Records Management Control and Indexing) was developed by the Canadian Public

Archives. A similar system is in operation in France as well.

4.6.2. Applications for Archival Management

The principal objective of computer archival management is mainly to control the processes (sorting, repair, description, etc.) of those document having a permanent informational and research value. Other purposes include the description of archival documents, the production of adequate finding aids and the retrieval of relevant documents following inquiries by users of the service. Among the packages that have gained worldwide reputation in this area, the following are of paramount significance:

4.6.2.1. ASSASSIN

Assassin was written in ANSI COBOL and developed by Imperial Chemical Industries. It has been on the market for over fifteen years. It can run on a variety of machines including IBM, ICL and VAX. It also has good searching facilities using both boolean operators and right-hand truncation.

4.6.2.2. FAMULUS

This package has been written in FORTRAN. It was developed in 1969 by the Pacific South West Forest and Range Experimental Station located in California. Famulus runs on an IBM 360/195. It has enjoyed considerable success

worldwide and especially in the UK. Because the record length is limited to 4,000 characters, it is only suitable for relatively small archives institutions. Other characteristics include the availability of a KWIC index facility. Moreover, the system can be used interactively (Orna and Pettitt, 1980).

4.6.2.3. GOS

GOS was written in a language called BCPL which has then developed into the language B and then C as it is commonly known today. It is distributed by the Museum Documentation Association situated in Cambridgeshire. GOS can be used to produce almost any type of catalogues be they for museum purposes or library purposes. Its principal features include (Orna and Pettitt, 1980):

a) Portability: One significant characteristic about GOS is that it has been implemented both on mainframes (Cambridge and Manchester Universities) and minicomputers (eg. British Museum).

b) Flexibility: Because of its extremely flexible structure, GOS is able to handle any hierarchical data structure no matter how complex it might be.

c) Compatibility: GOS also has very powerful editing facilities which allow it to output records in formats suitable as input to a totally different package.

d) Technical Support: The Museum Documentation Association provides help regarding implementation, maintenance and user training.

4.6.2.4. STAIRS

STAIRS stands for Storage and Information Retrieval System. It was developed by IBM. In addition to its indexing and search facilities, what makes STAIRS extremely attractive, in the present context, is the fact that IBM have also developed an Arabic version of the package in collaboration with the Kuwaiti National Scientific and Technical Information Centre. STAIRS was used at the House of Lord Record Office until 1983 when it was suspended because of financial constraints (Cook, 1983).

Amongst the four packages discussed herein, GOS is considered to be the best. Its advantages (portability, flexibility, compatibility, etc.) outweigh the disadvantages, which lie in the fact that its retrieval capabilities are rather limited in comparison with those of systems like STAIRS.

4.7. CONCLUSION

It can be seen from the above discussion of automated archival systems around the world and especially in Britain, the USA and Canada that the questions of information retrieval, the analysis of user's needs or

interactive access to data in archives offices have been getting short shrift. These are subjects which have been considerably developed in the information world and it seems that it is about time that archivists took the necessary steps to bring them into consideration when planning new automated systems.

Where automated systems have been introduced, these have usually attempted to imitate traditional methods instead of introducing some of the methods developed by other information professionals (Cook, 1981 and 1983).

Most of the automated systems are adaptations of systems developed in other areas. Indeed, several archival institutions have adopted systems devoted to library or museums functions (e.g. ASSASSIN, FAMULUS, GOS, INSPEC, STAIRS, etc.). One of the systems developed specifically for archival purposes is that conceived at Glasgow University (Cook and Bartle, 1983).

As was also stressed by Cook (1981), "most finding aids produced in archival environments aim at administrative control. A fully user-oriented system should aim at "intellectual control".

Finally, one very interesting finding of this survey is that it seems that automation has not been introduced as a means to reduce staff numbers, but rather to improve the efficiency and productivity of existing manual systems.

In my view, automation is far more likely to improve the profession than to replace it. Automation will upgrade it by permitting a sharper and clearer identification of that which is usually of professional character in records management and archives administration.

Those archivists who have some irrational antipathy towards automation per se should be regarded with some suspicion as they may be afraid that their profession will be exposed as being intellectually vacuous, a fact that is completely untrue. In a totally automated archives office, there will still be great need for skilled archivists, cataloguers, and so forth.

Those who regard automation, on the other hand, as a subject to be tackled and mastered are those who will plan future archival systems and the various tasks they are to perform and promote the profession of archivist and record manager.

PART II

PART II

BACKGROUND AND ANALYSIS

Defining with precision today's technology can be problematic, in that it appears to be changing so quickly that when one speaks of today's technology, he/she is well into yesterday's technology. Similarly, tomorrow's technology seems very near and very current.

Probably the most significant advance in information technology today is the implementation of telematics. Numerous technological applications have evolved from this area, including: teleconferencing, viewdata, videotext, electronic mail, and so forth.

The implementations of these designs is underway in many of the Third World countries, but suffers from many difficulties; including:

a) Economic or currency restrictions;
b) Lack of qualified staff;
c) Lack of continuity of long-term projects;
d) Lack of adequate information infrastructures;
e) Change of priorities in governments programmes;
f) Poor collaboration amongst institutions;
g) Unrealistically planned strategies; and
h) Lack of information policies.

The second part of this thesis consists of two main chapters:

Chapter Five of this thesis aims to highlight the above obstacles with an emphasis on the Arab World. It will:

1. Provide a background introduction to the Arab world;
2. Discuss the obstacles that prevent the development of a suitable information infrastructure in this area of the globe;
3. Shed light on major technological advances concerning the development of appropriate hardware and software for the processing of Arabic script; and
4. Make recommendations to overcome the obstacles facing Arab countries.

Chapter Six, on the other hand, gives special attention to the case of Algeria. It will:

1. Provide a background introduction to Algeria; and
2. Look into the problems that hamper a proper transfer of technology such as the shortage of qualified personnel, and absence of an adequate information infrastructure and information policy.

CHAPTER V

SCIENTIFIC AND INFORMATION INFRASTRUCTURE IN THE ARAB WORLD

It is widely admitted that information is instrumental to productivity, modernisation of society, and the well-being of any individual or group. Serving as the foundation for all aspects of national development and policy making, the continuing analysis and supply of information are indispensable for decision making. Information is also identified with wealth and power. Most nations recognise that information activities are essential or at least significantly contribute to their economic growth. However, special efforts are to be made for the acquisition, handling and utilisation of information. For this very reason, the creation of information systems has become an absolute necessity for it is the most effective way to narrow down the gap between the North (the developed world) and the South (Less Developed Countries).

The development of such systems in Arab countries is currently hampered by a number of constraints, of which the information technology gap is of the utmost importance. Generally speaking, the consequences of this information cleavage are considered to be more serious than those of the industrialisation gap.

Indeed, the latter is mostly attributed to the lack of financial resources. The information gap that separates these countries from their counterparts among the developed countries implies, however, a relative absence of information processing and technological transmission, to which one can add the human factors of levels of intellectual development and behavioural patterns in such countries. According to Masuda (1980), these factors more than the financial resources are the real obstacles to technological transfers.

In this chapter, the author aims to give a brief background introduction to the Arab world. Thereafter, the principal obstacles that hinder the development of a suitable information infrastructure in Arab countries will be addressed. In addition to that, we shall examine some major technological advances in so far as the development of appropriate hardware and software for Arabic purposes are concerned. Moreover, some recommendations will be presented to overcome the obstacles facing Arab countries.

5.1. BACKGROUND TO THE ARAB WORLD

The Arab world consists of one geographical belt stretching from the Atlantic Ocean in the West to the Arabian/Persian Gulf in the East.

The area is estimated at approximately 14,000,000 square kilometres (4800,000 square miles) which exceeds that of the United States and Europe put together (Butt, 1987).

The question of belonging to the Arab world is a very controversial one. Indeed, several different criteria can be used to determine the belonging of any one country to this part of the globe. Some would use history, others would use geography while other groups would use common language and cultural heritage.

However, for the purpose of this study, we shall define the Arab World as those independent countries member of the Arab League of states. These include: Algeria, Bahrain, Djibouti, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine (PLO), Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates, North and South Yemen, plus Egypt that has been suspended after " Camp David agreement" in 1976.

The Arab World has a climate similar to that of the Great Plains. The summers are intensely hot and dry; the winters are often bitterly cold.

5.1.1. Demographic and Cultural Aspects

In 1985/86 the Arab population was estimated to be just over 190 million (Butt, 1987). Table 5.1. represents the repartition of this population by country. As can be seen from this table, a great portion of this population is

concentrated in North Africa (Mauritania, Morocco, Algeria, Tunisia, Libya, and Egypt). Egypt alone constitutes more than 25% of this population, while the Northern African countries put together form approximately 55% of the whole population.

Table 5.1. Countries of the Arab World.
Source: Unesco Statistical Yearbook

COUNTRY	CAPITAL	AREA (km^2)	POPULATION	DATE
Algeria	Algiers	2,381,741	21,720,000	1985
Bahrain	Manama	690	416,275	1987
Djibouti	Djibouti	23,200	456,000	1986
Egypt	Cairo	997,738	49,600,000	1986
Iraq	Baghdad	438,317	14,110,425	1982
Jordan	Amman	97,740	3,515,000	1985
Kuwait	Kuwait	17,818	1,357,952	1985
Lebanon	Beirut	10,452	2,663,000	1985
Libya	Tripoli	1,775,500	3,640,000	1984
Mauritania	Nouakchot	1,030,700	1,419,939	1976
Morocco	Rabat	710,850	21,941,000	1985
Oman	Mascut	300,000	2,000,000	1985
Palestine	-	-	-	-
Qatar	Doha	11,437	257,081	1982
Saudi Arabia	Ryadh	2,240,000	11,542,000	1985
Somalia	Mogadishu	637,657	4,653,000	1985
Sudan	Khartoum	2,505,813	20,564,364	1983
Syria	Damascus	185,180	10,612,000	1986
Tunisia	Tunis	163,610	7,261,100	1985
UAE		77,700	1,622,464	1985
North Yemen	San'a	200,000	9,274,173	1986
South Yemen	Aden	336,869	2,365,000	1986

As can also be seen from Table 5.1., the population is characterised by its unequal distribution. Indeed, we can distinguish five main groups:

1. Group I: Consisting of Egypt only with a population of over 48 million people or 27 percent of the total Arab population.

2. Group II: Consisting of countries having more than 20 million in habitants. There are three such countries: Algeria, Morocco, and Sudan.
3. Group III: Consisting of countries with a population between five and fifteen million, Iraq, Syria and Tunisia.
4. Group IV: Consisting of countries with a population ranging between one million and four million. Countries pertaining to this category include: Jordan, Kuwait, Lebanon, and Mauritania.
5. Group V: Consisting of those countries with a population of less than one million: the Gulf smallest states: Bahrain and Qatar and Djibouti.

Islam, which is the religion of more than 90% of the Arab population, is at the very centre of the concept of socio-cultural unity, homogeneity and identity of the Arab world and can in no way be separated from the history of the societies and nations that became the Arab nation under the catalyst of Islam (Mansfield, 1976).

Besides Islam which is the official religion of most Arab countries, Arabic is also the predominant language of this part of the world. Indeed, it is spoken by twenty one countries in addition to Palestine. Moreover, the Arabic script is used in other languages such as Persian (the Farsi language of Iran) as well as several languages of Southern Asia (eg. Urdu, Pashto, etc.).

Although Arab countries appear from the outside to be an heterogeneous entity made up of moderate and conservative countries, on the one hand, and countries with revolutionary politics on the other, they feel as a group held together by memories of a common past, inheritance from a great Arab/Islamic civilisation, a common language: Arabic, and a common religion: Islam, as well as by the consciousness of being part of a common cultural heritage. The arabic language is an especially crucial element linking the Arabs with each other and with their culture; it is inseparable from Arab culture, history, tradition, and Islam, the religion of the vast majority of Arabs.

