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**TUNISIA COMPUTER TECHNOLOGY PROJECT**

**MID-PROJECT EVALUATION**

**FINAL REPORT**

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## LIST OF ABBREVIATIONS

|       |   |
|-------|---|
| AED   | Academy for Educational Development                               |
| AID/T | USAID Tunisia   |
| AID/W | USAID Washington  |
| CAI   | Computer Assisted Instruction                                     |
| CBE   | Computer-Based Education  |
| CBMI  | Centre Bourguiba de Micro-Informatique                            |
| CIT   | Carthage Institute of Technology                                  |
| CNI   | Centre National de l'Informatique                                 |
| DGT   | Direction Generale des Telecommunications                         |
| ENIT  | Ecole National d'Ingenieur de Tunis                               |
| ENSI  | Ecole National des Sciences Informatiques                         |
| ETAP  | Entreprise Tunisienne d'Activites Petrolieres                     |
| GOT   | Government of Tunisia   |
| IRSIT | Institut Regional des Sciences Informatiques et Telecommunication |
| ISG   | Institut Superieur de Gestion                                     |
| LAN   | Local Area Network  |
| LBI   | Louis Berger International  |
| MIT   | Massachusetts Institute of Technology                             |
| OCR   | Optical Character Reader  |
| PTT   | Poste, Telephone et Telegraphe                                    |
| RFP   | Request For Proposals   |
| USGS  | United States Geological Survey                                   |
| DGA   | Directeur General des Reformes Administratives                    |

**BASIC PROJECT IDENTIFICATION DATA**

1. Country: Tunisia
2. Project Title: Computer Technology Project
3. Project Number: 664-0334
4. Project Dates:
  - a. Project Grant Agreement: October 11, 1985
  - b. Contract with AED: August 1, 1986
  - c. Project Assistance Completion Date: March 31, 1989
5. Project Funding:
  - a. AID Bilateral Funding (Grant and/or Loan): \$3.3 million grant
  - b. Other Major Donors: None
  - c. Host Country Counterpart Funds: none

TOTAL FUNDING: \$3.3 million
6. Mode of Implementation:
7. Project Design:
8. Responsible Mission Officials: (For the full life of the project)
  - a. Mission Director(s):  
(1) Fritz Weeden  
(2) John Sperling (acting)
  - b. Project Officer(s):  
(1) James Vermillion  
(2) Evangeline (Kim) Schrader  
(3) Mark Karns
9. Previous Evaluation: None
10. Cost of Present Evaluation:

|                                  | <u>Person Days</u> | <u>Dollar Costs</u> |
|----------------------------------|--------------------|---------------------|
| a. Direct Hire                   | -                  | -                   |
| b. Contract: Louis Berger, Intl. | 74                 |                     |
| c. Other                         | -                  | -                   |

## COUNTRY CONTEXT

The Republic of Tunisia lies at the northernmost tip of Africa, a strategic location that has made it crossroads between Europe and the Middle East throughout history. Tunisia, Morocco, Algeria, and Northwestern Libya form the Maghreb (which means west in Arabic), an area of common history, language, ethnic groups, and culture. Tunisia is the smallest of the Maghreb countries. It is located between Algeria to the West and Libya to the Southeast and has a 1,600 kilometer (1,000 mile) coast line on the Mediterranean Sea.

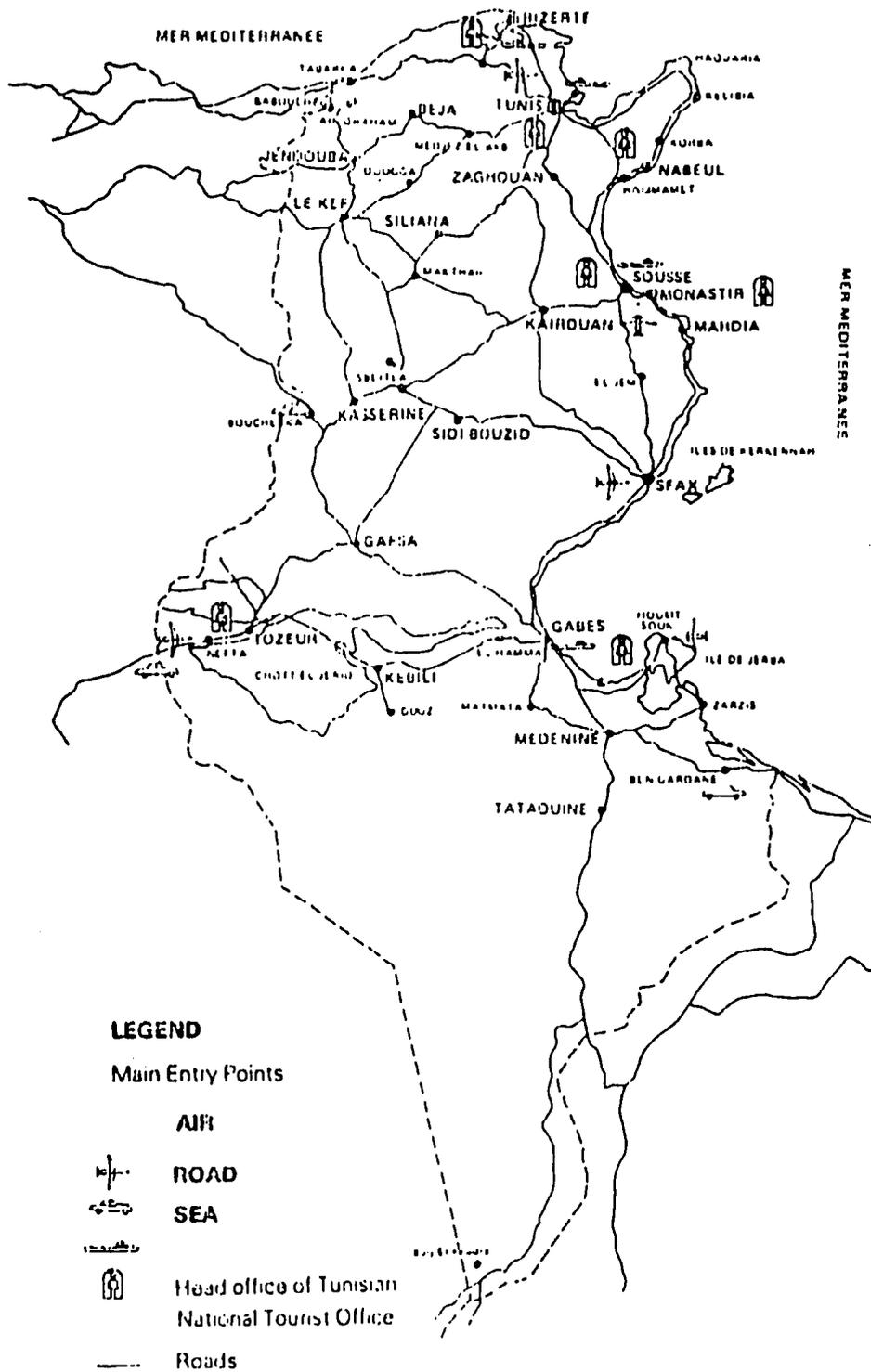
Tunisia's 1985 population is estimated at 7 million, over half of them under the age of 21. Almost all Tunisians are Arabs and Muslims. Islam is the state religion and nearly all Tunisians are Sunnis. There is a sizeable European population in Tunisia, primarily French, Maltese, and Italian. Arabic is the official language, but French is widely spoken as a second language, particularly in urban areas.

The country's area of 63,378 square miles is slightly smaller than Missouri. Northern Tunisia is the most heavily populated part of the country, mountainous (although elevations rarely reach 3,000 feet), and relatively fertile. The north also claims Tunisia's one major river, the Majarda. Central Tunisia is a semiarid highland with poor soil, little rainfall, and scant population. The south is arid and barren, except for occasional oases, as it merges with the Sahara. The climate is temperate in most of the country, with mild winters and hot summers. Rainfall occurs only in the winter, from mid-October until April.

Tunisia's government is a Presidential Republic, with decision-making centered in the executive branch. The President appoints the Prime Minister, the Cabinet, and 22 provincial governors. The Constitution of the Republic was promulgated on June 1, 1959. The country was ruled for 31 years by the leader of its revolution, Habib Bourguiba. In November 1987 he was deposed, and replaced by President Ben Ali, who is following a path of government reform and strengthening the role of technicians in the administration.

Since independence, the Tunisian government has prepared a series of economic development plans at raising the standard of living, improving and diversifying agriculture, and promoting industry. Agriculture is the country's major occupation and main source of income for 40% of the population. Traditional crops are cereals, olives, grapes and dates. Citrus fruits, vegetables and almonds are also produced.

Oil exports are Tunisia's largest source of foreign exchange earnings. National oil production from existing fields peaked at



5.4 million tons in 1981 and remains at roughly that level to date. Oil exploration is currently being conducted throughout the country, and several American firms are involved. Other major sources of foreign exchange are phosphates and tourism.

The University of Tunis was established in 1960 under the Ministry of National Education. Of the 35,00 students currently enrolled in its 25 faculties, 40% are women. Entry requires the Baccalaureate and is highly selective. Most of the faculties are in the Tunis metropolitan area. The language of instruction is French for most subject areas.

Tunisian women share equal rights with men on the basis of personal-status code established shortly after independence. This code is considered a model for developing countries.

## EXECUTIVE SUMMARY

The Computer Technology Project is designed to encourage the adoption of new forms of information technology to improve public and private sector performance in Tunisia. It does through support to the Institut Regional des Sciences Informatiques et Telecommunications (IRSIT), a regional research institute created by the Tunisian government in 1987. IRSIT is intended to be a center for applied research on innovative uses of information technology, serving both Tunisia and the region. The project supported a series of pilot research projects, through which IRSIT could develop its capacity to evaluate research activities, establish connections with U.S. institutions, and develop ties between the academic research community and industry. The project also called for IRSIT to coordinate Tunisian institutions in order to develop national strategy on the use of information technology in secondary and higher education. Project support has taken the form of funds for computer hardware, travel to the United States for training and other professional visits, and bringing consultants to Tunisia to assist on the pilot projects. A resident advisor has worked with IRSIT staff on implementing the project.

In assessing the project, we must note a few important points from the start. First, work began eight months late, because the original resident advisor pulled out literally on his way to Tunisia and had to be replaced. Consequently, none of the project activities are as far along as might have been hoped by this time. Second, when the resident advisor arrived April, 1987, IRSIT has only three staff members, and had not yet even been legally chartered by the Tunisian government. Consequently, some time and project resources had to be devoted to creating the institute, rather than directly into developing and implementing pilot projects. This further delayed the results which can be observed from IRSIT research activities. Moreover, the project design does not acknowledge that IRSIT did not exist, and so does not call upon the resident advisor to engage in basic institution building activities, nor does it identify this as part of the project. The project would have run more smoothly had this been part of its function. In light of these caveats, the evaluation has focused on how much progress has been made in accomplishing immediate project objectives, rather than looking for research results or significant influences on the society.

IRSIT is making reasonable progress towards establishing a group of pilot projects. These fall into three general areas, telecommunications, Arabization, and sectoral activities. In the first two areas IRSIT is building up groups of skilled staff, and the projects are linked to one another. The sectoral projects involve the oil and phosphate industries, the stock exchange, and use of satellite data to assist in combatting the anticipated

locust plague, and form a less coherent group. None of the projects has progressed far beyond the task definition stage, and a number of them will require hiring additional staff in the next year if they are to be completed. However IRSIT has made significant progress in defining manageable projects, and the existing staff are enthusiastic and well-qualified. They show promise of being able to accomplish a reasonable amount of what they are proposing, and of being able to learn what they do not already know.

In general, these are not research projects. Rather, most of them involve identification and introduction of technologies which, although new for Tunisia, are already well-established in other countries. The work on Arabization, which involves design of new techniques, and in some cases developing them for commercial use, is the only exception. The predominance of technology transfer, although not how the Tunisian government views IRSIT's activities, is probably appropriate.