5.1.2. Historical and political Aspects

Because of its geographical position, the Arab world, lying as it does at the crossroads of the main transport routes between Europe and Southern and Eastern Asia has always been and still is of great importance. However, currently the strategic dimension of the Arab world lies principally in the immense reserves, production and traffic of energy resources, oil and gas, in the region. The early history of the Arab world is linked with that of Islam conquests which started in the seventh century (Polk, 1980).

Politically, though the reunification of the Arab world under one independent regime was the main objective of Arab nationalism, the separate development of each territory and

the various forms of government created the tendencies to disunity which was accentuated by the colonial powers at that time.

The creation of the League of Arab states in 1945 which was inspired by the Arab awakening of the nineteenth century has been working from the very beginning towards strengthening the cultural, economic, and political ties between the Arab countries.

5.1.3. Economic and social Aspects

The socio-economic systems in the Arab world, which have undergone considerable changes over the past decades, have many elements of similarity.

Although, considerable efforts have been made over the past decades to develop other economic activities, such as manufacturing, transport and communications, services, etc., agriculture and pastoralism remain the basic economic activities in most Arab countries. Indeed, with the exception of oil and gas, exported products are almost entirely agricultural.

Co-operation between Arab countries has been hindered by political friction between the various Arab states, by their differing level of development and the absence of any strong regional administrative bodies capable of organising coherent supranational industrialisation plans (Butt, 1987; and Mansfield, 1976).

Inter-Arab trade still accounts for only about 5 percent of the Arab world total annual foreign trade, despite the existence of broad complementarity between the resources of different Arab countries.

5.2. CONSTRAINTS TO THE TRANSFER OF TECHNOLOGY TO THE ARAB WORLD

The last few decades have witnessed significant developments in microelectronics and digital communications which have considerably improved the range of possible applications of automated information handling. Such developments have resulted in new application areas previously not considered appropriate for computerisation, and in new information systems, products and services. The trends of rapid costs reduction coupled with the increased capability relating to the new information technologies have placed systems based on the new technologies within the budgetary range of many organisations in the Third World, particularly the Arab countries of the Gulf which have huge reserves of oil.

However, despite obvious benefits, the introduction of these technologies was not until recently necessarily straightforward, nor was it the sole solution to an organisation's information handling requirements. Indeed, several problems and barriers have hampered the transfer and applications of new technologies to these countries of which a number are discussed hereinafter.

Table 5.2. Parameters Affecting the Transfer of Technology to Arab Countries (Salem, 1986).

TYPES OF FACTORS	CONSIDERATIONS
ECONOMIC	1. Availability of manpower. 2. Unavailability of capital. 3. Inadequacy of current expenditure. 4. High cost of international activities. 5. Lack of local competition.
POLITICAL	1. Unstable governments. 2. Stress on security procedures. 3. Continuous change in the priority of programmes. 4. Centralisation decision making. 5. Ignorance of common scientific methods by top level management.
DEMOGRAPHIC AND CULTURAL	1. High rate of nonskilled manpower. 2. Language barriers. 3. Fear of new technology. 4. Lack of information and tools.
MANPOWER	1. Lack of skilled manpower. 2. Ignorance of the role of the information specialist in most organisations. 3. Difficulty of employing qualified professionals. 4. Lack of continuous education. 5. Lack of team work.
INFORMATION INFRASTRUCTURE	1. Lack of telecommunication tools. 2. Inconsistency of postal communications. 3. Complexity of customs procedures. 4. Incapability of joining major communication networks 5. Lack of standards for information and library activities. 6. Lack of comprehensiveness of collections of publications. 7. Lack of standardised forms to support information flow.

Various categories of problems related to the technology transfer within Arab countries can be identified including (Salem, 1986; and Griffiths, 1984):

1. Economic constraints;
2. Socio-political constraints;
3. Demographic and Cultural constraints;
4. Lack of adequate staff and manpower; and
5. Lack of adequate information infrastructure.

Table 5.2. above presents a detailed breakdown of each of these factors. It must be stressed that the objective of this chapter is not to dwell on all these parameters in details, but only to shed some light on the major ones. Indeed the last two elements will be given special emphasis as they are of paramount importance to the scope of our study.

5.2.1. Economic Constraints

With the exception of the Gulf states, one major constraint facing the transfer of technology and the development of an adequate information infrastructure in the Arab countries is of an economic type. Indeed, there is simply not enough money, particularly with foreign exchange problems, to buy the required equipment, subscribe to the conventional abstracting and indexing services or to pay for the facilities or trained information workers to go with the information (Thorpe, 1984).

In budgetary matters, most information services in Arab Countries are not allocated the necessary funds that would enable them to meet the objectives they were assigned. Some of these services are not even allowed to negotiate for funds from outside due to bureaucratic red tape. This financial constraints affect the erection of suitable buildings with conducive working space for information science work, acquisition of adequate reference sources and documents, equipment of centres with computer facilities, microfilm units, audio-visual aids and so forth. Additionally, personnel recruitment and training is also affected considerably.

Authorities in Arab countries may hesitate before deciding to take part in international information systems in view of the human and financial efforts involved, particularly because of heavy financial burden incurred in the collection, processing, accessing, and publication of information, the costs of running document delivery and translation services, and the investments to be made in information technology (Griffiths, 1984).

5.2.2. Socio-Political Constraints

An important obstacle to progress is the lack of continuity. Changes among government officials have a more substantial impact than in the developed world, leading often to radical personnel reshuffle at much lower administrative levels.

Such changes can also result in long delays of some project and perhaps even in their cancellation (Salem, 1986; and Griffiths, 1984).

5.2.3. Demographic and Cultural Constraints

Another barrier facing Arab countries is indeed the high rate of non-skilled manpower. Despite concentrated efforts to combat illiteracy by mounting massive campaign against it, the latter still runs presently in some Arab countries as high as 80 percent in some countries such as Mauritania, Somalia and North Yemen (Please refer to Table 5.3.).

Table 5.3. Illiteracy Rates in the Arab World.
Source: Unesco statistical year-book

COUNTRIES	%	YEAR	%	YEAR
Algeria	73.00	1971	50.4	1985
Bahrain	58.80	1971	27.3	1985
Egypt	74.12	1960	55.5	1985
Iraq	75.80	1965	10.5	1985
Jordan	67.60	1961	25.0	1985
Kuwait	45.00	1970	30.0	1985
Lebanon	21.50	1970	23.0	1985
Libya	78.30	1964	33.1	1985
Mauritania	88.90	1965	82.6	1976
Morocco	78.60	1971	66.9	1985
Saudi Arabia	97.50	1962	48.9	1982
Somalia	98.50	1962	88.4	1985
Sudan	85.30	1966	68.6	1973
Syria	60.00	1970	40.0	1985
Tunisia	76.00	1966	45.8	1985
U.A.E.	79.10	1968	46.5	1975
Yemen (N)	97.50	1962	86.3	1985
Yemen (S)	79.00	1973	58.6	1985

In accordance with the various plans and development programmes in the Arab world, the present policy is directed to meet the enormous needs of Arab countries in terms of experts, technicians, scientists, etc.; which have been brought to light by the process of modernisation and the course of development in the past few years.

However, Even those qualified people on whom their countries have spent colossal sums of money tend to leave their countries. The reason being the lack of adequate financial rewards, the only satisfying career for Arab scientists is in the West. As a matter of fact, nearly half of the Arab holders of the Ph.D. degrees, estimated at more than 27,000 have left their respective countries for better opportunities abroad (Salem, 1986).

In addition to the problem of high rate of non-skilled, there is the problem of language barriers. Concentration of the major sources of information within the developed world has other undesirable consequences on the LDCs in general and the Arab countries in particular. It creates a further level of dependency that is frequently resented. It also raises language barriers for some users in some countries. In addition, it produces a situation in which much of the literature that is best controlled, and thus most accessible, is directed towards the needs of advanced economies. At the same time, much of the literature that is most relevant to the needs of the Arab countries is easily accessible (Michel, 1982).

A further set of problems relate to the potential resistance to new technologies on the part of the users. Most of them fear that these changes will bring about unemployment.

5.2.4. Lack of Qualified Personnel

Another major obstacle that arab countries continue to face is the lack of qualified staff. Even more scarce are lecturers of library and information science. In many of the Arab countries, this kind of courses, when they exist, are run by instructors from the developed world. Despite the fact that this might be an opportunity to learn the most up-to-date techniques in the area, it still has the disadvantage that these lecturers will not reflect a full understanding of the problems faced by the LDCs.

In a study carried out by Salem (1986) on the information infrastructure in Arab countries, the author points to the striking shortage of technical manpower to support computer, information and microfilm applications in the Arab world. On this matter, he indicates that despite the availability of 21 Arab higher institutions (now 24 establishments) offering courses in the field of library and information sciences, the number of graduates still falls far short of meeting the needs of these countries. For instance, the number of students enrolled in these establishments during the academic year 1976/77 was as follows:

Table 5.4. Institutions of Information Studies in the Arab World

COUNTRY	NAME OF ESTABLISHMENT	YEAR ESTABLISHED	QUALIFICATIONS ON OFFER			
			PhD	MA	DIP	BSc
ALGERIA	1. Algiers University	1976	N	Y	Y	Y
	2. Annaba University	1982	N	N	N	Y
	3. Constantine University	1985	N	N	Y	Y
	4. Oran University	1984	N	N	N	Y
EGYPT	5. Alexandria University	1981	Y	Y	N	Y
	6. Cairo University	1951	Y	Y	Y	Y
	7. Helwan University	1981	Y	Y	N	Y
IRAQ	8. Baghdad University	1972	N	N	Y	N
	9. Mostansiriyah University	1970	N	N	Y	N
JORDAN	10. Jordanian University	1977	N	N	Y	N
	11. Society of Jordanian Libraries	1976	N	N	Y	N
	12. Society of Colleges	1979	N	N	Y	N
KUWAIT	13. Institute of Teachers	1976	N	N	Y	N
	14. Kuwait University	1985	N	N	N	Y
LEBANON	15. Beirut University	1970	N	N	Y	N
LIBYA	16. Fateh University	1976	N	N	N	Y
MOROCCO	17. School of Information Sciences	1974	N	Y	Y	Y
QATAR	18. Qatar University		N	N	N	Y
S. ARABIA	19. Emam Mohamed Bin Saud University	1974	N	N	Y	Y
	20. King Abd Alziz University	1973	N	N	N	Y
	21. Riyadh University	1976	N	N	Y	Y
SUDAN	22. Khartoum University (Cairo University Branch)	1966	N	N	N	Y
	23. Um Durman University		N	N	N	Y
TUNISIA	24. Institute of Journalism Sciences	1979	N	N	N	Y

KEYS: Y = Yes on offer.
N = Not on offer.

- 20 Ph.D students;
- 44 MA students; and
- 680 B.Sc/B.A students.

It also appears from the table above that with the exception of the Department of Information Studies at Cairo University and its branch in Khartoum (Sudan), all other departments of of Information Studies have been set up in the mid 1970s, which explains the fact that Arab countries are very short of qualified personnel in this area.

In addition to the lack of qualified personnel, one should add the ignorance of the role of the information specialist. Often an information specialist is mistaken for an untrained library officer or a general duty officer despite his professional qualifications and subject specialisation (Salem, 1986; Saracevic, et al., 1985; Slamecka, 1985 and Saracevic, 1980).

Information specialists should strive to push the profession into a position of social utility in Arab countries. This can be achieved by acquiring subject specialisation as well as professional qualification and by increased productivity of information scientists by way of professional writing and publication of research findings.

5.2.5. Lack of Adequate Information Infrastructure

It is widely admitted that appropriate information is essential to national development and progress. Nevertheless, it seems that policy makers in Third World countries continue to neglect this aspect or at least are not giving it high priorities when national development plans and budgets are prepared (Griffiths, 1984). This is, perhaps, due to the fact that the return on investment in libraries, archives and information services as a whole is long-term rather than short-term. What is more, the benefits tend to be intangible. Unlike in a school or a hospital where benefits can be easily evaluated, those deriving from a library, for instance, are difficult to assess. Hence the degree of priority given to the implementation of such services in developing countries. In the following the author will attempt to discuss issues related to the lack of an adequate information infrastructure in the Arab world.