Although the project design envisioned that the pilot projects would be carried out by other Tunisian institutions receiving grants through IRSIT, in practice most of them involve in-house work. IRSIT management is quite explicit that they do not want to operate in "foundation mode", and are interested instead in creating an institution capable to doing research itself. In all except the higher education projects, for which an RFP has been issued and proposals are now being evaluated, IRSIT's preferences have prevailed, and the institute is using the project to build its capacity to undertake research rather than to evaluate the proposals of others. Consequently, rather than building its capability to evaluate and select among research proposals, IRSIT is developing the ability to work with clients to define manageable research projects for in-house work.

It is not yet clear whether these projects will give IRSIT enough experience to be self-financing in the future. At present some clients are apparently willing to pay part of the cost of IRSIT services (although none of these contracts have been signed yet), but this may be because the AID subsidies make the institute less expensive than commercial firms. Some pilot projects are being wholly subsidized by the Tunisian government and the project, because they are expected to bring non-monetary returns to IRSIT. Such benefits include training staff in skills which may be marketable in the future, or establishing its reputation in Tunisia. If the computer technology project is to help IRSIT move onto a sound financial footing without subsidies, direct attention to the importance of the subsidies and the prospects for future commercial work is essential.

The education and research components of the computer technology project are totally separate from each other, reflecting the organizational structure of these activities in

Tunisia and the personalities of the individuals involved in carrying them out. Future work in Tunisia would do well to separate them entirely, instead of trying to link them under one general project.

The ability to travel overseas and to fund consultants in Tunisia has proven essential in order for IRSIT to develop linkages with individuals and institutions in the U.S. The ability to sustain the linkages established under the project will depend on the continued availability of foreign exchange for travel, and on whether IRSIT staff can take the initiative for establishing and maintaining contacts without a resident advisor to help them. So far they have taken little such initiative in most areas.

Organizational structure and management have been major problems at IRSIT. Recently, however, they have begun to address these issues, developing a more hierarchical organizational structure, recruiting mid-level management and research staff, and introducing a project management system for keeping track of the research projects. The computer technology project itself made some contribution to resolving these problems. However, it was not perceived to be within the authority of the project to insist on its suggestions or directly implement any changes. The resident advisor did make some efforts in this area, but these were not welcomed by IRSIT management.

Hiring and retaining qualified staff is a problem at IRSIT. IRSIT recruits primarily among students returning from Europe or the United States, so the pool of potential staff is quite small, especially for those with the experience to manage research projects. Salaries are competitive with the public sector and the universities, but not with industry. Moreover, researchers are hired on contract, which is atypical for Tunisia and keeps some potential employees away. Consequently, the institute may have trouble finding the staff to carry on the projects on which it has already embarked.

Contrary to the hopes expressed in the project paper, IRSIT does not have a major role to play in informatics policy in the foreseeable future. The institute's mandate does not give it a role in this area, and the planning and national coordination functions are already clearly assigned to other institutions.

The contractor and resident advisor have effectively met most of the demands placed on them, particularly with respect to linking IRSIT with U.S. institutions, interfacing between IRSIT and AID, and handling logistics. The problems which have arisen may be attributed to the problems a conventional development consulting firm has when working in a high-tech field. This applies to procurement, to identifying the best consultants for technical tasks, and to convincing those consultants to work at

AID rates. These are problems which will have to be addressed over time as AID undertakes more projects in this kind of field.

#### Recommendations:

The evaluation team wholly supports extending the termination date of the computer technology project to allow IRSIT to continue its activities using the funds which remain. During this time, we recommend that some effort go into reflecting on what has been learned in the past year and a half, and developing a more structured process for planning future activities. The ongoing efforts to strengthen organizational structure and management are crucial, and we recommend that they be given high priority.

If AID/Tunisia is interested in continuing to work in the information systems area, we recommend that they give additional support to IRSIT. The institution has made significant progress in the last year and a half, but the benefits to be obtained from foreign assistance are still significant, and the institute is not well enough established to be able to float comfortably without it. Future funding of IRSIT should allow it to continue working on the current projects, and devote particular attention to management, and to developing strategies to ensure stable funding in the future.

Information technology may be expected to play an important role in mid-level developing countries, as a direct input to productive activities, as a form of infrastructure, and as a productive sector itself. AID must therefore investigate how it can best support this development thrust. The computer technology project offers an interesting model, but it may not be directly applicable where an organization like IRSIT does not exist and the focus is more properly on technology transfer than research. However, it is worth considering in designing strategies for other countries.

MATRIX OF FINDINGS AND RECOMMENDATIONS

| FINDINGS   | RECOMMENDATIONS   |
|--|---|
| PRIMARY  |   |
| 1. Management and organizational structure have significant problems for IRSIT. Little systematic planning has occurred.   | <p>The current contractor's Resident Project Manager has been serving in a technical and coordinating capacity.</p> <p>IRSI currently needs a technical, planning, marketing and public relations expert. USAID should review this issue in light of future directions for technology transfer in Tunisia.</p>                        |
| 2. IRSIT management is now spread thin among many pilot projects.  | <p>No new pilot projects should be developed. If funds are needed for the management assistance they should be taken from the higher education pilot projects, which have not yet begun.</p>  |
| 3. Future IRSIT funding is uncertain.  | <p>The planning process should be started. It should include development of marketing and financial plans which detail potential sources of funds (earnings and subsidies) and an anticipated 5 year budget.</p>  |
| 4. Pilot projects (i.e., Arabitization, PTT, and Auto- and Tunisia Stock Exchange) show some promise of being successful.  | <p>IRSI needs to establish the ability of clients to pay for IRSIT's services.</p>  |
| 5. No dialogue or joint cooperation exists between IRSIT and CNI. Very little dialogue currently exists between IRSIT and CBMI.  | <p>Communication needs to be established between IRSIT, CNI, and DBMI with a view to merging IRSIT and CNI.</p> <p>CNI has the potential of being a paying client.</p> <p>CBMI is the link to technology transfer training at the secondary school level which could promote computer technology throughout the Tunisian society.</p> |
| SECONDARY  |   |
| i. IRSIT pilot projects meet many objectives and are selected according to many criteria.  | <p>Planning process should include specification of criteria for choosing projects and identify funding.</p>  |
| ii. IRSIT staff are interested in building in-house research capacity, not operating as a foundation which disburses funds.  | <p>Funding extension should focus on in-house work, not grants through IRSIT to others.</p>   |
| iii. Overseas travel has made it possible for IRSIT to develop linkages to U.S. institutions which would not have developed otherwise. IRSIT is not yet ready to sustain such linkages on their own. | <p>Additional funding for IRSIT should be provided for overseas travel, training linkages, and promulgating IRSIT's informatics ideas.</p>  |
| iv. IRSIT has played no role in informatics policy development, and this function is handled by other institutions.  | <p>IRSI should be expected to play a role in policy formulation and have a higher profile in order to be identified with informatics.</p>   |

## Chapter 1

### INTRODUCTION

#### 1.1 Project Goals, Objectives, and Scope

The Computer Technology Project aims to generate effective wide scale utilization of information technology to improve socio-economic performance in achieving Tunisia's development goals. In undertaking this project and its predecessor, the USAID Technology Transfer Project, the government of Tunisia has taken two important steps towards the development of a global approach to informatics which will contribute to accomplishment of national development plans. This project contributes to the overall national strategy by providing technical assistance, stronger linkages to U.S. institutions, and training of researchers and engineers in relevant fields and activities.

The project focuses principally on strengthening the capacity of IRSIT to lead in planning, managing and conducting research for broad, contextually appropriate application of computer technology in Tunisia. Through training, technical assistance, provision of hardware and software, and support for research and development pilot projects, the resource base of IRSIT will be improved. The pilot projects are to be directed at public as well as private sector organizations, through applied research and development in computer and information technology. Another important vehicle for the project is the selection and execution of pilot activities introducing computers into the university, secondary and non-formal educational systems of the country. While these subprojects will themselves be developmentally and economically important, they are justified primarily because they provide the experience in innovation in computer technology to allow forceful future efforts on a larger scale.

#### 1.2 Scope of the Evaluation

The evaluation report strives to assess the impact of the Computer Technology Project on the Tunisian public and private sectors. The report defines the current informatics environment at IRSIT, assesses the impact of the computer technology on the institute, and recommends improvements to support the current environment.

In carrying out this study we have conducted interviews with IRSIT staff and representative IRSIT clients. Information was collected concerning current cooperative work in the form of pilot projects requirements for future support from IRSIT or the computer technology project. Detailed data were developed identifying the current computer resource utilization for each

existing information technology project with its distribution by end using office and clientele. Table 1, at the end of this chapter, provides a listing of the detailed components of the project, which will be addressed in this evaluation.

The report will address the questions raised in the scope of work in the following way:

>> Chapter 2 discusses the evaluation methodology, and presents general criteria for evaluating the project.

Chapters 3 through 6 are the foundation of this report, addressing the four project components:

>> Chapter 3 briefly describes the status of each of the pilot projects currently underway.

>> Chapter 4 assesses the training component of the project.

>> Chapter 5 considers the contribution of the project to the development of IRSIT as an institution. This includes all of the activities described in the project paper and evaluation scope of work under "technical support", as well as the development of IRSIT's computer resources, which fall into the "institutional development" component of the project.

>> Chapter 6 considers project activities directed at institutional development in the informatics arena beyond IRSIT.

>> Chapter 7 assesses the performance of the contractor and resident advisor.

>> Chapter 8 discusses the political environment for informatics in Tunisia.

>> Chapter 9 reviews the major findings, and makes recommendations to IRSIT, AED, and USAID.

Appendix J presents an analysis of the data using a more abstract framework for evaluating the use of information technology in organizations. Appendices L and M set out the components of an IRSIT planning process, and an information technology model for the institute. Appendix N sets out more detailed functional requirements for implementing the model of Appendix M.

The recommendations made in this report address four questions. First, how can IRSIT, the resident advisor, and the contractor make best use of the funds and time remaining on the project? Second, should AID extend the project completion date to allow IRSIT to use the funds which will be unspent by March, 1989? Third, should AID consider providing additional funds to

IRSIT after the end of this project, and if so for what? Fourth, how should this model be applied to other countries, if at all?

**Table 1**

**COMPONENTS OF THE COMPUTER TECHNOLOGY PROJECT**

**COMPONENT No 1 : Technical Support**

**Activities :**

- 1.1 Short-term Advising
- 1.2 Institutional Linkages
- 1.3 Exchange of Scientists
- 1.4 Development of Training of Trainers
- 1.5 Selection of Institutions/Subjects
- 1.6 Research/Planning Model

**COMPONENT No 2 : Pilot Projects and Applications Research**

**Activities :**

- 2.1 Secondary Pilot Proposal
- 2.2 Selection of Secondary Activities
- 2.3 Implementation of Secondary Activities
- 2.4 Evaluation of Secondary Activity
- 2.5 Higher Education Pilot Proposal
- 2.6 Selection of Higher Education Activities
- 2.7 Implementation of Higher Education Activities
- 2.8 Evaluation of Higher Education Activity
- 2.9 Applications Pilot Proposal
- 2.10 Selection of Applications Activities
- 2.11 Implementation of Applications Activities
- 2.12 Evaluation of Application Activity
- 2.13 Coordination and Communication
- 2.14 Computer-based Education Recommendation

**COMPONENT No 3 : Training**

**Activities :**

- 3.1 U.S. Short-term Training
- 3.2 Training Institution Established
- 3.3 Tunisia Training
- 3.4 Observational Tours
- 3.5 Conferences Attended

**COMPONENT No 4 : Institutional Planning, Development and Analysis**

**Activities :**

- 4.1 Industry Linkages
- 4.2 Clearinghouse Established
- 4.3 Research Scientist Support
- 4.4 Colloquia

## Chapter 2

### ASSESSMENT METHODOLOGY AND CRITERIA

The goals and structure of the Computer Technology Project are new to USAID. They call for a broad spectrum of objectives, implemented via an ambitious range of activities. The project is attempting in three years to develop a research program comparable to countries which have worked in this field for more than twenty years. Moreover, it is doing this through a start-up institution which is well thought out in terms of concepts, philosophies, and overall goals, but which lacks experience in management, operations and practical implementation. In addition, the political climate in Tunisia has changed radically during the life of the project, leading to shifts in government structure and priorities. The implications of these changes for IRSIT and for this project are not yet clear.