5.2.5.1. Lack of Information Resources

A problem common to the Arab countries and the Less Developed Countries as a whole is the lack of adequate information sources. It is a well known fact that the great majority of published sources of information are published in the developed world and must be acquired in hard currency. Restriction on imports and hard currency have thus had severe implications on the acquisition of information sources. One should not look further than the latest drop in

oil prices and their effects on oil producers, namely OPEC, of which most Arab countries are members. Indeed, the first services that usually suffer as a result of these restrictions are the information services since the value of these institutions is not recognised and therefore is not given priorities when national development plans or budgets are prepared (Saracevic, et al., 1985; and Griffiths, 1984).

5.2.5.2. Lack of Current Awareness

The problem of poor library services seems to play a major role in limiting "current awareness" in both Arab and Third World countries. In addition, it has severely affected the contributions of their scientists on the international level. Indeed, this assumption was confirmed by a study carried out by Gordon (1979) and which showed that LDCs authors experience far higher rejection rates (57%) than authors from the developed world (17%). Amongst the reasons invoked by referees for recommending rejection are:

1. Demonstrable errors;
2. Insignificance of results;
3. Inadequacy of the paper's summary; and
4. Lack of clarity.

However, the major reason for which papers from LDCs' authors were rejected was attributed to a lack of originality. Indeed, while only 27.2% and 29% were rejected for lack of originality respectively for American and West

European authors, the rate of authors from LDCs was of 44%. Lack of originality usually implies that the paper in question attempts to contain an issue that has already been discussed elsewhere in the literature which in one way or another indicates the poor level of awareness of authors from these countries.

One might wonder why researchers and scientists from LDCs seek to publish the results of their research outside their countries? In addition to the fact that most prestigious scientific journals are published in the developed world, another reason is the lack of local journals. Indeed, to take the case of journals in the area of information science, only one quarterly publication exists for the whole of Algeria Morocco, Libya, Mauritania and Tunisia.

Because of the lack of scientific journals and therefore a lack of competitivity, there is no incentive to improve the quality of local journals to prevent what is identified as the "manuscript drain".

So, to improve the productivity of their scientists, and enable them to participate in the development of scientific research at an international level, it is of imperative importance that LDCs find efficient remedies as to how to maintain the current awareness of their elite. Otherwise, the gap between the developing and the developed nations can only continue to widen.

5.2.5.3. Science and Technology in the Arab World

The current state of scientific and technological activities in the Arab world suggests that:

a) The problems facing Arab countries as regards scientific and technological activities are similar to those facing most Less Developed Countries; and
b) The awareness of the impact of scientific and technological information upon the socio-economic development and progress is almost negligible.

The main obstacles facing Arab countries in transferring science and technology include the following (Salem, 1986; Saracevic, 1980; and Slamecka, 1985):

5.2.5.3.1. Aspects of Current International Movement for Science and Technology Transfer

1. Patents Ownership: This acts as a barrier to the movement of Science and technology;
2. Production Agreements: The developed countries insist on keeping secret their scientific and technical know-how.
3. Consultancy Studies and Services: These are highly expensive.
4. Importing of Capital Equipment and Factories: Arab countries export raw materials at very cheap rates, but at the same time import the same raw material in other forms after processing at very expensive rates.

5.2.5.3.2. Weakness of Science and Technology in Arab Countries

1. Science and Technology Policies: Most Arab counties have no clear and objective science and technology policies, and when they do so, they are often unable to fulfil the assigned objectives.
2. Shortage of Scientists and Technologists: A significant number of Arab countries suffer from the scarcity of potent persons in science and technology. This is connected to the education plan and its relation with the needs of the country (Salem, 1986; Saracevic, 1980; and Gordon, 1979).

5.2.5.3.3. Brain Drain

Developed countries offer many advantages to scientists and technologists, and the Arab countries indirectly assist in their migration since they do not try to provide their skilled professionals with an adequate scientific atmosphere.

5.2.5.3.4. Research and Development

Ideally, research and development should play a role of paramount importance in the development of a country. However, this does not seem to be the case in Arab countries. Indeed, it very hard to assess and analyse the present status of research and development expenditure in these countries because they are very difficult to find.

Nevertheless, Table 5.5. provides an insight into the expenditure of some Arab countries in research and development activities. It is important to note that none of the Arab countries for which data are available has reached the target of 1 percent of the gross national product set by international standard (Salem, 1986).

Table 5.5. R & D Expedenditure in Selected Arab Countries as a Percentage of the Gross National Product (1975)
Source: Unesco Statistical Yearbook.

Country	R & D Expenditure As a % of GNP
Algeria	0.02
Egypt	0.89
Iraq	0.65
Jordan	0.52
Kuwait	0.30
Lebanon	0.17
Libya	0.36
Morocco	0.02
Sudan	0.21
Syria	0.14
Tunisia	0.52

5.2.5.3.5. Gap Between Economic Activities and Scientific and Technological Activities

Arab countries plan their scientific and technological activities without relating them to various economic activities. They fail to make the link between economic activities and research institutions; they do not also have the potential to connect the economy and science to solve their industrial problems.

5.2.5.4. Scientific and Technological Information

Scientific and technological information is even weaker and less developed in the Arab World. This phenomenon can be attributed to the following reasons (Salem, 1986; Aman, 1984; and Salem, 1980):

1. The different use and meaning of scientific and technological information terms and concepts between Arab countries;
2. The role of the Arab League and its organisations and agencies in the area of information are still weak;
3. The role of information centres in Arab countries are not clear, and they usually deviate from their objectives;
4. Arabic technical manpower in the information and computer fields is rare; and
5. There are no societies or unions for information specialists in most of the Arab countries which can provide them with power, develop their movement, explain the role of information in all the fields and activities of their countries.

Added to that are the shortcomings affecting most information systems of the Arab World. These are mainly due to (Salem, 1986; Aman, 1984; and Griffiths, 1984):

1. Lack of surveys of information services in Arab countries;

2. Lack of co-ordination between various information services which often lead to duplication of work and waste of time, manpower and money;
3. Lack of objective plans for information services to develop a co-ordinated network;
4. Lack of communication with information services of the developed countries;
5. Lack of arabic cataloguing rules and classifications;
6. Ignorance of widely used international standard systems for the bibliographic description of records; such as: the copyright law, ISBN, ISSN, and so forth.
7. Shortage of training and education in the field of information and documentation.

5.2.5.5. Telecommunication

By telecommunications, we imply communication between people (telephone), between machines (computers) and between people and machines (television, video-text, etc.). Thus defined, telecommunications embrace the entire electrical and electronic infrastructure upon which the rationalisation of information is based.

By and large, the functions of telecommunication networks can be defined as follows (Salem, 1986):

1. Increase substantially the range, speed and capacity of business and office communication and information exchange. International, regional, and national computers networks are a best illustration;
2. Enable private link with factories, offices, etc. in the arrangement of domestic labour, ordering goods, communicating with banks, and so on; and
3. Provide new broadcasting facilities for television and radio such as cable and satellite broadcasting.

Bearing in mind the above mentioned functions, one ought to ask whether Arab telecommunication networks are up to their required standards.

Over two years ago, two Arab satellites were launched to cover the whole Arab region with regards to radio, television, telephone, data, etc. They were designed to provide the Arab world with 8,000 simultaneous telephone circuits, seven channels for television, data, telex and facsimile as well as one 2.6 GHz channel for transmission to rural areas (Salem, 1986).

But since their launch, ARABSAT satellites have hardly been used. The main reasons for the underutilization range from the lack of specialised manpower to the absence of earth stations in some Arab countries. Indeed, out of twenty programmed earth stations, less than half have been completed. In addition, ARABSTAT programme, which was conceived in the 1970s when oil export revenues were

soaring, is now seriously affected by the recent decrease in oil revenues. It should be remembered that oil prices have more than halved since the crash of 1986.

5.2.5.6. Information Technology and Computers

The countries forming the Arab World, in general, and the Middle East, in particular, are aggressively modernising themselves, and of course a major factor in modernisation is computerisation.

Until recently, however, such developments were hampered by the unusual properties of the Arabic script. The following is a brief account of the main factors that hindered the development of appropriate technologies. Additionally, some major solutions will be discussed.

One major problem that hindered the transfer of technology, particularly the computer technology is that of multilingualism. Most of the Arab countries have been in the past under the domination of either English or French. As a result of this, some of them continue, in one way or another, to produce their administrative documents in a language other than Arabic. Even in those countries where Arabic has replaced the foreign language, most of their archives, for instance, have been produced in English or French. Hence the problem of developing a system capable of dealing with two languages at the same time (Becker, 1987; Lakhdar-Ghazal, 1987; Aman, 1984; and Musa, 1982) .

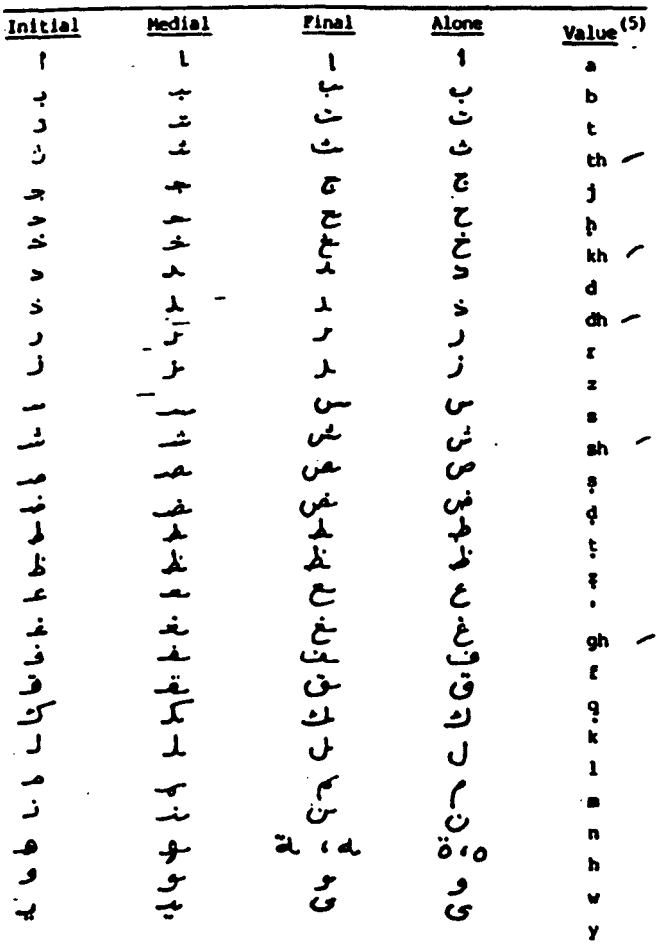
In the following, we shall study the characteristics of Arabic language to contain the various obstacles that delayed the development of a computer technology suitable for the Arab World.

5.2.5.6.1. Characteristics of Arabic Language

Until recently, any computer application that aimed to handle Arabic script was virtually impossible to implement successfully. All attempts were confronted to five categories of problems related to the basic characteristics of the Arabic script (Becker, 1987; Tekfi, 1986 and Aman, 1984).

1. Unlike languages using Latin characters, Arabic is written from right to left;
2. It consists of 31 characters (i.e. 28 letters in addition to "Al-hamza" which appears as a separate character, "Ta Al-Marbutah" which is another form of the character "Ta" and "Alif Al-Maqsurah".
3. With the exception of the letters "Alif, Dall, Dhall, Raa, Zin and Waw" which can only be linked to the previous characters, all the remaining set of characters can take four different shapes depending on whether they are situated at the beginning, middle, end or separately from the whole word (see Fig. 5.1.). Because of this particular problem, it is virtually impossible to conceive a keyboard that includes all the various forms of the Arabic script.

Figure 5.1. Various shapes of Arabic Script.