Because of the ambitious scope of this project, its unfamiliarity to AID, the early development stages of IRSIT, and the uncertainty in the larger social climate, the evaluation methodology is crucial. Clearly developed approaches and criteria for analysis are essential to give value to the scope, findings, and recommendations of this report.

#### 2.1 Assessment Methodology

The assessment study began with a review of the project documents and IRSIT's environment through the review of existing documentation and interviews with AID/Washington, USAID/Tunis, AED/Washington and IRSIT's top management. This initial review encompassed at a high level the major aspects of the project, especially strategic policies and plans, management, organizational operating environment, and pilot applied research projects.

Subsequently, the emphasis concentrated on the middle and lower level aspects of the project, mainly the hardware, software (both systems and applications), ADP management, project management, operations and procedures, criteria for monitoring, evaluation and measurement of results, and resource availability and utilization. The project's scope, inputs and outputs were identified and matched with resource usage by conducting interviews and discussions with project managers and staff, program managers, system managers, analysts and users at IRSIT and among some of its clients.

A series of interviews, each designed to collect specific data, were conducted across the entire spectrum of IRSIT's managers, staff and clientele. The initial interviews with IRSIT

managers sought to define the IRSIT community, identify organizational policy, procedures, and informal relationships and interfaces, and collect additional related information. The management and pilot project interviews were conducted with staff and were structured to capture primarily the management plans, methodologies, evaluation and selection criteria for such projects. We then assessed the feasibility, depth, innovation and scope of each pilot application, as well the skills and interests of the interviewees. Appendix I presents a more detailed description of the topics covered in each set of interviews. Table 2 summarizes the personnel groups and the data they were asked to provide:

Table 2: ASSESSMENT METHODOLOGY

| <u>Personnel Group</u>  | <u>Assessment View</u>  | <u>Methodology</u>  |
|---|---|---|
| Top Management<br>(high officials,<br>directors, VIPs)                  | High level views<br>(plans, policy,<br>strategic view)              | Interviews, current<br>and future outlook                                 |
| Mid Management<br>(directors, mana-<br>gers, senior<br>personnel/staff) | Middle level views<br>(practical, management<br>implementation)     | Interviews<br>Discussions<br>Current and future<br>outlook                |
| Lower Management<br>(operational mana-<br>gers, implementors,<br>staff) | Lower level views<br>(operational, imple-<br>mentation, user views) | Interviews<br>Discussions<br>Technology and<br>training<br>Future outlook |

## 2.2 Assessment Criteria

Implementation of the computer technology project did not begin until April, 1987, and IRSIT was not officially created by the Tunisian government until December of that year. Consequently, it is premature to assess the impacts of the project on informatics in Tunisia. The project final evaluation will be better timed to measure the impact of the completed pilot projects, and should be used for that purpose. This assessment must focus instead on the progress to date, and evaluate whether the longer run goals of both IRSIT and the project are likely to be achieved based on the evidence available so far.

Because IRSIT did not exist when this project began, it is important to distinguish, in setting up evaluation criteria, between an evaluation of IRSIT itself, and an evaluation of the contribution of the project. Because IRSIT's effectiveness as an institution is a significant indicator of success of the project, we must look at both factors. However, in evaluating IRSIT's basic effectiveness as an institution we must also recognize that the project was not designed to build a start-up institution, and so should take neither responsibility nor credit for the results.

The overall evaluation criteria therefore fall into two categories; those focused on the implementation of the project itself, and those focused on the development of IRSIT. Project-related criteria include the following:

- >> Project management: how smoothly was the project run, were potential difficulties circumvented by foresight and planning?
- >> Support of pilot research studies: how well did the project monitor and support field activities to assure that valid experimental results would be obtained?
- >> IRSIT institution building: what efforts were made on the part of the project to build a research capability in IRSIT?
- >> Dissemination activities: how effective was the project in disseminating research results?
- >> Cost effectiveness: how well was the project managed and its financial resources utilized?
- >> Technology transfer: how did the project contribute to Tunisia's effort to transfer technological knowledge in the computer and telecommunications fields?
- >> Training: how many Tunisians received advanced training under this project and what was the quality of the training?
- >> Tunisia-U.S. relations: what positive effects did this project have on Tunisia-U.S. relations; how successful was the project in developing linkages between institutions and individuals in the two countries?

The criteria for assessing IRSIT development focus on the overall issue of whether IRSIT is making appropriate advances in the direction of meeting its overall objectives. Key issues include:

- >> Strategic planning: has IRSIT defined increasingly clear objectives or plans for what it is trying to do? Has it set out plans for carrying this out? Has it developed strategies

for marketing its results/services?

- >> **Technical skills:** are IRSIT staff technically equipped to evaluate hardware and software, modify hardware and software, carry out research projects or development activities
- >> **Ability to evaluate and select research projects** according to: technical feasibility, appropriateness for the social, political, or economic context, cost effectiveness and efficiency, extent to which they meet market needs (public or private). Has IRSIT explicitly stated criteria for evaluating research projects?
- >> **Organization and management structure:** has IRSIT developed a management structure which meets its needs? Has it concentrated on areas of technical expertise in order to build a critical mass needed to carry out projects? Has it hired marketing or fund-raising staff to ensure the work or funds to support IRSIT? Is it carrying out ongoing evaluation of research and development activities to monitor their progress, evaluate their appropriateness to IRSIT objectives, etc.
- >> **Linkages:** how have links with US institutions been established, on whose expertise is IRSIT depending? What process has been used to ensure that IRSIT is connected to the most desirable US institution? Is IRSIT able to sustain and further develop US linkages without AID support?
- >> **Reputation:** To what extent has IRSIT begun to develop a reputation as a significant national center for research?

## Chapter 3

### PILOT PROJECTS

IRSIT participated in about fifteen pilot projects through the assistance of the computer technology project, and more are currently being planned in the higher education area. This chapter reviews the individual projects, presenting a brief description of each which focuses on how it came about and the nature of the relationship between IRSIT and the client. Chapters 4 and 5 will discuss the projects as a whole in the context of evaluations of the training component of the project, IRSIT's technical capability, the process and criteria for evaluating proposed research, and so on. Appendix B provides a summary of all of the pilot projects, covering hardware and software used, staff participation, and other factual details.

#### 3.1 Support to Specific Economic Sectors

IRSIT has undertaken a number of projects intended to support specific sectors of the economy, or industrial firms. This is part of its mandate to establish linkages with Tunisian industry, and to introduce innovative uses of information technology to improve productivity.

**Project: Improving Phosphate Mine Productivity**  
**Client: Compagnie Des Phosphates De Gafsa (CPG)**

On September 30, 1987, the Compagnie Des Phosphates De Gafsa (CPG) signed an accord with IRSIT agreeing to jointly pursue applied computer research to improve the CPG's position in international markets. This accord is seen by the CPG as one aspect of a major restructuring of the CPG in accord with World Bank recommendations. The objective of CPG cooperation with IRSIT has been to improve productivity by introduction of informatics to the mining engineering staff and management.

The CPG was one of IRSIT's earliest clients. The director of the CPG is on IRSIT's board of directors, so cooperation between the two institutions was given from the start. After a visit by two consultants from the Colorado School of Mines, three activities were proposed: the development of a computer training center at CPG, the identification and installation of mine planning software, and assistance in improving drilling and blasting techniques.

The training center was created in May 1988, with PS/2s donated by the computer technology project. A team of CPG and IRSIT engineers went to the United States to view and evaluate

software packages, and to receive training in the process of software evaluations. They narrowed the choice to three packages, from which the CPG has now chosen one. An independent expert in drilling and blasting has visited the CPG twice to evaluate their drilling and blasting techniques; this does not involve information systems work, but was felt to be essential to CPG operations, so it was paid for with project funds.

The future development of this project is a matter of some dispute. The CPG's needs at this point are to purchase and install the mine planning software. However, there is no clear role for IRSIT in this activity. The IRSIT staff member most involved with this project has recently left to go to work for the CPG, leaving IRSIT with no one who is up to date on the project. Moreover, CPG is hesitant to pay IRSIT for further involvement of its staff in the cooperative effort, or to ensure that there is a meaningful role for IRSIT staff. IRSIT managers are beginning to feel that the CPG is simply interested in getting free hardware and software from the computer technology project, but is unwilling to contribute to the development of IRSIT as an institution. They are withholding their agreement to buy the mine planning software until the two institutions can come to an agreement about the roles and contributions of each in a joint undertaking.

**Project: Improving Oil Exploration**

**Client: Enterprise Tunisienne d'Activites Petrolieres (ETAP)**

The objective of cooperation with the national oil company has been to improve its oil exploration and exploitation techniques, with the ultimate goal of helping Tunisia earn more foreign exchange from its oil resources. This effort has high priority because Tunisia's known oil reserves will only last for another two years. Improved technical and cost efficiency in the exploration process, therefore, have the potential to have a significant impact on the Tunisian economy. ETAP is interested in working with IRSIT because they expect them to provide software more cheaply than they could get it from a commercial vendor. IRSIT is interested in ETAP because they expect this project to bring funds into the institute, provide training to the IRSIT staff working on it, and will benefit Tunisia by improving its foreign exchange resources.

The effort since the beginning of 1988 has been on project definition. The original project leader conducted a survey of workstations and workstation-based software for oil exploration in January, 1988. The project scope was then narrowed to focus on vertical seismic profiling, a technique for collecting, processing, and analyzing data about the soil characteristics adjacent to exploratory drilling sites. IRSIT has hired a geophysicist whose specialization is software development for

vertical seismic profiling, and who has taken over management of the project. She has conducted a survey of commercial VSP software, and a British package has been selected.

The project is now at the stage of negotiating a contract between IRSIT and ETAP which will define the roles of the two institutions and how the costs will be shared. IRSIT is expected to purchase the software, which will be run on a VAX 780 belonging to ETAP. The software to be purchased needs to be modified for use under Tunisian geological conditions. The IRSIT geophysicist will do this, and will then train ETAP staff in use of the final product. This process is expected to take two years. Once the product is in use, it will enable ETAP to carry out itself the processing and analysis of VSP data, a service which it has paid the international oil companies substantial amount to do in the past.

**Project:** Automating the Tunisian Stock Exchange  
**Client:** Ministry of Finance

The automation project in the Tunisian stock exchange is intended to promote ownership of equity in Tunisian private and parastatal industry through the distribution of information on Tunisian companies over the national X.25 network. The project was begun at the initiative of USAID, which was interested in it as a component of its privatization efforts. The stock exchange hopes to develop a data bank on Tunisian industry which can be accessed over the PTT network, through the videotext system being developed by the PTT (with IRSIT assistance). Over time the system will be made available to government ministries, universities, brokerage houses, and institutions in other Arab countries whom the Ministry of Finance hopes to interest in Tunisian investments. In a later phase of the project the Ministry hopes to create a system which stores all information about stock sales and prices; however this is not projected for the immediate future.

IRISIT is negotiating with the stock exchange staff to arrive at a reasonable form of cooperation between the two institutions. IRSIT staff have already analyzed the 1989-1990 national plan for X.25 network being set up by the PTT, to determine its adequacy to support this system. As proposed, the stock exchange proposal requires a substantial amount of programming. However, they cannot afford to pay IRSIT for this service, and are hoping that the AID project will pick up the costs. The model of cooperation which is now being developed involves IRSIT staff serving in an advisory and planning role, while Ministry of Finance programmers carry out their recommendations in actually developing the software.

So far no training has been provided under this project.

Some of the stock exchange engineers have investigated similar systems in Canada and France, without assistance from the computer technology project. It is anticipated that someone from the Ministry of Finance will visit the New York Stock Exchange to observe its operation and discuss its data-processing architecture with senior financial experts and system designers.

**Project:** Location of Cricket Using Satellite Technology (LOCUST)  
**Clients:** National Remote Sensing Center, Ministry of Agriculture.  
National Institute of Meteorology

In March, 1988 it became apparent that conditions in the Sub-Saharan countries would produce potentially dangerous numbers of locusts in Tunisia in the fall of 1988 and probably in subsequent years. Through AID, the US Geological Survey was contacted to determine whether remote sensing via satellite could be effective in locust control. USGS has been using satellite mapping of the highly vegetative areas ("greenness maps") to locate probable regions of locust infestation in Sub-Saharan Africa, order to identify areas for ground and air extermination teams. Although there are questions about whether agrometeorological conditions make this approach viable for Tunisia, AID and the Tunisian government were interested in trying it.