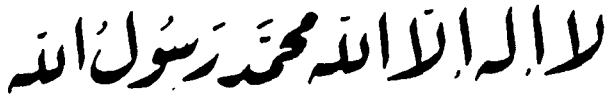


Initial	Medial	Final	Alone	Value[5]
ا	ـا	ـا	ا	a
ب	ـبـ	ـب	ب	b
ت	ـتـ	ـت	ت	t
ث	ـثـ	ـث	ث	th
ج	ـجـ	ـج	ج	j
ح	ـحـ	ـح	ح	ḥ
خ	ـخـ	ـخ	خ	kh
د	ـد	ـد	د	d
ذ	ـذ	ـذ	ذ	dh
ر	ـر	ـر	ر	r
ز	ـز	ـز	ز	z
س	ـسـ	ـس	س	s
ش	ـشـ	ـش	ش	sh
ص	ـصـ	ـص	ص	ṣ
ض	ـضـ	ـض	ض	ḍ
ط	ـطـ	ـط	ط	ṭ
ظ	ـظـ	ـظ	ظ	ẓ
ع	ـعـ	ـع	ع	ʿ
غ	ـغـ	ـغ	غ	gh
ف	ـفـ	ـف	ف	f
ق	ـقـ	ـق	ق	q
ك	ـكـ	ـك	ك	k
ل	ـلـ	ـل	ل	l
م	ـمـ	ـم	م	m
ن	ـنـ	ـن	ن	n
ه	ـهـ	ـه، ـة	ه، ة	h
و	ـو	ـو	و	w
ي	ـيـ	ـي	ي	y

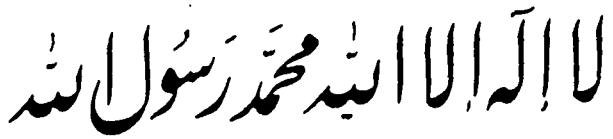
4. Related to the previous factor is the fact that the Arabic alphabet is highly calligraphic. Indeed, it is believed that over 900 different shapes of the Arabic alphabet exist. The development of this phenomenon seems to have been encouraged by the prohibition of some types of drawing in Islam. Figure 5.2. shows some types of the numerous arabic calligraphic styles.
5. Finally, one should point to another parameter that has added to the complexity of developing a computer capable of accepting Arabic script namely the five vowels (Al-fathah, Al-kasrah, Ad-dammah, As-sukun and Al-sheddah) which depending on the context can appear above or below each character. Although these vowels are not very important in commercial publications such as newspapers and magazines, it must be emphasised, however, that they are very crucial when carrying out, for instance, a bibliographic search. To illustrate this idea, let us take the case of the preposition "صن" which can mean "who" or "from" depending on whether the vowel "Al-fathah" or "Al-kasrah" is being used.

Considering the set of factors listed above, it is easy to realise why the conception of arabic computers has taken such a long time to develop. Indeed, a major problem that had to be overcome was to do with finding a way to uniformise the characters of the arabic alphabet. To achieve this, a series of meetings between experts of the concerned countries took place between 1976 and 1982. Consequently, a

Figure 5.2. Various Arabic Calligraphic Styles.



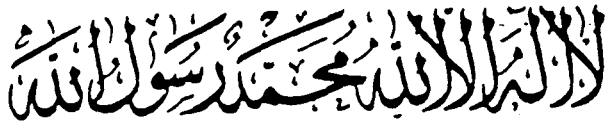
Ruq'a



Nastaliq

Diwani

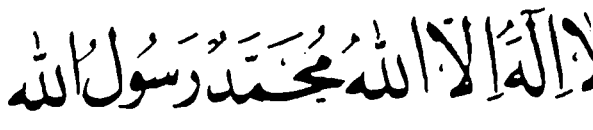
Royal Diwani



Rayhani

Thuluth

Kufi



Naskh

Naskh generated by computer

The phrase "There is no God but Allah, Muhammad is the Prophet of Allah" in various Arabic calligraphic styles.

uniform code known as CODAR-U/FD was adopted (see table 5.6.). The normalisation of arabic scripts is very important in that it enables library or archive offices using computerised systems to enhance their search facilities. It should be noted that computerised arabic library systems were developed well before the adoption of the CODAR-U/FD as the standard form of keyboard input, but suffered from several disadvantages. Of these, the following are of utmost importance (Aman, 1984; and Tekfi, 1986):

1. These systems did not make use of the five vocalisation symbols. Thus, the results of on-line searches were less pertinent as it was impossible to specify the term to search for when several terms consisted of the same characters but different vocalisation symbols;
2. The poor quality of the characters both on the screen or printout was deemed to be unpleasant to the reader's eye; and
3. The way in which the keyboard was set up was inappropriate for input purposes.

5.2.5.6.2. Recent Technological Developments

As a result of the publication of the CODAR-U/FD, several development in terms of both hardware and software have been achieved.

Table 5.6. The CODAR-U/FD.

b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
					0	0	0	0	1	1	1	1
					0	0	1	1	0	0	1	1
					0	1	0	1	0	1	0	1
0	0	0	0	0			SP	O	ﻫ	ذ		ـّـ
0	0	0	1	1			!	1	ء	ر	ف	ـّـ
0	0	1	0	2			"	2	آ	ز	ق	ـّـ
0	0	1	1	3			#	3	أ	س	ك	
0	1	0	0	4			¤	4	ؤ	ش	ل	
0	1	0	1	5			%	5	إ	ص	م	
0	1	1	0	6			‘	6	ئ	ض	ن	
0	1	1	1	7			’	7	ا	ط	ه	÷
1	0	0	0	8			)	8	ب	ظ	و	×
1	0	0	1	9			(	9	ة	ع	ي	«
1	0	1	0	10			*	:	ت	غ	ﭖ	»
1	0	1	1	11			+	؛	ث	]	ـّـ	}
1	1	0	0	12			،	>	ج	\	ـّـ	|
1	1	0	1	13			–	=	ح	[	ـّـ	{
1	1	1	0	14			.	<	خ	^	ـّـ	–
1	1	1	1	15			/	؟	د	_	ـّـ	

5.2.5.6.2.1. Hardware

Following the adoption of CODAR-U/FD numerous systems compatible with this code have seen the light of day.

1. The Method of Hyder

This method was introduced by Dr. Hyder (Department of Computer Science, Montreal University, Canada). Basically, it consists of keying a character which instead of appearing immediately printed on the screen is stored in the computer's memory. When the next character is entered, the previous letter is displayed on the screen. The most important advantage of this method is that it only requires one form of each arabic script to be represented on the keyboard while the others are automatically chosen by what Dr. Hyder (Aman, 1984) calls the "Arabic Script Processor" (ASP).

Despite this enormous advantage and its compatibility with the CODAR-U/FD, this method does not respond fully to the needs and requirements of Arab's archives, libraries and information services which often store documents in latin languages. To meet the requirements of these institutions, it was deemed necessary to conceive a system that incorporates the following facilities:

1. Ability to handle both Arabic script (as defined by CODAR-U/FD) and Latin script;

2. Ability to accept Arabic and Latin scripts on the same line; and
3. Ability to display properly the shape of each character so as to distinguish between characters that have some similarities.

Several companies have since then concentrated their efforts to produce systems compatibles with the above requirements. The most significant ones are:

- Al-Muhandis;
- Arabic Latin Information Systems (ALIS);
- Multi Media Video (MMV);
- SK Computer systems;
- European Space Agency;
- International Business Corporation; and
- Atari.

2. Eurab Terminal

Amongst the first institutions to produce a bilingual terminal was the European Space Agency (ESA). This was marketed in 1978 and is known as the Eurab Terminal. Although this system has the capability to handle both Arabic and Latin scripts simultaneously, it has the disadvantage of being incompatible with CODAR system adopted only in 1982 (Isotta, 1978).

5.2.5.6.2.2. Software

The development of appropriate software for Arabic use has been slower than that of hardware. Only a few applications have seen the light of day. In what follows, the author will describe the most significant of them.

1. Arabisation of MINISIS

This project was being carried out by The Arab League Documentation Centre in Tunis in collaboration with IDRC with funding from the UNDP.

IDRC is using an HP-2645A terminal with option L98 as the basis for this work, but will write the software in such a way it makes it as independent of the terminal as possible; a configuration processor will allow the user to specify certain characteristics of the terminal being used (Aman, 1984).

2. Arabisation of STAIRS

The National Scientific and Technical Information Centre (NSTIC) of the Kuwait Institute for Scientific Research (KISR) started automating its services in 1975. Until 1980, the system operated in batch. However, with the acquisition of an IBM 4341 computer in the same year, it has become possible to move to the use of on line applications not only in English but in Arabic as well. The latter part

of this section is devoted to the Arabic application (Khalid, 1983).

In order to respond to the needs of the growing number of users and provide them with easy access to the growing book and periodical collection, NSTIC acquired in 1981 a version of the STAIRS software package to work on its IBM computer. In addition to the technical characteristics of the package (eg. formulation of queries at different levels, input can be submitted in several different formats etc...), other factors stimulated the choice of this package (Khalid, 1983):

1. NSTIC had previous experience with the use of CMS (Conversational Monitor System) and all its files were created via CMS. Most important, however, is the fact that STAIRS accepts files created through CMS which represents a paramount advantage;
2. Several organisations in Kuwait have had experience using STAIRS;
3. STAIRS were to be given a complete support by IBM; and
4. The development of an Arabic version of STAIRS. Numerous kuwaiti organisations in addition to the IBM representatives in the country participated in the development of this version. For detailed information on the use and retrieval capabilities of Arabic STAIRS, the reader is kindly referred to the paper by Khalid (1983). Figure 5.3. illustrates a query conducted using the Arabic version of STAIRS.

Figure 5.3. A Sample Search Conducted on Arabic File of NSTIC's Database Using the Arabic Version of STAIRS (Khalid, 1983).

1. After logging on, Arabic STAIRS is intialized by entering:

2. The System responds by providing a welcome panel with brief explanation about STAIRS commands

3. On hitting 'ENTER' the system provides a list of files with a one line description of each file. The user enters the appropriate number (e.g. 1)

4. The system responds with a message that Arabic STAIRS has been accessed and that the user has to hit 'ENTER' and wait.

3. The Lexar Data Base

Scientific and technical concepts have been growing and changing at a staggering rate. To keep pace with these developments, it was vital for arab countries to conceive a system that incorporates this terminology and the changes it regularly undergoes. Hence the LEXAR data base, a French acronym for "lexemes arabes" (arabic lexemes). Lexar has been implemented with the assistance of the European Space Agency. Several bilingual and multilingual sources have been used to build this data base. This project was made possible using the following tools:

- A bilingual terminal namely; the Eurab terminal (please see above);
- A bilingual printer (Facit);
- A bilingual software for data input developed by the research institute of ESA (ie. ESRIN) in 1979; and
- An arabic version of Quest (ie Questar) for querying the database also developed by ESRIN in 1982.

The development of LEXAR underwent two main stages, the first of which lasted between 1978 and 1982. Despite the assistance of several international organisations (UNESCO, PNUD, the Commission of the European Communities and ALESCO), the first phase of the implementation programme suffered a number of problems principally due to the fact that the project was entirely new. Out of the 400,000 semantic relations assigned to the first phase of the

project, only 140,000 were completed and amongst these, 80,000 of them were inadequately entered because of bad telecommunication links between Rabat (Morocco) and Frascati (near Rome -Italy).

The second phase of the project, started in 1982 and completed in 1984 was, however, a real success. The reason for this was due to the acquisition of a high performance mainframe. The data base initially located in Frascati (Italy) was transferred to Morocco, where the computerisation of the data entry procedures was performed. The LEXAR data base consists, now, of approximately 450,000 semantic relations which can be searched on line. The average yearly growth rate of LEXAR is estimated at 22% (Lakhdar-Ghazal, 1987).

As already stated, LEXAR makes use of QUESTAR, an arabised version of the well-known query language: QUEST. It is possible to search for the equivalent of any concept in Arabic or any of the european languages such as English and French.