The IRSIT project involves developing the capability to produce greenness maps from satellite data downloaded to a receiving station in Italy. IRSIT stands to benefit from this effort in a number of ways. First, the greenness maps, if they prove to be an effective tool, may be marketable to other countries in the Maghreb to help deal with their locust problems. Second, the project will allow IRSIT to develop skills in satellite imaging and geographic information systems which currently do not exist in Tunisia, and may therefore be marketable within the country. Third, the system created at IRSIT could be used in a number of other domestic applications, and it has already generated considerably interest in the Ministry of Agriculture, Office Nationale de Topographie, and other government agencies. Fourth, the project is highly visible, and if it is successful it will attract a great deal of favorable attention to IRSIT. (This is a risk, of course; if the project fails it will attract unfavorable attention to the institute.)

This undertaking is fairly straightforward, and does not require IRSIT to spend time in project definition. Consultants from the USGS have prepared a project plan, and analyzed the feasibility of carrying it out at IRSIT. The major unknown is the ability of IRSIT staff to learn the necessary information about geographic information systems, and the question of whether the IRSIT computer center will be installed soon enough to allow

the production of the first greenness maps by the next rainy season (October, 1989). Training in the USGS software for preparing greenness maps is planned for the IRSIT team leader in the winter of 1989. Training in ARC/Info, the commercial package used for integration satellite and attribute data, will be conducted later in the spring.

This project does not have an institutional client who is prepared to cover the costs. The Ministry of Agriculture will be the immediate user of the greenness maps, and a number of other government institutions have expressed an interest in using the system to analyze their own geographic data. At some point they may pay for access to the system, but at present the funds will come directly from IRSIT's budget and from the computer technology project. However, the Prime Minister's office has expressed a strong interest in the venture, and is ensuring that the funds will be available in IRSIT's budget to pay for it.

This project is essentially a technology transfer and production task, and does not have a research component in the near future. Once the production greenness maps has been streamlined, this task is to be transferred to the National Center for Remote Sensing, which has just been created but it not yet operational. At that point IRSIT will be left with the skills, hardware, and software to begin working in the area of geographic information systems with other clients.

### 3.2 Telecommunications Projects

**Project:** Measurement of the Telephone Network Service Characteristics

**Client:** Direction General Telecommunications (DGT) of the Tunisian Post, Telephone, and Telegraph (PTT).

In this project the PTT is interested in rationalizing the Tunisian voice telephone network in support of its plan to double the number of subscribers by the early 1990s. The project itself involves measuring the service characteristics of the voice telephone network as actually perceived by the subscribers. This project was suggested by the PTT, which is interested in working with IRSIT because of the institute's focus specifically on telecommunications. IRSIT's interests in this project are several; bringing some funds in from the client, and developing both a product and a set of skilled staff who may be marketable elsewhere in the region.

The project will measure the quality of telephone service by installing physical devices along the lines which repeatedly simulate calls, and measure the time taken to get a line, to reach the other "party" (another device on the line), and so on. A team of IRSIT and PTT engineers have carried out a survey of

the existing equipment for measuring telephone use and quality of service, and analyzed of its applicability to the PTT's requirements. Based on their analysis, they plan to develop their own device, which will then be manufactured for use by the PTT. They have also completed a preliminary design for the measurement system, which includes a hardware recommendations, an outline of the software modules needed, and consideration of the communications protocols for the system.

IRSIT and the PTT are beginning contract negotiations on this project. It is expected to require a team of five or six engineers, who will be hired once the contract is signed. The hardware is expected to be purchased by IRSIT, out of computer technology project funds. There may also be some cooperation with AT&T, through either their U.S. or their Ireland divisions; however the details of these linkages have not yet been worked out.

**Project: Videotext**

**Client: Director General of Telecommunications (Tunisian PTT)**

This project aims to introduce bilingual (Arabic/Latin) videotext service to Tunisia, and to promote the development of both public and commercial services accessed through this service. It was proposed by the PTT to IRSIT, which was interested in it in the context of its work both on Arabization and on telecommunications. IRSIT expects this project to have regional applications, as other Arab countries become interested in expanding their telephone systems in this direction. They expect the PTT to pay for the services it receives from IRSIT, so the project will bring funds into the institute. This project also has links to a number of other projects under way at IRSIT, which will make use of the videotext services once they are available.

The project involves two major activities; development of a prototype videotext terminal which can handle Arabic and Latin characters, and development of a standard protocol for handling the bilingual presentation of information. IRSIT engineers working with staff from the PTT have already completed an analysis of the French minitel terminal design, and are designing some of the basic Arabic language features of the system. They are in the process of carrying out a survey of major videotext systems available commercially (NAPLPS, MINITEL, CAPTAIN), in order to determine whether one of them can be adapted to Tunisian use. The initial software development work will be done on a PC system which emulates the minitel. Once the hardware for the Tunisian minitel is designed, work will continue on that system.

IRSIT has finalized a joint project plan with the PTT, which sets out five setups for implementing the project. The project

will require about five IRSIT staff members, plus team members from the PTT. Once the project is underway, work will be carried out at the PTT's school for training telecommunications technicians, rather than at IRSIT.

**Project:** IRSINET

**Client:** IRSIT, Eventually various universities

Since its inception IRSIT has been expected to develop a network which would link Tunisian institutions involved in informatics. This system is to be linked to BITNET, a non-commercial network connecting academic institutions in the U.S. and Europe. This effort has both short-run and long-run objectives. In the short run, it is intended to facilitate communication among Tunisian researchers through the use of electronic mail. It is also expected to improve contacts with European or American colleagues, through use of the BITNET network. Over BITNET it may also be possible to identify people with similar interests, and to access either private or non-commercial databases on various subjects of interest. In addition, IRSIT is considering selling time on its core computer, to be accessed over this network.

The long-run goal of this project is to begin the development of networking infrastructure throughout Tunisia. As is true with telephones, the value of networks as a means of communications increases exponentially with the proportion of people connected to the system. Although IRSINET will start small, it will become part of what is expected to be a growing network infrastructure linking Tunisians to each other and to the rest of the world.

IRISIT already has a connection to BITNET, and Tunisia has been made an official member of BITNET. Once IRSIT's core computer center is installed, the institute will become a bitnet node through which other institutions can access the network as well. At that time the IRSINET linking will be set up, linking IRSIT, ENIT, ENSI, the Faculty of Sciences at the University of Tunis, the PTT school, and other educational institutions. This network will rely on lines being installed by the PTT, and will use the X400 messaging system. There has been no training carried out yet in connection with this project, although once the system is installed the users will need training on its use.

### 3.3 Arabization Projects

IRISIT has embarked on a number of different projects in the area of Arabization of computer hardware and software. This focus has been a part of IRSIT's mandate since the institute was first proposed. It reflects a combination of political and commercial objectives, as well as a desire to establish IRSIT's

and Tunisia's position as a leader in the Maghreb. While the work in this area has been separated into several distinct projects, in fact they are integrated with each other, as well as with some of the work in the telecommunications area. The individual areas for research and development in the Arabization area have been chosen in some cases to fit the skills of IRSIT staff, and in other cases to meet the interests of potential clients. However most of this work has no client in the short run, and is being funded out of IRSIT operating funds and the computer technology project.

**Project:** Arabic Speech Analysis  
**Client:** IRSIT, AT&T Bell Laboratories

This project has as its goal the analysis and synthesis of Arabic speech from text. These capabilities have applications in medicine (for the visually impaired), industry, the public telephone system, and in other sectors of the Arabic-speaking world. IRSIT has become involved in this area because of the interests of Salem Ghazeli, one of the institute's senior researchers and a professor at the Bourguiba School of Modern Languages in Tunis.

This project is proceeding through several steps. First, IRSIT must install a speech analysis workstation and associated software. The requirements have already been developed, leading to selection of a SUN workstation with AT&T software. The IRSIT staff working on the project now must develop a lexical database of Arabic text for use in testing proposed algorithms for speech synthesis. They must also set out the rules of Arabic grammar which they will use in developing these algorithms. Once they have completed these two tasks they will be ready to begin the actual speech synthesis work.

Although there is no client for this work, IRSIT is negotiating with AT&T's Bell Laboratories over a possible cooperative venture. Bell Labs contacted Salem Ghazeli when they began a project on Arabic speech synthesis, because they knew of his work in the area at the Bourguiba School. Since Ghazeli was then affiliated with IRSIT, he proposed that the two institutions collaborate on work in this area. Ghazeli has visited Bell Labs twice since the project began. It has been proposed that he go to New Jersey for one year to work on the actual synthesis part of the project; however the funding for this trip has not been fully identified, so it cannot be finalized.

**Project:** Arabic Character Recognition  
**Client:** IRSIT

This project works on the problem of developing an optical

character reader (OCR) which can recognize Arabic characters. The long term goal is to develop an OCR which can handle both Latin and Arabic, although in the short term the focus is simply on Arabic. IRSIT embarked on the project because the institute hired a researcher who had developed a new algorithm for Arabic character recognition as his doctoral thesis in France, and this provided an opportunity to continue work on it. The project has the potential to offer significant financial returns, since there is substantial demand for Arabic text scanning.

The algorithm for identifying Arabic characters has already been developed and tested at IRSIT, with over 97% accuracy. The current standard for such software is 93-94%, so the IRSIT product should definitely be competitive. However, it only works for typed text, because it cannot identify letters which overlap vertically by more than a certain percentage, as is typical with typeset Arabic. Moreover, on an 80386 PC it runs quite slowly; to be competitive commercially it will have to be marketed with a special circuit board which enables it to perform dynamic comparisons efficiently.

The IRSIT staff working on this project are now involved in packaging a preliminary product which could be marketed on a small scale. This will not be a high-performance package, because IRSIT does not yet have the circuit board to speed up the calculations. Once the additional hardware is received, they will have to adapt their software to use it, and then refine the product they are offering. They have not yet mapped out a marketing strategy, although they are considering both small-scale sales to local institutions, and selling the program to a large software house which would market it internationally.

**Project: Arabic-English Translation**

**Client: Joint development agreement with Linguistic Products (Houston, Texas)**

The goal of this project is to develop a low-cost PC-based package that can translate between English and Arabic. IRSIT has entered into an agreement on this venture with Linguistic Products, a small software firm in Houston Texas which has already created a similar package in Spanish. IRSIT chose to work with Linguistic Products because it provided an opportunity to do their own software development. They turned down the proposal of WCC, another American software development house, that they market the WCC translation package in Tunisia, on the grounds that IRSIT was not interested in being a marketing institution.

IRSIIT has signed an agreement with Linguistic Products which sets out the responsibilities of each of the parties, gives a timetable for the work, and explains the profit-sharing agreement

and budget considerations. As called for in this agreement, IRSIT has already supplied Linguistic Products with an Arabic alphabet and simplified grammar, and is beginning work on a base Arabic-English dictionary of 20,000 words. The agreement calls for Linguistic Products to write the code, beginning with a simple program to do word-for-word translation and translation of a limited list of idioms. Linguistic Products staff will also train IRSIT staff in the design and structure of its translation program. Once these tasks are completed, work will proceed on technical dictionaries and creation of a marketable package.

The agreement between Linguistic Products and IRSIT specifies the terms for sharing the revenues generated by this package. Fifty percent of the revenue from each sale is divided evenly between the two partners. The other 50% goes to the marketer; thus if IRSIT sells a copy it receives 75% of the sale price and Linguistic Products receives 25%; similarly if Linguistic Products sells a copy it receives 75% and IRSIT receives 25%. IRSIT is not yet predicting what it expects to make from this venture.

### 3.4 Assistance to CNI

IRSIT has provided assistance to CNI on two projects, by providing funds to bring U.S. consultants to Tunisia. These projects do not involve IRSIT staff, nor has the computer technology project provided hardware or software to CNI. The objective in providing these resources to CNI is goodwill, to foster a cooperative environment and help CNI to carry on work which is related to IRSIT interests and objectives.