As it stands at the present moment, and despite being selective, LEXAR remains an invaluable tool for Arab terminologists in that it will help them develop a methodology for the conception of arabic scientific terms and thus enable authentic translations between Arabic and the rest of the european languages.

To conclude this section, it can be said that the implementation of Arabic versions of MINISIS, QUEST and STAIRS are definitely great steps forward in that they highlighted the tremendous potential to develop arabic automated systems in an area that has always been neglected. It is only through the development of such applications and the multiplication of such efforts that Arab countries will eventually be able to narrow down the gap that separates them from developed countries (Tekfi, 1986).

5.2.5.6.3. Links to On Line Databases

At present, there are about 7 Arab countries linked to one or more international information networks. The first online link was established in 1975 between the Moroccan National Documentation Centre in Rabat and ESANET. It has been followed in 1978 by the National Information Centre for Science and Technology of the Kuwaiti Institute for Scientific Research which linked with Dialog. In 1980/81 the Egyptian National Information and Documentation Centre was also linked off-line with Dialog. The Tunisian Agricultural Documentation Centre was connected with the FAO (Food and Agriculture Organisation) in Rome. Saudi Arabia is also linked with some international databases.

5.2.5.7. Information planning and information policy

Great efforts are being made by ALESCO (Arab League Educational Cultural and Scientific Organisation) with the assistance of UNESCO to promote and develop inter-Arab co-operation in the realm of library and information science as well as scientific and technological activities Salem, 1986).

ALESCO has been very active ever since it was created in 1973. The best illustration of ALESCO's efforts is the useful programme of publication, reports and studies, as well as conferences and seminars on the current topics of library and information science.

The one message shared by all ALESCO as well as other studies related to the information status in the Arab world is the emphasis on a fully integrated information policy with a social and economic plan for inter Arab co-operation and co-ordination.

5.3. CONCLUSION

In this chapter the author tried to cover the various obstacles that impede the development of a suitable information and scientific infrastructure in the Arab world. Various facets of the current situation were analysed; including:

1. Economic constraints;
2. Socio-political constraints;
3. Demographic and Cultural constraints;
4. Lack of adequate staff and manpower; and
5. Lack of adequate information infrastructure.

An emphasis was put on the last two factors. From the discussion of the above constraints, it can be concluded that Arab countries urgently need to explore all possible means to keep pace with the technological revolution. The following are a series of recommendations deemed to be important to close the technological gap separating them from the developed countries.

5.3.1. The National Level

1. Co-ordination between information resources and channels so as to eradicate duplication of efforts and as a result reduce the overall cost;
2. Clear identification of objectives and an information policy regarding available information systems, their capacity, types and services and performances;
3. Design of a comprehensive information covering the available systems and connecting the information plan with education and economic plans;
4. Development of a telecommunication infrastructure relating to the development of technology;

5. Introduction of information technology in organisations and institutions still using traditional information systems; and
6. Plans for enough technical manpower to work effectively in these fields, and implementation of the education plan, introducing information and computer related subjects in secondary and higher education.

5.3.2. The Regional Level

Once the national plans have been implemented successfully, the next step for Arab countries would be to concentrate on regional co-operation. This should include the following:

1. Current changes in science and technology and their eventual channels of transfer to the Arab world;
2. Role of information in the development of Arab countries;
3. Co-ordination between Arab countries in plans for information services; and
4. Seeking of help from international organisations.

5.3.3. Relations with More Developed Countries

Arab countries should strive to improve their relations with their counterparts of the developed world by concentrating on joint programmes to enhance the state of their information infrastructure. This can be easily achieved through training programmes, seminars and conferences and through co-operation between the two sides.

5.3.4. The Role of International Organisations

Arab counties should fully use and benefit from the services provided by international organisations such as UNESCO, ALESCO, FAO, PNUD, and so forth.

These institutions can play a vital role in developing the information infrastructure of Arab countries especially if the latter begins to implement international standards of information technology.

It is essential for developing countries to study in depth international and co-operation programmes in the field of science and technology, such as UNISIST, the UNESCO general information program. The following topics are of the utmost importance:

1. How to establish information policies and plans at the regional, national and international levels;
2. Development of national scientific and technical information systems;
3. Importance of international information systems for building national capabilities;
4. Training and manpower development in the information field.

It is also extremely important for Third World countries to make serious efforts towards adapting information technology to their own needs by taking into consideration likely constraints regarding their specific environments. This will

be realised only if local in-house pilot information systems are developed and implemented. This approach will create the nucleus for the required expertise needed for the continuation of the system. What is more, it will guide the efforts aimed at building the infrastructure for information technology. It is therefore important for developing countries to consider information as a basic asset.

CHAPTER VI

BACKGROUND TO ALGERIA

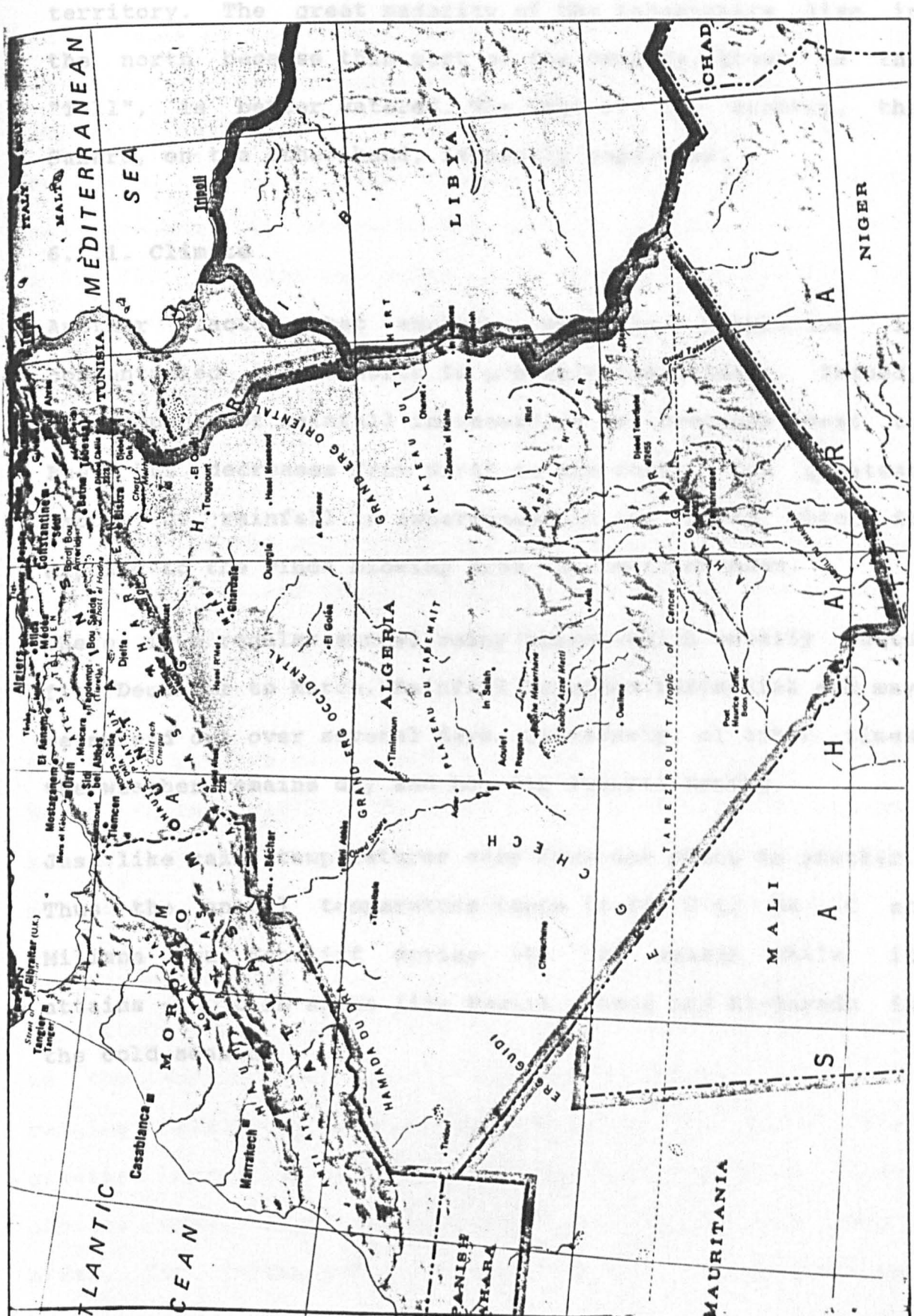
6.1. INTRODUCTION

Algeria is an independent Republic in the North West of Africa which is commonly known as the "Maghreb". With an area of 2,381,741 square kilometres of which some four-fifths is desert, it is considered to be the second largest country in Africa after Sudan and the tenth largest country in the World. According to the statistics published by the Ministry of Planification in 1984, Algeria's population was estimated at approximately 20,841,000.

Algeria is bounded to the North by the Mediterranean Sea, to the West by Morocco and Western Sahara, to the East by Tunisia and Libya and to the South by Mali Mauritania and Niger (Please see Figure 6.1.).

Algeria is a country of vastness, the Mediterranean Sea to the North separates it from Europe but at the same time opens a thousand doors to it, whereas the Sahara which represents about 1,995,000 Km^2 of the country's area links it to Africa. The coastline stretches for 1,200 km. While history, language, customs and religion make Algeria an integral part of the Arab and Muslim World, its internal and external choices place it among the Socialist Nations.

Figure 6.1. MAP OF ALGERIA



Algeria's population is unequally distributed throughout its territory. The great majority of the inhabitants live in the north because this part of the country, known as the "Tell", is better watered. The rest of the country, the Sahara, on the other hand, is poorly populated.

6.1.1. Climate

Another factor that explains why the population is concentrated in the North is probably the climate. Indeed, the amount of rainfall increases as one proceeds West to East but decreases from North to the South. The greatest amount of rainfall is experienced in the North which is exposed to the winds blowing from the Mediterranean.

There is a regular annual rainy season which usually lasts from December to March. Rainfall is often torrential and may be spread out over several days. Conversely, at other times the weather remains dry and hot for several months.

Just like rain, temperatures vary from one place to another. Thus the annual temperature range is 44 C to 54 C at Miliana and Echeliff during the hot season while it attains -15 C in areas like Bouira, Batna and El-Bayadh in the cold season.

6.1.2. Demography

As a result of the census undertaken in 1966, the population of Algeria was evaluated at 11,821,679. The preliminary census of 1971 gave a total of 14,643,700 (Djaad, 1982). Following the last census conducted in 1984, the population was numbered at about 20,841,000, in addition to about 1,000,000 Algerian nationals living abroad particularly in France.

The principal features of the population in Algeria are those usually found in most developing countries. It is mainly characterised by its youth . In the beginning of 1970s, 56% of the population was less than 19 years old; 37% was between 20 and 59 while only 7% was over 60 years old. In 1982, 60% of the population were less than 18 years old and 75% were less than 30 years old (Djaad, 1982).

The birth rate is considered to be one of the highest in the World (Horne, 1977). In 1981, this was estimated to be something like 3.2%. The population is expected to reach 24 million by the end of 1980s if such a rate is maintained.