**Project:** Arabstar Display Card

**Client:** Centre National de l'Informatique (CNI)

Arabstar is an Arabic display card for the IBM PC and used in conjunction with a bilingual (Arabic/Latin) word processing program. Both the software and the circuit board have been developed at CNI. The computer technology project has assisted CNI in gaining expertise in designing and marketing the card, which is to be marketed outside of Tunisia for sale throughout the region. This assistance was provided to CNI by a U.S. consultant experienced in the design, marketing, and manufacturing of circuit boards. He has reviewed the CNI product and made recommendations concerning technical features and the process for selecting a manufacturer. Unfortunately, the card itself is already somewhat obsolete, because it is designed to work with the color graphics adapter (CGA), whereas the enhanced graphics adapter (EGA) is now becoming the industry standard. However, CNI's experience developing and manufacturing the card is still worthwhile, in part because many institutions in the

Arab world are still using the CGA, and in part for its training value.

**Project:** Arabized Software Development Environment  
**Client:** CNI

This project aims to develop a bi-lingual, adaptable, software development environment based on UNIX and X-windows. The computer technology project brought in a consultant from Georgia Tech who has developed an user-friendly UNIX interface that provides assistance on the operating system at different levels of sophistication depending on the skill of the user. The project aims to Arabize this interface and port it through the X window manager. A review and categorization of such services available on UNIX has already been completed, as have selection of the hardware platform and systems software for implementation of bi-lingual software development environment. The development of an audience requirement statement incorporating a user profile for diverse users is now in process. The computer technology project providing training to two CNI engineers, who attended an X-Windows seminar at MIT and worked at Georgia Tech on a draft design for the Arabized environment.

### 3.5 Internal IRSIT Activities

IRSIT has undertaken several activities which are designed to build the institution's expertise by developing its own informatics infrastructure. Naturally these efforts do not have clients per se; however because they are developing new skills at IRSIT, they may lead to marketable activities in the future.

**Project:** IRSIT Core Computer Center  
**Client:** IRSIT

IRSIT's core computer center will provide the hardware and software resources needed by many of the research activities currently underway within the institute. In the process of setting up this center, the hope is to develop IRSIT's skills at analyzing the requirements for a core computer center, selecting and installing the appropriate equipment. So far the system architecture has been designed, and hardware and software selected which includes a minicomputer, a set of personal PC workstations, and a set of more specialized project workstations. The hardware has been selected, and contract negotiations for purchase of a VAX 6210 are in their final stages. An RFP has been issued for site preparation, and selection of a vendor is in process. The computer is expected to be ready for installation

by January, 1989.<sup>1</sup> The installation of the system will be accompanied by training in the U.S. for the two IRSIT staff members designated as the system managers.

**Project:** Office Automation and Software for Informatics Systems (OASIS)

**Client:** IRSIT

IRSIT is setting up its own internal operations as a model for how office automation can be used in Tunisian organizations. One objective in doing so is to improve the productivity of IRSIT staff and management through the use of tools such as text editors, spread sheets, an on-line database, electronic mail, and the connection to BITNET. A second objective is to set an example for IRSIT's client institutions. A third objective is to develop the skills to analyze office automation requirements, and select and install appropriate hardware and software. This project involved a survey of the staff to assess office automation needs and to identify problems with the existing operating procedures at IRSIT. This was followed by the selection and installation of a local area network (LAN) and an electronic mail system. Software to be accessed over the network is being installed incrementally, beginning with routine packages like word processors, and progressing to those whose use is less widespread. On-line databases are being installed as they are developed, and the staff have now been connected to the network which allows access to BITNET. Two IRSIT staff members have been trained in LAN architecture and administration in connection with this project.

### 3.6 Secondary School Projects

The computer technology project has funded two closely related projects directed at secondary school education, one involved with training of trainers to teach about microcomputers, and the other involved with provision of microcomputers and training to two pilot high schools in the Tunis area. Both of these projects have been implemented by the Centre Bourguiba de la Micro-Informatique (CBMI), with no participation whatsoever by IRSIT or the resident advisor. The complete separation of IRSIT and the resident advisor from the secondary education component of the project is largely due to the personality CBMI's director, and to his conflicts with others involved with informatics in Tunisia. This has made the overall project somewhat disconnected, with the role of education activities and their connection to the rest of the project somewhat unclear.

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<sup>1</sup> See Appendix C for the full configuration of the IRSIT computer center.

**Project: Training of trainers**  
**Client: CBMI**

CBMI offers a sequence of courses in the use of microcomputers, which are open to public employees, teachers, and the general public. These are taught at their facility in downtown Tunis, where students can also work on the machines in their microcomputer laboratories. They have also developed a curriculum to train people to teach about microcomputers, which is being taken by teachers in the pilot high schools and in the regular CBMI courses.

The AID project has contributed to these efforts through the provision of microcomputers at the CBMI center. It has not provided any consulting, technical assistance, or other forms of support. Curriculum development is handled entirely by the CBMI staff. The curriculum offers five levels of instruction: basic use of microcomputer packages, more sophisticated use of professional tools, using packages for database management and integrated project management, beginning PASCAL, and developing applications in PASCAL. The focus is very much on routine uses of computers which do not require any expertise in computer science or programming. This is probably appropriate for training government employees or the general public interested in knowing the basics of microcomputer use.

**Project: Support to the Pilot High Schools**  
**Client: CBMI**

The Tunisian Ministry of Education has created two pilot high schools which are designed to provide up-to-date technical education to a select group of students from all over the country. These students are selected on the basis of a national examination, and receive scholarships for their support at the schools, so admission is largely based on merit. The Lycee Bourguiba, which is adjacent to CBMI, uses French as its language of instruction, while the Lycee Ariana, in the suburbs of Tunis, relies primarily on English. These students are expected to go abroad for their university educations, and it is hoped that they will be attend the leading technical institutions in the Europe, the United States, or Canada.

Part of the special nature of the education at these two schools is that it relies heavily on incorporation of microcomputers into the entire curriculum. The AID contribution to these two schools, through CBMI, has been the provision of 32 Mac Plus microcomputers. The computer technology project was also supposed to locate sister schools in the United States from whom these two schools could seek assistance and advice in

incorporating computers into the curriculum. It was also supposed to provide some training in the development of software for computer-assisted education, but this has been limited and apparently quite ineffective.

Consequently, although the students use microcomputers, what they do is extremely simplistic. In their first two years they learn LOGO. In the third and fourth years they study word processing and learn to use drawing packages. In the fifth and sixth years they learn PASCAL. It has not yet been decided what they will do in the seventh year, as the two schools now only go through the sixth year of high school. Throughout their study they spend one hour per week in computer classes, and are not allowed to use the machines outside of class. The integration of microcomputers into other subjects of study is also fairly routine; language drills, reading texts on screen instead of in paper, or using the computers to measure rapid sequences of events for physics experiments. The teachers in the two schools have introduced some CAI packages from England and France, but for the most part they are expected to design their own applications in the curriculum. With five years of experience but no training, they are now being asked to produce a standard curriculum for integration of microcomputers into high school education in Tunisia.

In order for this project to be viable, the teachers must receive some serious exposure to the work going on in the United States on the use of computers as an instructional tool. Not only should they be paired with sister schools in the U.S., they should spend some time attending conferences, visiting schools of education where this is a major focus, and broadening their understanding of how computers can be integrated into a high school curriculum. In addition, if these students are to be competitive with their intended peers in the U.S.--the hackers who will know more about computers when they become MIT freshman than many of their instructors--they must receive more serious training and better access to the computers. Admittedly, this is much more difficult when students do not own their own micros, and are in a rigid educational system which does not allow time for individual experimentation. However, it would certainly be possible to accomplish more by teaching more, giving the instructor better training, and allowing the students to use the machines whenever they wish.

### 3.7 Higher Education Projects

Although higher education projects were an integral part of the original project concept, so none of the funds for them have been disbursed. In early 1988 IRSIT issued an RFP which called on faculty members to propose projects that would link university research to industrial activity and involve the development of

new methods for using information systems in education. The RFP set out ten criteria for evaluating proposals:

1. economic development importance of the project, and particularly the economic viability of the product it would produce;
2. need for technological innovation in the field;
3. scientific and technical merit of the proposal;
4. appropriateness and efficiency of the didactic approach;
5. clarity and importance of the university-industrial linkages established;
6. benefits of linkages established with U.S. institutions;
7. variety in the range of projects selected;
8. integration of Tunisian case studies into the curricula;
9. quality of the evaluation plans included in the proposals; and
10. commercial potential of the products to be produced by the project.

Well aware that Tunisian researchers were not accustomed to responding to RFPs or developing written proposals, IRSIT held an explanatory meeting at which prospective applicants given advice on how to prepare their responses. The grants are to provide hardware, training in the United States or Europe, consultant visits, and if appropriate some IRSIT staff time to work on the projects.

IRSIIT has received seven responses to the RFP. Most of them respond to only a few of the criteria listed, particularly with respect to linkages to Tunisian industry. Two proposals are related to industry, both to develop software to train students in manufacturing processes. In view of the fact that university research in Tunisia has not historically had a connection to industry, it is not surprising that the proposals do not establish that link. They have a stronger tie to national development issues. Two proposals involve development of data and software for water resources management, and a third addresses a variety of animal husbandry issues. One, proposed by the Bourguiba School, is linked to the Arabic speech research already underway at IRSIT. The last is more narrowly education oriented, proposing to set a microcomputer lab in the Ecole National d'Administration. The selection among these projects is to be carried out in November, based on the criteria set out in

the RFP.

Although the response to the RFP has not been overwhelming, at least some of the proposals offer the potential for accomplishing useful research. However, Ellouze and other leaders of IRSIT are quite clear that they do not want to play this role in the future. This process has come to be labelled the "foundation model", because IRSIT serves as a conduit of funds, but is for the most part not involved in carrying out the research itself. IRSIT leaders have decided against this model for the future, because their interest is in building an institution which is itself capable of carrying out research, rather than one which tries to influence the national research agenda through its determination of whom to fund. Moreover, they are not likely to be in a position of having funds to award in the future. Although they consider the process of issuing the RFP and reviewing the proposals to be a useful experience, they do not expect to replicate it.

## Chapter 4

### TRAINING

The computer technology project included a large budget for sending IRSIT staff and other Tunisians abroad for short-term training, conferences, and observational tours, and for bringing consultants in to conduct training at IRSIT. About thirty trips have been made under this part of the project, by junior and senior staff of IRSIT, staff of some of IRSIT's client institutions, and other national figures in the information systems environment such as Habib Bourguiba, Jr. and Farouk Kamoun. Not surprisingly, the higher level participants spent most of their time visiting American institutions and meeting with key individuals in their fields, while the junior people, particularly among the IRSIT staff, attended more structured training courses and conferences.<sup>2</sup>

The selection of participants for training and design of their programs overseas was made on a highly individualistic basis. There was no overall training plan beyond lists of the people who were expected to go overseas in the coming year and the general kinds of training each would receive. However a significant effort has been made to ensure that the overseas trips are serious endeavors, and that a free trip to the U.S. does not come to be viewed as a perk of working with IRSIT. For each person sent abroad, a training plan was proposed which described the work of that person at IRSIT and the areas in which his or her skills or experience needed to be expanded. Based on information provided by the resident director and often by the participant him or herself, if s/he had previously spent time in the U.S., a list of suggested courses, organizations, individual contacts, and conferences was developed in Tunis. This would be forwarded to AED in Washington, along with the required authorizations for the trip from Mike Denny, Noureddine Ellouze, Farouk Kamour, and Mark Karns. AED staff have handled all logistics for both training and travel.

For a number of reasons, it is not possible to objectively measure the impact of these trips in order to evaluate whether the expenditure was justified. Because each training program was individually designed to reflect the participant's background and IRSIT's needs, the value of the experience varies from person to person. Moreover, although the short courses were designed to present specific information which could be measured, observational tours and conferences are more valuable as a way of

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<sup>2</sup> Appendix D lists all the people sent abroad, the courses they took, the organizations or individuals they visited, and the conferences they attended.

making contacts and bringing someone up to date on what is going on in a field. As a result, it is often not possible to define or measure an anticipated impact; the influence is serendipitous, and occurs in unexpected ways.

On the whole, these overseas visits seem to have been successful. The effort made to justify each component of the training in terms of the participant's responsibilities at IRSIT or in the client organization has meant that courses are usually relevant to his or her work. In a few cases short courses turned out to be inappropriate or at too low a level, because the information available about the course was inadequate. However most participants were enthusiastic about the training they received, and pleased to focus narrowly on issues of importance to their work rather than taking the diffuse approach which characterized their university educations.

The conferences and visits to specific organizations were similarly considered to be valuable. In the nature of such activities, they are somewhat hit and miss; for every valuable conversation held or session attended at a conference there are sure to be three or four of no interest. However especially for younger staff, these events provided a valuable opportunity to meet people and enlarge their perspective on the work going on in their fields.

The ability to send people abroad has benefits for IRSIT beyond the experience it provides to individual staff members. Because they have travel funds, IRSIT can participate in higher level missions to the United States to investigate industrial or commercial development opportunities; one such mission is currently under discussion with the Ministry of Trade and Industry. In addition, the ability to go abroad makes it possible for IRSIT to develop opportunities to work with American institutions which would probably be dropped if Tunisians could not go to the United States to follow up on them. Thus the collaboration with PC Linguistics, the efforts underway to work out a plan with Bell Labs, and other cooperative ventures are furthered by IRSIT staff visits. These benefits are not easy to quantify, and it is sometimes not possible to see the gain from an individual trip in the short run. However, taking a long run perspective, it is clear that the ability to travel abroad has greatly strengthened IRSIT's ability to develop linkages with U.S. institutions and so its ability to serve as Tunisia's window on western technology.

The in-country training portion of the project has been limited. Consultants who were visiting IRSIT in the context of specific projects have given seminars on subjects including OS/2, project management, essentials of geographic information systems, and so on. However with the exception of a consultant to the CBMI who came solely for the purpose of working with teachers on

the use of computers in education, in-house training has been incidental rather than deliberate. This should come as no surprise. The training needed by IRSIT staff and other Tunisians sent abroad could not be conducted efficiently in Tunisia, because each person is receiving a specialized program. If many people were receiving the same training it would be reasonable to consider offering it in Tunisia; however this is not the case. Moreover Tunisian training obviously could not substitute at all for the conferences and observational tours, which depend on individual presence in the United States.

## Chapter 5

### TECHNICAL SUPPORT

The technical support component incorporates most of the computer technology project's activities to develop IRSIT as an institution. The project documents focus on the institutional capacities needed specifically to carry out research projects. However, because IRSIT did not exist when the project began, a lot of basic work has been needed before the institute could begin working on its research activities. Some of this is quite routine; furnishing the office, hiring clerical staff, developing routine operating procedures. Other tasks are more fundamental; hiring researchers, buying computer hardware, identifying clients, beginning a strategic planning process, organizing a management structure.

Since the start of the project, there has been a tension between the desire to simply begin working on projects, as envisioned in the project paper, and the need to create an organization which could carry them out. By providing the technical resources with which to begin implementing research activities even before IRSIT had developed a reputation, a strong research staff, or a secure client base, the computer technology project has facilitated the broader development of IRSIT as an institution. However the activities called for under this component of the project are oriented essentially towards carrying out projects, but not towards building the organization itself. Although we have structured our discussion of the activities carried out under this component of the project along the lines set out in the project paper and the evaluation scope of work, in discussing each issue we have gone beyond the scope of those documents, to consider the broader issues involved in creating IRSIT as an institution.

The project paper sets out several major objectives in this area. The first objective is to develop IRSIT's capacity to evaluate proposed research projects according to a number of criteria including feasibility, cost effectiveness, efficiency, appropriateness to the Tunisian political, economic and social climate, and whether they meet demands expressed in the Tunisian private or public sector. A second objective is to develop IRSIT's capacity to plan and manage the implementation of research projects. A third objective is to develop its technical capacity to carry out research, and to evaluate and modify hardware or software as needed. A fourth objective is to establish linkages with U.S. individuals and institutions who can enrich IRSIT's research. A fifth objective is to establish linkages with Tunisian industry which will help bring the benefits of information systems research into the private sector. A sixth objective, addressed elsewhere in the product documents

but properly considered an aspect of building IRSIT as an institution, is acquisition of computer hardware and software both for ongoing operations and for research activities.

### 5.1 Evaluating Research Proposals

#### Evaluation Process:

The selection process for IRSIT research activities has rarely involved reviewing and choosing among clearly defined projects. Instead, in all cases except the higher education projects still underway, it has involved identifying a potential client, and then working with them in order to define a feasible project. This has been true for a variety of reasons. For some projects political concerns (broadly defined) dictated that they would work with the client, and IRSIT was left to figure out how; such was the case with the phosphate mines, CBMI, and the stock exchange. It was a given from the start that IRSIT would work on Arabization; here the research interests of several particularly experienced staff members dictated the areas chosen for investigation. Other clients, such as the PTT, expressed an interest in working with IRSIT and a willingness to pay for its services, and then began a process of negotiating to define both the project and the terms of cooperation.

Consequently, although IRSIT has not gained much experience choosing among well-defined projects according to predetermined criteria, they have devoted substantial effort to working with clients to narrow and define projects. The skills developed among the IRSIT staff in working with clients on unstructured questions will be fundamental to their ability to continue carrying out applied research, particularly in the development of fee contracts. While the development of this kind of skill has not been explicitly stated as an objective of the computer technology project, the project has in fact played a major role in allowing this skill to develop. First, simply by providing the computer resources to enable IRSIT to begin carrying out pilot projects, the project gives IRSIT greater bargaining power with its clients. Second, especially at the start of the project the resident advisor played an important part in the process of defining workable projects.

Up to now individual staff members handling the negotiations on particular projects have been gaining this experience, with little explicit discussion about the process of defining projects. However, the institute as a whole should also be gaining through the management recognition of project definition as a key process which will be repeated in many of its undertakings. At this point in its development the IRSIT staff are ready to begin discussing this process explicitly, in order

to share and consolidate their understanding of how the organization will define projects. Such discussion may help them to speed up the process of project definition, which so far has been quite slow as they have been learning as they go along. With some experience under their belts, the IRSIT research staff are ready to engage in this kind of discussion and improve their ability to define projects.

As we have already seen, the major exception to this pattern for project selection is in the higher education pilot projects. In that area IRSIT has solicited clearly defined project proposals, and will select among them based on specified criteria, following the model anticipated by AID. Although the IRSIT staff consider this a useful experiment, this is not a role that IRSIT expects to play in the future, both because they will not have funds to give out in this way, and because they prefer to work themselves with clients and carry out projects in-house.

#### Criteria for Evaluation:

As IRSIT has attracted more clients, and embarked on a wider range of projects, the institute is defining its own criteria for prioritizing projects, which are somewhat different from those set out in the project documents. Nouredine Ellouze describes several criteria for choosing among projects:

1. They should have regional, rather than simply national application.
2. They should involve cooperation with another institution, preferably one outside of Tunisia.
3. They should have a client who is willing to pay for IRSIT's services on the project.

Additional criteria apply to the choice of projects which have application at the national rather than the regional level:

4. They should reflect the needs of the Tunisian economy, particularly for foreign exchange.
5. They should reflect the priorities of groups in the Tunisian government who are willing to finance IRSIT projects.

In practice, although some of the projects may have regional applications, none of them has clients outside of Tunisia. Moreover, a number of additional objectives have clearly motivated IRSIT to include projects in its portfolio. These include concerns like developing the skills of IRSIT staff, or carrying out highly visible activities which will develop IRSIT's

reputation. Pursuing some of these goals will require a subsidy from project (or IRSIT) funds, and there is no reason to expect that financial returns will accrue to IRSIT in the foreseeable future, or indeed ever. While the social cost benefit analysis might come out positive on such projects, IRSIT's balance sheet certainly will not. However, they may still be reasonable activities for an organization of this type, if it can generate the funds to finance them.

In addition, some of the objectives may conflict with each other, or with other important aspects of IRSIT's management. For example, the importance of developing information systems skills which will have value throughout the economy is stressed in many projects. However, for these skills to reach the rest of the economy, IRSIT staff will have to move on to do other things with their training, as is already occurring in some cases. While this benefits the economy, it does not help IRSIT create a stable research organization. This outcome is sometimes translated as success of the IRSIT endeavor, while at other times it is understood to mean that the institute is failing because it cannot hold onto its staff.

## 5.2 Planning and Managing Research

### Strategic Planning:

IRSIT's awareness of the need to plan and manage its research activities in a structured way seems to be growing. Over the first year and a half of the project, it has taken on a broad range of activities, and has frequently felt that it was spread too thin for its management capability. The project itself has not directly contributed to the increased structuring of the institute. The resident advisor attempted early on in the process to introduce a structured planning process which would involve all of the IRSIT staff, but his proposal was rejected by Nouredine Ellouze. He has also recommended that Ellouze take some management training courses in the United States, but this idea has met with resistance as well. The resident advisor, a number of the consultants reviewing IRSIT activities, and the IRSIT Scientific Council have all recommended that IRSIT focus its efforts and prioritize its activities so as to get a better handle on where it is going and how much it is equipped to undertake. However no formal planning process has ever been instituted, although there is certainly a lot of informal discussion of objectives and strategies among the staff.

This is a good time for IRSIT to begin developing a more structured strategic planning process. The organization has taken the initial steps required to become established, is demonstrating that it can attract paying clients, and is beginning to become known in Tunisia. It is well enough

established that its research staff no longer have to devote all of their energies to simple day-to-day operations. While there has been a wide variety of internal discussion among individual staff members about where the organization is going, there has not yet been any more formal discussion of what IRSIT is trying to accomplish, and in particular of the choices that must be made in selecting a direction for the organization.

The point of instituting a planning process is not to produce a formal, written document, which could become a political target to individuals or groups outside of IRSIT, and could create expectations which would limit the flexibility of the institute. Instead, the object of such a process would be to push IRSIT leaders towards an evaluation of what they might like the organization to do, and a recognition that they will always be making choices among options, rather than working towards all of them at once. By setting out, at least for internal use, the objectives which are guiding them, they establish criteria for making decisions in their day-to-day operations, and set up a framework for evaluating their progress over time.

#### Organizational Structure:

In the past few months IRSIT has begun responding to the need for increased management control and organizational structure with three initiatives. First, the research department of the institute (which now includes most of its staff) has been grouped into three areas, Arabization, telecommunications, and industry projects. The Arabization and telecommunications groups each have research directors responsible for overall management of activities, and each project within the group has its own leader. This approach seems to be helping to alleviate some of the problems, although it is somewhat limited. Finding qualified research directors is proving very difficult, and the people hired so far are only part time, holding university jobs as well. Moreover at present there is no research director for the industry projects group, which includes the most diverse range of activities and therefore will prove the most difficult to manage.

Second, in early 1988 IRSIT hired an administrative and financial director, who is in the process of developing an organizational chart for all of the non-research functions of the institute. His plan calls for four non-research departments: administration and finance, studies and training, marketing, and international cooperation. He has then elaborated in some detail the functions and staffing requirements of each department. Although this plan is quite ambitious for IRSIT's present level of development--if fully implemented it would call for more administrative staff than the institute now has researchers--it does indicate a concern about creating management structures, and about the form they should take. At present the administrative and financial department exists, with the director and an

accountant. A director for international cooperation has been hired, and will begin work in December, 1988. He will also have some responsibility for training, since this is part of the background he brings to IRSIT. Additional department directors are to be recruited in 1989.

However, as with research directors, finding experienced administrators for IRSIT is difficult. Middle level public servants, like the director of administration and finance who has been detailed from the Ministry of Tourism, tend to want to create the cumbersome bureaucracy which characterizes most of the Tunisian public sector. Ellouze is very anxious to avoid creating an organization where "the administration runs the researchers" rather than vice versa. As a result, he is very particular in seeking staff. He usually looks for people who have worked overseas, preferably in the United States, and who are interested in a flexible, "American style" organization. Not surprisingly, there are not many of them in Tunisia, so recruiting managers is a slow process.

#### Project Management:

Third, IRSIT is in the process of introducing a project management system intended to help project leaders think through the steps involved in carrying out their work, who will be doing what, how the budgeted resources are to be spent, and when each task should be completed. Using Timeline, a PC-based project management package, one of the researchers on the office automation project is working with each team leader to break their projects into tasks and schedule and prioritize them. Success in meeting the project deadlines will be the basis for awarding bonuses to research staff, in order to create an incentive to take the system seriously and stick to the schedules.