As already stated, the population is unequally distributed throughout the country. Indeed, most of it is concentrated in the Northern sector of the country while the Sahara remains relatively poorly populated. In the North, the greatest densities are found in urban agglomerations, like Algiers, Oran, Constantine and Setif, as well as some rural areas, for instance Kabylia (Tizi Ouzou), which remains

Table 6.1. Population of Algeria by Regional Unit

No	WILAYA	AREA (Sq Km)	POPULATION
01	Adrar	422,498.0	161,936
02	Ech-Cheliff	8,676.7	1,040,563
03	Laghouat	112,052.0	391,817
04	Oum El-Bouaghi	8,123.0	464,806
05	Batna	14,881.5	691,079
06	Bejaia	3,442.2	659,040
07	Biskra	109,728.0	662,778
08	Bechar	306,000.0	184,069
09	Blida	3,703.8	1,126,303
10	Bouira	4,517.1	454,805
11	Tamanrasset	556,000.0	62,680
12	Tebessa	16,574.5	439,638
13	Tlemcen	9,283.7	678,025
14	Tiaret	23,455.6	731,542
15	Tizi Ouzou	3,756.3	1,028,864
16	Alger	785.7	2,442,303
17	Djelfa	22,904.8	403,500
18	Jijel	3,704.5	604,319
19	Setif	10,350.4	1,776,673
20	Saida	106,777.4	450,594
21	Skikda	4,748.3	597,530
22	Sidi Bel-Abbes	11,648.2	604,773
23	Annaba	3,489.3	650,096
24	Guelma	8,624.4	633,733
25	Constantine	3,561.7	807,245
26	Medea	6,704.1	575,305
27	Mostaganem	7,023.6	396,765
28	M'Sila	19,824.6	540,013
29	Mascara	5,845.6	526,644
30	Ouargla	559,234.0	261,760
31	Oran	1,820.0	889,800
TOTAL		2,381,741.0	20,841,000

over-populated despite the large number of people who have emigrated to Western Europe, mainly to France.

Compared with 1962, the illiteracy rate has drastically decreased in the late 1970s. Nowadays, it is thought that 70% of the population in Algeria is literate (Djaad, 1982).

6.2. HISTORY

The early history of Algeria which derives its name from Al Djazair (the arabic equivalent for islands) is similar to that of North Western Africa as a whole in that the neighbouring countries, particularly Morocco and Tunisia, share the same kind of history. Indeed, North Western African countries have been subjected to six principal foreign influences. The first was that of the Phoenician and Carthaginian which lasted for approximately 1000 years from 1200 B.C. Then followed the Roman influence for another 650 years. Between 429 and 642 came the Vandals and Byzantine restoration which was superseded by the Arab predominance for about 800 years. From the beginning of the 16th century until the French colonisation on 14th July 1830, Algeria was under the control of the Ottoman Empire. The following is a brief account of the last three stages.

6.2.1. Arab Conquest

Muslim armies had begun their Westward advance from Egypt in A.D. 647, but their conquest of North Western Africa was not completed until 711. The eastern part of what is now Algeria was the main centre of resistance to the Muslims. The Muslim conquest did not, however, lead to the settlement of the country by arabs. While arab leaders and soldiers were installed in small towns, the rural areas remained under the control of the berbers. Until the short Spanish conquest in the 16th century, Algeria was ruled by several dynasties of which the Omayyads, Fatimids, Zarids, Hammadids, Almoravids and finally Almohads are the most important (Mortimer, 1968; and Cartwright, 1974).

6.2.2. Turkish Conquest

The Christian reconquest of Spain was followed in the early years of the 16th Century by the Spanish occupation of several places on the Algerian coast (mainly Mers-El-Kebir, Bejaia and the Island part of Algiers itself). Because Sultan (king) Abd-Al-Wadid accepted the protectorate, the Muslim population decided to appeal to Turkish pirates for help. These, in turn, appealed to the Ottoman Sultan in order to send strong forces to support them (1518). These events resulted in the end of the Spanish conquest, the fall of the Sultan Abd-Al-Wadid and the reduction of Algeria to a vassal state of Ottoman and Turkish (Mortimer, 1968)).

Turkish Algeria was theoretically governed by a Dey nominated by the officers of the militia. The country was, at that time, divided into three major provinces which were also subdivided into cantons. The provinces were ruled by Beys while the cantons were governed by Caids. Both Beys and Caids enjoyed a considerable measure of autonomy which led to the end of the Ottoman and Turkish Empire by the beginning of the 19th Century.

6.2.3. French Colonisation

The French 132 years involvement in Algeria had started, ominously enough, with the toppling of the last Bourbon Throne on 14th July 1830. The Turkish were deported. Troubles in France delayed further conquest for a few days, but gradually the main towns were colonised. Despite formidable resistance, the whole country succumbed by 1857.

Concerted political opposition began after the Second World War, reflecting the rise of Nationalism in other parts of Africa and the Middle East. The first major nationalist movement was the Etoile Nord Africaine, formed by Messali Hadj. Its revolutionary demands forced its underground. Other groups put forward less radical reforms, but these too were rejected. When the French administration took control, it proved to be no more flexible and therefore aggravated the situation. As early as 1947, armed cadres were trained and organised. Joint action between the groups was agreed

and on 1st November 1954 at midnight, the Algerian Revolution under the political banner of the Front de Liberation Nationale (F.L.N.) through its armed forces, the Armee de Liberation Nationale (A.L.N.) began (Horne, 1977).

The Algerian Revolution lasted nearly 8 years. This war was to cause the fall of six French Prime Ministers and the collapse of the Fourth Republic itself. It also came close to bringing down General de Gaulle and his Fifth Republic and twice to the confronting Metropolitan France with the threat of Civil War. The Algerian Revolution was described as undeniably and horribly savage, bringing death to an estimated 1.5 million Algerians (Lambotte, 1976; and Horne, 1977).

6.3. THE NATIONAL ECONOMY

Following Algeria's long war of independence (1954-62) and the departure of French personnel, the economy was severely disrupted and suffered from a shortage of skilled workers. To overcome these problems, the government assumed a dominant role in the economy through the nationalisation of large agricultural estates, important manufacturing enterprises and banks in addition to the nationalisation of the extraction and processing of hydrocarbons (petroleum and natural gas) which constitutes the corner-stone of the Algerian economy (Martens, 1973).

Indeed, assisted by sharp rises in petroleum prices since 1973, Algeria has experienced rapid economic expansion and industrialisation with the inevitable decline in the importance of agriculture.

6.3.1. Agriculture

Although only about 10% of Algeria's land can be used for agriculture, 42% of its population relies on agriculture. There are about 6.8 million ha of arable land, that is an average of 1 ha per rural inhabitant (Lassassi, 1988). The main agricultural products comprise: cereals, grapes, maize, olives, citrus, dates, fruits and tobacco.

During the colonisation, the most profitable estates were owned by the French and the country's agricultural production was geared to the metropolitan market. For instance, until the late 1970s wine was one of Algeria's major valuable export.

Since the accession of the country to its independence, the policy for agricultural improvements aimed at a higher degree of self sufficiency and included important agrarian reforms (reforms in land-holding, establishment of co-operatives, expenditure on irrigation work, etc.). One of the most spectacular project in this area, however, is the one that attempts to stabilise physical conditions in the northern half of the country by planting a 'wall of trees' twenty kilometres wide across the country.

6.3.2. Industry

It was already pointed out that the Sahara, in Algeria, is the least populous part of the country. Nevertheless, it conceals rich mineral resources and above all abundant sources of energy to the extent that petroleum and its by-product natural gas constitute the basis of the Algerian economy. Indeed, in 1986, the reserves of petrol were estimated to 8,000 million barrels. Oil production began in 1958. On the other hand, natural gas reserves were evaluated at 3,200,000 million cubic metres (Lassassi, 1988).

To service the export market, three pipelines were built to coastal terminals. The most important project in this area, however, remains the 2500 km gas pipeline linking Algeria with Italy via Tunisia and which was completed in 1983. A similar project which will link Algeria with Spain is being studied. But, the route that was suggested, through Morocco to the Straight of Gibraltar, was considered unsatisfactory by Algeria because of its dispute with Morocco over the problem of the Western Sahara.

Algeria set a precedent for nationalisation and by 24th February 1971 gained control of all foreign oil interests. The oil and gas industries are run by a state organisation namely SONATRACH (Societe Nationale pour la Recherche, le transport, la Transformation et la Commercialisation des Hydrocarbures).

As already stressed, until the independence the country was a captive market for French manufacturers and as a result local industries remained almost inexistent beyond construction materials, textile and basic food processing. However, with its substantial oil and gas revenues, Algeria has been able to make bolter efforts to lay a solid foundation for its economy. For instance, the output of Al-Hadjar's iron and steel works located at Annaba which began production in 1972 is believed to have reached 2 million tons by the end of 1970s. Several other industries related mainly to petroleum industry (petrochemicals, fertilisers and plastic factories) have also been developed. Other developments include vehicle and agricultural machinery assembly situated mainly at Constantine and Sidi Bel-Abbes (Martens, 1973; Lambotte, 1976; and Lassassi, 1988).

6.3.3. Planning

Since 1962, the vital sectors of the economy have been taken over, reorganised and managed by state agencies. This control has enabled the implementation of national plans. Between 1967 and 1973, Algeria concentrated on the establishment of heavy industries but has since then focused attention on medium-size manufacturing industry, improved agriculture and more comprehensive welfare services.

Because the first development programmes concentrated mainly on heavy industries, this led to the depopulation of rural areas, and as a consequence to a decline in urban living

standards. Accordingly, in December 1979, the FLN Central Committee indicated a shift of emphasis by condemning the country's reliance on the export of hydrocarbons and persistent regional imbalances.

Thus several measures evolved from this meeting in order to tackle the problems previously referred to. The following points constitute the major decisions taken during that meeting (Lassassi, 1988):

1. Decentralisation of industry away from Algiers;
2. Reduction of export of crude oil;
3. Completion of large-scale project already started; and
4. Encouragement of private sector.

Of more significance, perhaps, is the emphasis put on the agricultural sector. Indeed, in an effort to combat the decline of the importance of agriculture, to cut down food imports and to boost employment, the government increased investment in agriculture to 11.8% of the total in the development plan of 1980-1984 and to 20% in that of 1985-1989.

Another target of 1980-1984 plan was to tackle the chronic housing shortage. In fact, an ambitious building programme was launched with an objective of 450,000 new homes to be built during that period (Lassassi, 1988).

6.3.4. Trade

Before independence, France has been Algeria's main trading partner, but since then its prominence has been diminishing steadily because of increasingly broadened exchanges with the other members of the Organisation of the Economic Co-operation and Development (OECD) such as Belgium, the Federal Republic of Germany, Italy, Spain, the United Kingdom, in addition to the USA.

Indeed, until 1962, France took 81% of Algeria's exports and provided 82% of its imports. However, by 1977, France's share of Algerian trade dropped to 12.7% and 24% of exports and imports respectively (Leca and Vatin, 1974; and Lassassi, 1988). Furthermore, when France decided to take a larger part of its crude oil from Saudi Arabia, Algeria retaliated by imposing a ban on the import of French goods.

With the advent of a socialist government in France, however, relations improved considerably. Thus, in 1983 France was providing 24% of Algeria's imports and taking 30% of its exports.

6.4. HOME AFFAIRS

During 1976, Algerians participated in three major referenda. The first one organised on 27th June resulted in an overwhelming approval of a National Charter which committed the population to the building of a socialist nation, designated Islam as the state religion and defined

fundamental rights of citizenship (including Women's Rights).

The second referendum, held on 17th November 1976, established a new constitution after eleven years of interruption while the third, on 10th December of the same year, reconfirmed Colonel Houari Boumediene, who died on 27th December 1978, as Algeria's President with an official majority of 99.38%.

Finally, on 25th February 1977, a National People's Assembly (A.P.N.) consisting of 261 members was elected on the basis of a candidate list presented by the F.L.N.

6.4.1. Government

The first Algerian Constitution was promulgated in 1963, but was then suspended in 1965. It is only in 1977 that Algerians voted for another Constitution. Under this constitution, it is stressed that Algeria is a socialist single-party state. The head of the state is the President of the Republic who is nominated by a congress of the party of FLN. He is elected for a five-year-term by universal adult suffrage and shares legislative power with a National people's Assembly which was originally composed of 261 members and then increased to 281 on 5th March 1982 . Just like the President, members of the National Assembly are elected by universal adult suffrage for a five-year term.

6.4.2. Administration

Administratively, the country is divided into regional units (Wilaya) which are subdivided into districts (Daira) which are in turn subdivided into communes. Originally, Algeria consisted of 15 administrative regional divisions. This was the result of the administrative reorganisation which took place in 1956. The number of regional divisions was increased to 31 in 1974 and then to 48 in November 1984.