It is clearly too early to assess the effectiveness of this new system. So far the staff seem guardedly optimistic; recognizing the need for more structure, glad to have the tasks required of them spelled out clearly, but nervous about being called upon to perform on a set schedule. Moreover, to the extent that bonuses are strictly based on meeting the time deadlines, unrealistic schedules could cause considerable discontent among the staff.

This is good time for IRSIT or the computer technology project to provide team leaders with training in project management. Most of the project leaders have never led a team of people before, and are not used to thinking in terms of dividing a project into discrete tasks, prioritizing them, linking them to a budget, and managing their staff to as to ensure that the project is completed on schedule. They will probably need training and practice at assessing how long each task will take,

which goes beyond learning how the project management software is used. Incorporating some training into the process of introducing the new software will help reinforce the concepts involved, and improve the likelihood that the effort will be successful.

### 5.3 Technical Capacity

IRSIT has succeeded in attracting a dynamic group of skilled researchers who have many of the technical skills needed to carry out the research they are undertaking. To the extent that they lack some key skills, at least some of the staff will probably be able to develop them as they begin implementing their projects. However several issues may be cause for concern in the area of technical capacity to undertake research. First, the staff are mostly young and inexperienced, and while they have significant technical skills, as has already been mentioned they lack the ability to manage research projects. The hope is that some of them will stay on long enough to move into positions leading research projects as they gain more experience.

However, this is related to the second problem, staff retention. Three researchers have left IRSIT over the past year, for a variety of reasons. While IRSIT pay scales are higher than the rest of the civil service, they are lower than what these people can receive in private industry or, in several cases, in family businesses. In addition, during the first year of IRSIT's existence the projects were very much in flux, and research staff were frequently switched from one project to another. This caused substantial discontent, and made people feel that the organization was unstable. Moreover, to the extent that IRSIT seeks to train people who will spread their skills throughout the economy, losing trained staff is a sign of success, because it means they have learned valuable skills at IRSIT which they can take elsewhere. Although this may not describe all the people who have left in the last year, it suggests that staff retention will always be a problem for IRSIT.

Another important factor in staff retention is that all IRSIT employees (except those detailed from other government organizations like CNI) work on contract instead of holding permanent positions. This is a very unusual arrangement for Tunisian government employees, who are not accustomed to the frequent changing of jobs which is typical of young professionals in the United States. While some of the research staff are excited by the environment at IRSIT and do not mind working on contract, many would prefer the stability of a permanent position, particularly in the universities. The decision to hire all staff on contract is part of IRSIT's effort to create an "American style" institution, and avoid the entrenched, inactive bureaucracy which characterizes most of the public sector.

Ellouze is adamant about not wanting to hire the kind of staff who are interested in staying in one position for life, or who are afraid of the periodic reviews inherent in working on contract, because he feels they will not contribute to the growth of IRSIT as a dynamic institution.

This relates, of course, to the third problem involved in developed IRSIT's technical capabilities, the difficulty of finding qualified employees in the first place. As with administrative staff, the institute recruits primarily among Tunisian students returning from completing their graduate work abroad, on the assumption that these people will be well educated and will have assimilated a Western model of how to work. While the people they hire are competent, the pool is obviously small. To carry out the projects currently being launched, IRSIT will probably have to hire at least a dozen researchers in the next year. Finding them from this limited pool is going to prove very difficult.

There are no simple solutions to these problems. Although offering people the stability of employment which is available in the rest of the public sector would satisfy some people, it would probably do so at too high a cost in terms of creating a bureaucracy out of IRSIT. Seeking out more faculty members interested in working with IRSIT on a part-time basis may offer a partial solution. While these people are not making the commitment of full-time staff, some of them are interested in carrying out their research at IRSIT because it offers much better computer facilities than the universities. Since they can work at IRSIT without giving up the security of their university posts, they may be more willing to do so than people who would have to take a greater risk to work with IRSIT.

Another possibility is to look to other Tunisian organizations for experienced information systems professionals, particularly to CNI. IRSIT currently has two staff members who are detailed from CNI. This strategy can work well, although it creates the risk of bringing in people who work in the bureaucratic mode of permanent employees in the public sector. According to one of the CNI employees, there are many people at CNI who would like to be detailed to IRSIT, because it is a more exciting place to work. The number available depends on the cooperation between Nouredine Ellouze and the PDG of CNI, Farouk Kamoun.

Yet another option is to bring in medium to long-term technical advisors from the United States with donor support. The current project only includes funds for short term consultant support, but not for long-term experts who could serve as team leaders. If paired with Tunisian counterparts, these people could provide the training needed to help IRSIT grow its own team leaders in-house over time. The difficulty might be to find

Americans interested in such positions. High-level technical specialists in fields like those of the IRSIT projects are not usually oriented towards working in the developing world or towards the salaries paid in the development professions. While AID may be able to bring them in for short-term consulting (sometimes for free as pro-bono work), they may have trouble finding long-term consultants. However, the idea is certainly worth investigating further.

#### 5.4 U.S. Linkages

Establishing ties between IRSIT and U.S. academic and industrial institutions has been a major part of the computer technology project and of the resident advisor's job. While it is clear from the roster of consultants who have come to Tunisia and from the itineraries the Tunisians who have travelled to the U.S. that the volume of contacts has been significant, it is important to consider the nature of those contacts as well.<sup>3</sup>

One important issue is the nature of the linkages, i.e. who is providing what to whom. There is a distinct difference between paying an American consultant to provide advice or training, and working as a colleague with a researcher who sees IRSIT staff as counterparts, not clients. Most of the U.S. contacts, particularly those with people who came to Tunisia, have been the former type. They have provided the means for IRSIT staff to learn about technological developments, opportunities, areas of research, and other issues which have proven important in developing IRSIT's pilot projects. Only a few of the contacts, notably those between Salem Ghazeli and Bell Labs (speech synthesis), and those between him and PC Linguistics (translation) have involved IRSIT and an American institution working as equals on a project. This is a crucial distinction, because while the client-consultant relationship is definitely beneficial to IRSIT, it will not be sustainable after AID funds are no longer available to pay consulting fees, transportation, and other expenses.

A second important issue is how U.S. contact people have been identified. Two issues are really involved here, whether the resident advisor and AED have identified the best possible contact people, and the extent to which IRSIT staff will be able to continue developing U.S. contacts once AID funding ends. The process for identifying U.S. contacts so far has generally begun with IRSIT staff approaching the resident advisor with their needs. In some cases he has responded by getting directly on the

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<sup>3</sup> See Appendix E for a list of consultants who have come to Tunisia, and Appendix D for a list of Tunisian who have gone abroad and their itineraries.

telephone to the U.S. to track down someone working in the desired area. In other cases he has forwarded the request to AED, which has turned to members of the computer technology project consortium, or sought additional names from its consultant roster. The IRSIT staff seem pleased with the results, and feel that the resident advisor has been very helpful in finding contacts for them. The feeling was expressed that it was better for Mike Denny to locate people directly than for AED to search its consultant roster, because the chances of finding a good fit were better when someone closely acquainted with the IRSIT need did the seeking than when someone removed from it who looked for resumes that seemed relevant. However, IRSIT staff are not always in a position to evaluate whether they have been matched with the best contacts available. In some cases the process of identifying U.S. contact institutions has been haphazard or incomplete, where a more thorough search of the opportunities might have been more appropriate.

Perhaps a more important question is how far the IRSIT staff will be able to go in maintaining and extending their U.S. contacts without AID funding and the assistance of the resident advisor. Although they may be able to maintain some of the contacts already established, a number of factors suggest that they will not be able to extend them. The IRSIT staff often will not know where to look to locate people who share their interests. They are not accustomed to using overseas phone calls to track people down, especially working in English, and it is likely that the Tunisian government would not be willing to pay the phone bills even if the staff were inclined to work this way. Their access to the BITNET network, which links many academic institutions in the U.S. and Europe, may provide some means of remaining in touch or identifying new contacts, but the effectiveness of this tool remains to be seen. In addition, the lack of funding for travel will reduce the ability to expand their base of contacts by going to international conferences. Thus in general, although the process of setting up linkages to the United States has begun well, such connections are not maintained without ongoing efforts--and investments--to stay in touch.

### 5.5 Linkages to Tunisian Industry

The computer technology project has established some linkages in Tunisian industry, particularly with parastatal organizations, but this area has not been developed as fully as might be hoped. Since public and parastatal organizations account for a large portion of the Tunisian economy, it is not surprising that most of IRSIT's clients have come from these areas, especially since IRSIT is itself a public agency. Moreover, the Tunisian private sector is not accustomed to carrying out research or developing new methods of production like the ones IRSIT could offer.

Instead, they typically produce under license to European companies without considering the possibility of developing or improving on the production process.

Consequently, it will take a more active approach on IRSIT's part to seek out clients in the private sector if it really wants to establish a linkage between private industry and applied research. This would involve a systematic analysis of Tunisian industry to identify potential clients, and active marketing of IRSIT's services. Such a study of the private sector has not yet been carried out, although it was proposed by the resident advisor in an early memorandum on the development of private projects. This is probably not a task which could be handled well by the existing IRSIT staff; it requires an understanding of marketing, industry structure, and the use of computers in manufacturing, rather than technical skills in computer science. This would be an appropriate first task for IRSIT's marketing director once they have found one, or for a short term consultant hired under the computer technology project.

#### 5.6 Acquisition of Computer Hardware and Software

Two questions are important with respect to the acquisition of computer resources; do IRSIT researchers have access to adequate facilities, and are they learning how to evaluate hardware and software themselves. Access to computer resources has been improving, but many of the projects are still waiting for machinery to be purchased. IRSIT bought a group of PCs at the start of the project in order to get the work moving. The acquisition of specialized resources has proceeded more slowly, since it involves thorough surveying of the available hardware and software. The core computer center, in particular, has been in the pipeline since the summer of 1987, when the first RFP was developed for its purchase. A number of projects are now waiting for its installation, anticipated in January 1989, in order begin work. In addition to these delays, there is some resentment because resources have been spent on hardware for clients, when IRSIT itself still does not have its system operating. Thus although hardware acquisition is moving along, it is something of a bottleneck within IRSIT at present.

IRSIIT staff have participated in a number of hardware and software selection processes, and are developing their abilities in this area. A number of the pilot projects have involved the researchers in software or hardware evaluations, and this has been used as an opportunity to provide training. Although at present the resident advisor still plays an important role in technology evaluation, IRSIT staff are taking part in the process and building their skills.

## 5.7 Summary: Technical Support to IRSIT

The technical support component has been faced with the difficult task of trying to initiate a research program in an organization which did not exist when the project began. Although many problems still remain, with project assistance IRSIT has made major headway in creating an organization and beginning substantive research and development activities. The project's major contributions to this effort have been the technology resources to allow IRSIT staff to begin working, and the access to U.S. institutions for ideas and advice. The project has not been able to participate directly in creating the institution, but has provided resources to permit IRSIT to begin creating itself.

## Chapter 6

### INSTITUTIONAL DEVELOPMENT

The fourth component of the project includes activities intended to build the capacity of Tunisian institutions to continue doing research and development in the information systems area once the project is completed. Some of the outputs expected from this area overlap significantly with those of the technical support component of the project. These include issues pertaining to development of IRSIT's institutional capability to plan and manage research, and the establishment of coordinating mechanisms between IRSIT and United States institutions. The project paper also includes hardware purchases as a part of institutional development. All of those issues have already been discussed in the section on technical support.

In this section we will consider the impact of the computer technology project on the broader institutional framework for automation in Tunisia. Two specific outputs were anticipated in this area. First, the project documents call for coordinating mechanisms between IRSIT and the other Government of Tunisia organizations in the information systems arena, and the development of a comprehensive plan for activities in the field of computer technology. Second, they call for an analysis of alternative strategies for introducing computers into the educational system, including consideration of the proposed Carthage Institute of Technology.