At both the regional (wilaya) and commune levels, there are provisions for popular assemblies and each wilaya has an appointed governor (Wali). The various administrative units are vertically connected to the Ministry of Interior. All candidates for election, whether to local or national assemblies or to the presidency of the Republic, are nominated by the FLN but the electorate may be offered a choice of candidates.

6.5. FOREIGN POLICY

In order to consolidate and build its national strength, Algeria chose, after its independence, to conduct its foreign policy with extreme caution. However, Algeria remained committed to anti-imperialism and a militant stand of the Palestinian question despite the fact that its involvement in the six day Palestine War was relatively small.

It is only in the early 1970s that Algeria began to play an increasingly important and diplomatically successful role in the world affairs. This change in policy coincides with the joining of the Organisation of Petroleum Exporting Countries (OPEC) in 1969.

6.5.1. Algeria and the Maghreb

Long-standing disputes between Algeria and Morocco over areas on their common frontiers deteriorated into open conflict soon after the independence. The hostilities which opposed the two countries in October 1963 were quickly brought to an end through the mediation of interested African countries, but they left a legacy of bitterness between the two countries (Horne, 1977; and Lassassi, 1988).

A determined effort was made to improve relations with neighbouring countries in the Maghreb. Thus, in January 1969, President Boumediene paid his first visit to Morocco for talks with King Hassan II and the following June, frontier posts were reopened for the first time since 1963.

In May 1970, an agreement was signed, settling the long-standing border dispute and pledging mutual co-operation on the Spanish presence in Western Sahara (Lassassi, 1988).

From early 1975, a major confrontation developed between Algeria and Morocco over the future of the Western Sahara which was under Spanish control until November 1975 when

Spain decided to hand over the territory to Morocco and Mauritania.

Nevertheless, following a series of meetings between the heads of states in 1983, relations between the countries composing the Maghreb (Algeria, Mauritania, Morocco and Tunisia) improved considerably. As a result of this effort, the Maghreb Fraternity and Co-operation Treaty was signed between Algeria, Mauritania and Tunisia. The aim of this treaty was to lay down the foundations for the long-discussed Greater Maghreb Union. However, this union seemed unrealisable so long as the divergence existing between Algeria and Morocco over the Western Sahara remains unresolved. This conflict was finally resolved when the leaders of both countries met in the West of Algeria in the Summer of 1988 for preliminary discussions. Since then, the relations between the two countries have been gradually improving.

6.5.2. Algeria and Africa

As a result of its revolutionary experience, Algeria supports what it considers legitimate "National Liberation Movements" all over the World especially those in Africa and the Middle East.

Algeria is also interested in developing political and commercial relations with African states to the south and is looking to eventual markets for its industrial products.

For this reason, the Algerian Government has paved a trans-Saharian highway from Algiers to Tamenrasset. Paving to Mali and Niger should further facilitate expanded trade between North and West Africa.

6.5.3. Algeria and the Arab World

Amongst the Arabs, the Algerians have enjoyed high prestige for the past twenty-five years because of their courage and endurance during the bitter struggle for independence. This has given them special influence in Arab affairs. Between 1967 and 1973, Algeria was one of the states which rejected the UN Security Council Resolution 242 and showed its scepticism towards Egyptian and Jordanian attempts to achieve a political solution to the Middle East struggle. When Egypt accepted the US-sponsored cease-fire in August 1970, Algeria decided to withdraw the contingent of troops it stationed on the Suez Canal.

Algeria's position towards the Palestinian question remained uncompromisingly militant. Thus, when the Palestinian radio stations were banished from Cairo in May 1970, they were allowed to broadcast from Algiers as from June of the same year (Lassassi, 1988).

Until today, Algeria continues to be a faithful supporter of the Palestinian cause and continues to provide the palestinian Liberation Organisation (PLO) with all necessary aid.

6.5.4. Algeria and the Non-Aligned Movement

Whatever the importance of its Arab policy, Algeria's special contribution to world affairs is as a spokesman for the developing countries of the Third World in their dialogue with the rich industrialised nations.

Algeria defines its foreign policy as one of strict independence and non-alignment. It is often a leading proponent of the Third World viewpoint in international affairs and has taken an active role in the Non-Aligned Movement.

Since 1962, Algeria has always been one of the prominent non- aligned countries and accordingly played a key role in the negotiations over the American hostages in Iran, leading to their release in January 1981.

Algeria clearly established its claim at the conference of non-aligned nations held in Algiers in September 1973 and attended by fifty-seven heads of state.

6.5.5. Algeria and the Western Bloc

The relationship with France, Algeria's main customer and the source of substantial assistance, remained paramount until February 1971, when the Algerian President, Houari Boumediene, announced the take-over by the Algerian government of a 51% holding in Compagnie Francaise des Petroles (CFP) and Entreprise de Recherches et d'Activites

Petrolieres (ERAP); and the entire nationalisation of the various gas companies and pipeline interests. Consequently, the French government reacted by (Bouzidi, 1983):

- Asking several French technicians and teachers to leave Algeria; and
- Boycotting Algerian oil.

In addition, several attacks were organised against the Algerian community in France. According to published statistics, there is an average of one Algerian being assassinated every month since 1971 (Lassassi, 1977).

Relations between the two countries, however, improved with the advent of the socialist government in France in 1981. Consequently, in December 1982, Chadli Bendjedid, made the first ever visit of an Algerian President to France since independence. Among the problems discussed by the two governments at that time, the following were of the utmost importance:

- Repatriation of Algerian workers in France;
- Algerian trade deficit with France;
- Illegal immigration to France;
- Price of Algerian gas exported to France; and
- Transfer of the Algerian archives to France in 1962. This problem will be the subject of a detailed discussion in the next chapter.

A highly critical, often openly hostile attitude to the USA, was maintained until 1974 when full diplomatic relations were restored. The reasons for this disagreement was due to the American intervention in Vietnam and its standpoint towards the Palestinian problem. By 1977, the trade between the two countries increased dramatically. Relations with USA were further strengthened in the beginning of the 1980s when Algeria contributed to the release of the American hostages in Iran. Thus, a notable improvement in the relations with the United States was made, culminating, in April 1985, in a summit meeting in Washington. This was also the first visit of an Algerian head of state to USA since independence.

6.5.6. Algeria and the Eastern Bloc

Algeria's political system is democratic neither in the Western parliamentarian, nor in the Marxist, meaning of the term. At the time of independence it was widely believed that the FLN which had been the instrument through which Algerians had taken part in the revolution, would be entrusted with ruling the country and 'mobilising the masses' in the Marxist sense (Lassassi, 1988).

Fears that Algeria might fall under Soviet dominance, especially after the French handed over in 1968 the military harbour of Mers-El-Kebir, situated near Oran, proved groundless (Horne, 1977).

In theory, Algeria would like to develop relations with the Eastern Bloc states. In practice, however, Algeria is increasing its political and commercial relations with all countries of the World. For example, until the beginning of the 1980s, Algeria acquired most of its military equipment from the Soviet Union, but when the Algerian President visited the USA in April 1985, he seized the opportunity to express his wishes to buy arms from a wider market and principally to purchase American military aircraft, electronic equipment and radar (Lassassi, 1988).

6.6. HEALTH

Making medical care available to every sick person and to providing them with the proper remedy at the proper time, has been one of the golden dreams of humanity ever since man began to seek perfection at the individual as well as the community level.

Nonetheless, the number of countries which have been able to provide their citizens with full medical care, whether free or not, is still negligible, even amongst the developed world. Bearing this in mind, it is easy to realise how anxious the algerian government has been to achieve an ideal social system if we know that the state has taken on the obligation to provide medical care to all citizens. Moreover, this full medical care guaranteed by the state is not confined just to the use of the medical facilities available in Algeria, but also entitles any citizen who has

not found recovery in the country's public medical facilities to seek treatment abroad at the expense of the Algerian Ministry of Health.

6.7. EDUCATION

The Algerian government is very much concerned about education and provides considerable sums of the national income to provide its citizens with the best educational programmes throughout its different stages.

In Algeria, education is free for both boys and girls attending schools and at all levels of study. Indeed, The government is concerned with the education of female as well as that of male population. In 1983, for instance, the female population represented 43%, 39% and 32% of primary, secondary and higher education respectively.

Adult literacy which in 1966 averaged 81.2% is being combated by a large-scale campaign in which the broadcasting services in addition to schools are widely used.

Broadly speaking, the algerian education system is divided into three main levels:

1) Primary education;
2) Secondary education; and
3) Higher education.

Table 6.2. Education in Algeria
Source: Unesco Statistical Yearbook.

YEAR	PRIMARY EDUCATION	SECONDARY EDUCATION	HIGHER EDUCATION
1962/1963	777,636	51,014	2,841
1963/1964	1,105,066	56,085	3,816
1964/1965	1,270,150	80,480	5,926
1965/1966	1,357,608	94,745	8,053
1966/1967	1,409,381	135,336	9,272
1967/1968	1,500,399	160,444	9,720
1968/1969	1,585,682	177,382	8,264
1969/1970	1,689,023	198,836	-
1970/1971	1,887,148	242,335	19,531
1971/1972	2,057,048	299,280	24,334
1972/1973	2,244,844	344,407	27,122
1973/1974	2,409,367	384,001	30,070
1974/1975	2,525,365	419,759	35,888
1975/1976	2,663,248	512,428	41,847
1976/1977	2,785,264	615,267	52,424
1977/1978	2,897,500	745,838	61,767
1978/1979	2,976,842	847,184	59,921
1979/1980	3,064,810	933,335	68,416
1980/1981	3,122,566	1,031,791	79,351
1981/1982	3,178,912	1,154,709	78,027
1982/1983	3,241,924	1,473,053	95,867

In Algeria, education is compulsory for a period of nine years between six and fifteen years of age. Primary education begins at the age of six and lasts for six years. Intermediate education starts at twelve years of age and lasts for up to seven years. It consists of a cycle of four years which is known as the middle or intermediate education and another of three years referred to as the secondary education.

Until 1973, when reforms were introduced, education in Algeria continued to follow the pattern laid down by the French administration. To keep in line with the objectives of the National Charter, however, the various primary and secondary schools were unified in 1976. Thus private education was abolished and a nine-year 'Enseignement Fondamental' was introduced.

6.7.1. Primary Education

According to the latest statistics published in 1975-76, 95% of primary school teachers and 65% of secondary school teachers were Algerians while they were mainly French before and shortly after the independence.

The statistics published in 1984 by the Ministry of Planification show that 84% of children aged six to eleven years (93% of boys and 75% of girls) attended primary schools. 47% of those aged twelve to eighteen were enrolled at secondary schools (54% boys and 39% girls), whereas only

5.8% of the population aged 20 to 24 was attending higher education institutions.

At the present moment, priority in the sector of education is given to teachers training, the development of scientific and technical programmes, adult literacy and training schemes in order to satisfy the economic and technical needs of the country. Thus, in 1983, there were 20,664 teachers of which 35% were female. In 1986, there were 5,000,000 pupils enrolled at primary schools while there were only 777,636 in 1962-63, that is an increase of over six times.

6.7.2. Secondary Education

Similarly, 2,000,000 pupils were registered in secondary school establishments whereas only 51,014 were enrolled at the beginning of the independence which corresponds to an increase of approximately forty times.

6.7.3. Higher Education

To encourage the pursuit of learning amongst students at university level, grants of approximately 200 pounds are paid to them termly.

As far as higher education is concerned, in 1982 there were 4 established universities and eight newer ones with a total of 80,000 students. A programme was under way to build a Centre Universitaire within every regional unit (Wilaya).

Thus in 1986, 26 out of the 48 regional units had their own university.

As a result of the opening of these new institutions, the number of students receiving higher education reached 166,000 while there were only 2,725 in 1962-63. According to the statistics published in 1983, the female population represented 32% of the total number of students attending higher education institutions.

Because of the conviction that the power, economic growth and prosperity of advanced countries stem from science and technology, Algeria like any other Third World country has given priority to education, and mainly science and technology, in its various programs of development.

Education is, however, only one factor amongst several others that are required to achieve economic prosperity. Another significant parameter is indeed the availability of libraries, archives and information services together with the availability of suitably qualified personnel.

6.8. STATE OF THE ART OF THE INFORMATION INFRASTRUCTURE AND SERVICES IN ALGERIA

Like the rest of Third World countries, Archives, Libraries and information services in Algeria are characterised by the following features:

1. Inexistence of basic information sources such as abstracts, indexes, specialised directories and bibliographies;
2. Shortage of qualified staff;
3. Inexistence of a professional organisation that can co-ordinate the various activities of this sector;
4. Lack of an adequate information infrastructure; and
5. Lack of an appropriate information policy.

6.8.1. Lack of an Adequate Information Infrastructure

The most significant problem facing Algeria and indeed all developing countries is the absence of a suitable information infrastructure. In fact, this infrastructure barely exists and where it does it is not adequately developed.

In Algeria, as in most developing countries, libraries are not given the importance that is required to help them contribute effectively to the national economy. Indeed, not only the number of libraries is too limited to respond to the needs of the ever increasing population, but also the resources allocated to these libraries are extremely limited. Even university libraries which are supposed to provide the various sectors of the economy with a qualified personnel are not well equipped to carry out their duties.

It is only in the mid-1970s and principally with the publication of the National Charter in 1976 that the government recognised the importance of libraries in the process of development. Thus an ambitious programme of 1,000 libraries was considered.

It should, however, be stressed that this programme was never carried out fully because of the lack of sufficient financial resources.

6.8.2. Lack of Qualified Staff

Related to the lack of an adequate information infrastructure is the lack of a properly trained personnel. In 1979, there were approximately 60 higher institutions (universities and others); at the same time, the number of professional was thirteen (7 librarians and 6 documentalistes).

One of the crucial problems facing information services in Algeria is the incredible shortage of qualified staff. Allahoum and Tekfi (1981) conducted a study which assessed the availability of well trained personnel in 101 institutions in the region of Algiers. These organisations consisted of:

- 14 ministries, that is 13.72% of the sample;
- 32 research centres, that is 32.35% of the analysed institutions; and
- 55 state owned companies, that is 53.92% of the total.

Table 6.3. Scattering of Qualified Staff by Category of Institutions
Source: Allahoum & Tekfi (1981).

ORGANISATIONS BACKGROUND	MINISTRIES	RESEARCH CENTRES	COMPANIES	TOTAL
GENERAL BACKGROUND	29	53	67	149
TECHNICAL BACKGROUND	10	14	28	52
TOTAL	39	67	95	201

The results reached by this study are summarised in Table 6.3. It can be seen from this table that out of the 201 people who took part in this study, only 52 (25.87%) have had some kind of technical training in library, archives and information fields. It is also to be noticed that 53.84% of this population was concentrated in state owned companies. A very likely reason for this is the fact that companies tend to give higher salaries than the other sectors which are mainly public (e.g. ministries).

It would be wrong to believe that all of what was referred to as staff with technical background or experience is actually properly trained. Indeed, the study also revealed that the type of training received, by the staff who participated in this study, could be broken down into three different categories:

- Medium level (O'levels) 3.84%;
- Secondary level (A'levels) 59.61%; and
- High level (B.Sc or Diploma) 36.53%

The first category represents people with a long experience in the area. The second consists of those who failed in their Baccalaureat and undertook a one-year course in librarianship (Diplome Technique de Bibliothecaires Adjoints = Technical Diploma for Assistant Librarians) while the last category includes people who have a B.Sc degree or postgraduate Diploma in Librarianship and Information Studies (Allahoum & Tekfi, 1981).

Considering the great shortage of qualified staff in these areas, a Department of Librarianship and Information Studies was inaugurated at Algiers University in September 1976. It offers a four-year course leading to a B.Sc degree in the area. Each academic year is divided into 2 semesters sanctioned by examinations (Please see syllabus in Appendix 1).

Basically, the course is comprised of:

- 1185 hours devoted to technical subjects;
- 450 hours are allocated to general subjects of which 360 hours are devoted to foreign languages. Students have the option to choose between four different languages; namely: English, Italian, Russian or Spanish;
- 6 practical trainings (one at the end of each of the first six semesters); and

- Writing up a thesis in the last semester (ie. Semester 8).

Initially, during their final year, students had to choose between three options namely: Documentation, Librarianship and Archives Administration. Since the beginning of the academic year 1986-1987, however, this system of options has been abolished. The main reason being that not a single student accepted to opt for the Archives Administration option ever since the course started in 1976. Accordingly, archival institutions in Algeria continued to suffer from a relatively higher shortage of staff than their counterparts libraries or documentation centres.

The number of students who graduated since the Department of Librarianship and Information Studies opened at Algiers University is presented in Table 6.4.

The table above points out to two major facts:

a) The number of graduates is extremely low to respond to the country's national needs. As the above table indicates, only 187 students graduated since the department was first opened that is an average of 26.7 students per year since the academic year 1979/80 which saw the graduation of the first students in this field; and
b) It can further be noticed that the archives option remained completely deserted by the students.

Table 6.4. Evolution of the number of Graduates at the Department of Librarianship & Information Studies (Algiers University)

YEAR	LIBRARIES	DOCUMENTATION	ARCHIVES	TOTAL
1979/80	0	4	0	4
1980/81	1	23	0	24
1981/82	6	31	0	37
1982/83	6	13	0	19
1983/84	2	15	0	17
1984/85	6	47	0	53
1985/86	4	29	0	33
TOTAL	25	162	0	187

Amongst the factors that explain why only a few students consider opting for Information Studies in Algeria, the following are of significant importance:

1. Students do not think that it is worth risking 4 years full time study to undertake a B.Sc. degree in a field that remains completely unknown at the national level;
2. The lack of information about the syllabus and especially the future prospects of this degree force potential students to avoid this area; and

3. The lack of a status specific to Archivists, Librarians and information scientists.

One striking drawback of the present syllabus is the neglect of subject relating to modern information retrieval and automation. Indeed, the whole syllabus includes only 3 modules related to Information Technology and automated systems. These are:

- Introduction to Computer Science;
- Automation of Libraries; and
- Introduction to Information Technology.

Added to that is the fact that students have no access to computers and modern information retrieval facilities.

To encourage students to consider this profession, three further departments of librarianship and information studies were inaugurated in three different cities, namely: Annaba and Constantine in the eastern part of the country and Oran in the western part of it.

The lack of sufficient and well trained staff is therefore a serious problem affecting developing countries and it considerably hampers the development of documentation, library and archives services of all kinds and at all levels.

This shortage of skilled information professionals is believed to be one of the major causes of the slow development of Arab countries. Indeed, this situation has

placed information specialists at a disadvantage in relation to other specialists and the profession has been unable to obtain the political, administrative and financial decisions necessary for the development of its services. Due to the vital importance of this profession as a factor of development, developing countries ought to rethink their policies toward this profession if they are to overcome their problems.

6.8.3. National Information Policy

The UNISIST II conference recommended that "all countries should elaborate national scientific and technological" in order to promote scientific, technical, economic and social development and accordingly stimulate and harmonise the setting up of national information systems and/or networks (1979).

Algeria's national information policy was first discussed during the 7th session of the Central Committee of FLN (Front de Liberation National = National Liberation Party) between 15th-17th June 1982. As a result of this meeting, the following resolutions were adopted (Morsli, 1982 ; and O.P.U., 1982):

1) Approve the report on information policy as a reference document for the development of information;
2) Make sure that every citizen has the right to an objective information;

3) Consider information as an essential tool of the revolution;
4) Ensure the co-ordination between the different organs of information;
5) Confide the responsibilities of the various organs of information to the militants of the party (FLN);
6) Help journalists in accomplishing their duties;
7) Let journalists have access to all sources of information;
8) Stress the relationship between information policy and cultural policy;
9) Speed up the reorganisation of the different organs of information;
10) Consider the organs of information as social institutions;
11) Elaborate an urgent programme to enable the rational use of the various means of information available in the country and those that are necessary to meet the above objectives;
12) Integrate the various information projects within the national development plans;
13) Widen the radio and television broadcasting network; and
14) Use publicity as a means to make the national products widely known amongst the population.

To keep in line with the recommendations and guidelines set by the Unisist programme, an ad hoc committee, at a high level, was set up on 25th November 1984 to materialise the

resolutions cited above. This high committee consists of 9 members, namely:

a) The President of the National Popular Assembly (APN);
b) The Prime Minister;
c) The Minister of Information;
d) The Minister of Foreign Affairs;
e) The Minister of Posts and Telecommunications;
f) The Minister of Culture and Tourism;
g) The General Secretary of the Ministry of Defence; and
i) The General Secretary of the Presidency.

The committee was placed under the authority of President Chadli Bendjedid; and was assigned the following objectives:

1) Guarantee the right to information to all citizens;
2) Develop information about the country so as to safeguard the national cohesion;
3) Ensure the distribution of a qualitative information;
4) Protect the various components of the society and notably youth from information which might affect the national identity and values;
5) Develop all technical and technological means of information; and
6) Encourage training and promote the professions of journalists in addition to those directly related to the development of communication.

It can be seen from the above outline that the Algerian Information Policy as it stands at the present moment makes no mention of the role of archival institutions, libraries, documentation services, data bases or networks, which are keys components of any well-formulated information policy, nor does it refer to information specialists while clearly mentioning journalists. Ideally, the scope of an information policy should include:

1. Manpower: development: the education and training of information specialists, broadly defined, for the design and operation of systems and services; and the provision of sufficiently high renumeration, status and career prospects to attract people;
2. User education: the promotion of effective use of documents and information services by educating future users in schools and universities, as part of their curricula, and educating existing users while "on the job";
3. The introduction, where appropriate of information technology; and
4. The stimulation and support of research, as necessary to increase understanding of information problems and to provide reliable data for decision-making.

Above all, a national information policy should include a large element of planning in order to ensure, as far as possible, that rare resources are used on priorities activities, efficiently and without wasteful duplication.

6.8.4. Computerisation of Information Services

Recently, significant efforts have been made with regard to the automation of information services. An illustrative case is the computerisation of the postal check system in Algeria where 176 people were made redundant through voluntary retirement (Please see Table 6.5). Examples like this give a clear idea about the trade-offs between employment and use of technology and demonstrate how beneficial information technology can be when applied in critical bottlenecks, especially, in relation to infrastructure and services.

Table 6.5. Effects of Computerisation on the Postal Check System in Algeria

	Manual (1974)	Automated (1977)
No of Operations	24,360,000	33,620,000
Volume in Million of of Dinars	109.5	210.8
No of Accounts	452,000	709,000
Average waiting time before processing of document	15 days	2 days
Payment at desk (average waiting time)	3 to 6 hours	2 minutes
Saturation ratio	95%	50%
Employment	856	680

In the case of libraries, it is to be mentioned that not a single library in Algeria, be it National, Public or University library, has so far automated its services.

It is hoped that the next few years will witness the launching of an ambitious programme of automation involving not only the National Library and University Libraries but also the Algerian National Archives. The computerisation of the latter has been the subject of an intense discussion in the last five or six years. However, no fixed date has yet been suggested as for the beginning of the experimental study. The following chapters will give an insight into the state of the art of the Algerian National Archives including the development of a computerised prototype system using dBASE III PLUS programming language.

6.9 CONCLUSION

In this chapter, the author attempted to shed light on various aspects regarding Algeria. A brief description to Algeria's historical, political, economic, social, and educational system was given. Indeed, it was also particularly demonstrated that despite a relatively strong economy, Algeria suffers from the various obstacles that face all Less Developed Countries; namely:

1. Shortage of qualified staff;
2. Lack of an adequate information infrastructure; and
3. Lack of suitable information policy.

Chapter Seven will look closely at the Algerian National Archives, describe its main components and discuss the various problems that have resulted from the transfer of archives to France in 1962.