#### 6.1 Coordination Among Information Systems Organizations

IRSIT has not played a coordinating role among the information systems organizations in Tunisia, nor is it likely to do so. In order to understand why this is the case, it is useful to overview the other national organizations which play a role in this area.<sup>4</sup>

The Conseil Supérieur de l'Informatique et des Telecommunications (CSIT), created in early 1988, is responsible for developing national policy on informatics and providing the impetus for implementing it. It was formed from an earlier Commission Nationale de l'Informatique, which was larger and occupied a lower position in the national bureaucracy. The council has jurisdiction is over training, research, industrial development, use of information systems, and broadening public

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<sup>4</sup> See Appendix F for a more complete description of the organizations playing a role in the information systems arena in Tunisia.

awareness of the benefits of the technology. The members of this council are representatives of various interested ministries including education, plan, industry, and commerce, as well as the presidents of IRSIT and the Centre National de l'Informatique (see below) and representatives of the prime minister's office. A permanent committee of the CSIT has the authority to review and approve the information systems plans of all government agencies, as well as all purchases of computers larger than microcomputers.

The Centre National de l'Informatique (CNI) is the most influential organization in the national information systems arena. It was founded in 1975, and is a large, well established, and somewhat bureaucratic organization with a staff of over 200 programmers. In the organizational structure it is directly under the authority of the prime minister. Its president director-general (equivalent of chairman of the board and CEO), Farouk Kamoun, is a key player in national level information systems activity in Tunisia.<sup>5</sup>

CNI has two main functions. One section of the institution serves as the staff for the CSIT, preparing materials for its meetings and carrying out its directives. This group handles the preparation of the five-year informatics plans, which set out the national agenda in the information systems area and map out the actions to be accomplished over the five-year period. The second such plan was developed for the period 1987-1991, in coordination with the 7th national five-year plan. This part of CNI is also involved in the preparation of new laws pertaining to informatics, which gives them a major influence on the direction of national policy.

The other section of CNI is a service bureau, carrying out data processing and applications development for the public sector, as well as some applied research particularly in the area of Arabization. CNI is a parastatal organization, so this group is expected to cover its costs through fees charged to other public agencies for its services.

In the educational arena, five schools offer technical training for information systems professionals: the Ecole Nationale des Science de l'Informatique (ENSI) in Tunis, the department of informatics in the Faculty of Science at the University of Tunis, the Institut Superieur de Gestion (business school) in Tunis, the Faculty of Economics and Management in Sfax, and the Ecole Nationale d'Ingenieurs de Tunis (ENIT). Training is available for technicians, programmers, systems analysts, and more specialized professionals up to the level of the doctorate du troisieme cycle. Nouredine Ellouze, the

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<sup>5</sup> Kamoun is also the Tunisian project director for the AID computer technology project.

director-general of IRSIT, is on the faculty of ENIT, and a number of other IRSIT staff members teach at these schools. In addition, the Institut Supérieur de Gestion offers a program in MIS and database management to the business school students.

The Centre Bourguiba de Micro-Informatique (CBMI), created in 1985, provides public education and secondary school training in microcomputer use. Through training courses open to the public at its center in Tunis, and through programs in high schools and microcomputer clubs throughout the country, it teaches how to use microcomputer packages and some elementary programming. It has played an active role in obtaining micros to set up computer laboratories in high schools, most recently through its program "HB-1000" designed to bring one thousand microcomputers into the country per year. The director of the CBMI, Mokhtar Latiri, is a fiery individual on whom depends much of the success of the organization. He has played an active role in informatics activity in Tunisia for many years, and was the first director general of IRSIT before Nouredine Ellouze was appointed.

IRSIT's niche in this environment is to be a regional, rather than a national center, and to focus on research and development rather than on national policy or coordination. Beyond the allocation of AID funds through the computer technology project, it has neither the authority nor the influence to guide other ministries in framing or coordinating their information systems agendas. Consequently, this has not been a part of the computer technology project.

## 6.2 Institutions for Introducing Computers in Education

The analysis of alternate structures for introducing computers into the Tunisian educational system has been carried out through the work on the proposed Carthage Institute of Technology. Following the guidelines of the project paper and the contract between AID and AED, consultants Harold Hoelscher and Clifford Clark prepared two reports which surveyed some of the options for strengthening education in informatics. They considered the demand for technically trained university graduates over the next few years, especially technical managers, and concluded that a major new training effort would be needed. Because of the inflexibility in Tunisian education, they feel that it would be difficult to introduce new approaches in the context of one of the existing schools, and so propose the creation of a private, U.S.-type institute providing technical training linked strongly to industrial needs.

In 1987 the Tunisian government declared that it would create the Carthage Institute of Technology, and gave Farouk Kamoun authority for continuing work on it. Subsequently Habib Bourguiba Jr, the president of IRSIT, asked Nouredine Ellouze to

use computer technology project funds for a detailed feasibility study of the CIT. Although neither the Ellouze nor the resident director felt this was the best use of the funds, politically it was impossible to refuse the request, so the study was carried out.

The CIT plan calls for creation of a new institute to offer bachelors, masters and doctorate degrees in applied sciences and management. The institute is to be regional in its orientation, attracting students from Africa and the Middle East, and faculty from all over the world. One innovative feature of its design is that its graduate degrees are all to be interdisciplinary, and are to involve close cooperation with industry in order to ensure that the skills learned will have direct application in the Tunisian economy. It is intended to be a private university, although the exact meaning of this is not yet clear. It will receive its accreditation from the Ministry of Higher Education, but will have a private board of directors and if possible private funding. The plan calls for the bachelors and masters degree programs to begin with the opening of the institute, and the doctoral program to be introduced in its seventh year of operation. The construction of the new campus is to be carried out in four phases over eleven years, at a cost estimated at over \$100 million.

So far no concrete steps have been taken to make this plan a reality. The plan has been critiqued, and suggestions made for areas in which further work is needed, particularly on costs, funding sources, and implementation schedule. The direction of the critiques is towards reducing cost estimates, slowing down the pace of development, and working on special programs which can help the institute bring in operating funds. So far, however, no commitment has been made by the Tunisian government (or anyone else) to try to raise the funds for the Carthage Institute. In view of the costs involved, implementation of this plan does not seem likely in the foreseeable future.

## Chapter 7

### PERFORMANCE OF THE RESIDENT ADVISOR AND CONTRACTOR

The contractor and resident advisor on the computer technology project have performed well in most respects. To the extent that problems have arisen, they have had to do with managing IRSIT as a start-up organization, time delays, and with the technical nature of the project, which calls for different skills from most development projects.

This section reviews first the activities of the resident advisor and then those of the contractor. In each case, it assesses how well they have performed their major responsibilities. When there were problems, it considers why they arose and how they might be avoided in the future.

#### 7.1 The Resident Advisor

The resident advisor has effectively performed most of the tasks assigned to him. IRSIT staff are very positive about his assistance in establishing contacts in the United States and identifying appropriate consultants and training programs. They also feel that his assistance has been valuable in defining and structuring the pilot projects, and in helping build the organization at the start of the project. On some of the pilot projects he has also provided substantive technical assistance as well, in the areas where his technical expertise is sufficient to allow him to play this role. These included in particular the projects designed to build IRSIT itself, such as office automation and installation of the local area network. On most of the projects, however, he has contributed primarily to logistics and locating information in the United States, rather than to the technical content of the project. This is, of course no surprise; no one person will have the technical skills to contribute meaningfully to a wide range of research projects like those being implemented at IRSIT.

AID staff are also pleased with Mike's performance as the liaison between them and both IRSIT and the project. He and his assistant, Faouzi Ben Sedrine, have effectively coordinated the logistics of the project: dealing with AID, getting expenditures approved, getting computer hardware into the country, and so on. There have been some complaints both from IRSIT staff and from Mike Denny about the number of steps required to approve any expenditures above \$500; the signatures of the resident advisor (Mike Denny), the general director of IRSIT (Noureddine Ellouze), the Tunisian project director (Farouk Kamoun), and the AID/Tunis project officer (Mark Karns). This process certainly is cumbersome; however it is unavoidable in this context. Had

Ellouze been director-general of IRSIT when the Tunisian project director was appointed he might have been given this post, which would have simplified operations substantially; however it is clearly too late to do anything about this now.

The proliferation of individuals with responsibility for this project created some problems for the resident advisor when he began at IRSIT. As he puts it, at the start he "didn't know who his boss was." Moreover, because for all intents and purposes IRSIT did not exist before Mike began work--and legally it was not created until December, 1987--there was a great deal to do simply to create the institute. Mike's role in this initial organizational period, and the extent of his responsibilities in IRSIT management, were open to some question. Both Mike Denny and Nouredine Ellouze have spoken of problems as he was developing his understanding of the Tunisian environment and which aspects of American management could be transferred to this context.

These problems seem to have been resolved, and Mike has apparently developed effective working relationships with all of his "bosses"; Nouredine, Farouk Kamoun, and the series of AID project managers who have overseen this project. In terms of IRSIT management, however, this appears to have been at the cost of Mike keeping at arms length from what is sometimes referred to as "IRSIT, but not the American project". Mike has not played an active role in fundamental organization building at IRSIT aside from what is included in the American project, i.e. strategic planning, building an organizational structure, staff recruitment, and developing routine operational procedures. Nouredine has preferred that these aspects of the institution be kept separate from the American project, in order to give IRSIT its own identify. By his own admission, however, Nouredine is a professor and a researcher, not a manager, and IRSIT has felt the problems associated with this kind of leadership. While the relative lack of structure of the institute is clearly a problem both from AID and from IRSIT perspectives, Mike has not been in a position to do much about it.

## 7.2 The Contractor

By and large the Academy for Educational Development has also performed its duties well. In their handling of the logistics of training, Tunisians travelling to the United States, and consultants travelling to Tunisia, which has comprised a major part of their responsibilities on this project, there have not been any significant problems.

Questions about AED performance have arisen in the areas in which an information systems project requires a different set of backstopping skills from what is needed in most development

projects. In identifying consultants, AED has gone to the consortium developed for this project, and to its consultant roster. While many of the consultants have been excellent, the process for choosing them did not ensure that AED had really surveyed the market to ensure that they were getting the best qualified people or organizations for cooperation with IRSIT. Moreover, the consultants rosters of most development consulting firms do not include people with the technical skills called for in this project.

Perhaps more to the point, most professionals in the technical areas of interest to IRSIT--telecommunications, computerization of industrial processes, speech synthesis, etc.--are not interested in development. They are in the private sector, where they are accustomed to being paid far more than AID or even other development agencies are likely to offer, and certainly more than IRSIT could afford without donor assistance. A number of the American consultants who have participated in this project have done so for free, essentially as pro-bono work, since even the highest rates offered AID do not approach the opportunity cost of their time. This factor has undoubtedly hindered AED's ability to bring the best people in to work with IRSIT in some areas.

AED's limitations have also been felt in the area of procurement of computer equipment. The initial problems in procurement are well known. Originally AED contracted with a Sperry subsidiary for procurement. However, because Sperry might have bid on IRSIT hardware itself, this was felt to entail a conflict of interest. AED therefore hired FETCO, a procurement company, to cover this task. FETCO proved unable to handle the job, apparently because they did not know the technology well enough, and procurement requests went unfilled. Eventually AED resolved the problem by bringing procurement in-house, hiring someone who knew computer hardware well enough to take on the job. However, the problem here is a general one which will affect all such projects. As in the case of consultants, technically skilled people who know computer hardware well do not generally work in the development field, or at development rates. Firms like AED will have to recognize that this is a new, specialized need which cannot be met by their conventional staffs, and will have to design their backstopping teams accordingly.

The time delays caused by AED's proposed resident advisor pulling out literally on his way to Tunisia had a significant impact on the implementation of the project. Mike Denny arrived in Tunis eight months after Lorne Bouchard was to have begun work, a significant set-back in a three-year project. It is not clear, however, what the contractor could have done to avoid this problem, since they fully believed that Bouchard was going to take the position, and in fact Bouchard was a major reason why

AED was awarded the contract. Possibly the search for a new person could have proceeded more quickly, saving at least a few months. While this delay was extremely unfortunate, however, it reflects more on the individual than on the contractor.

The delays in getting the IRSIT computer center set up may be attributed in some part, although certainly not entirely, to the contractor. In the summer of 1987 a consultant came in to develop an RFP for IRSIT's computer hardware. At that point IRSIT had very little idea of what it would be doing, and so was unable to provide clear specs for its processing needs. Consequently, the resulting RFP did not meet the institute's needs as they were perceived by that fall. The RFP was therefore redone in-house at IRSIT, and the procurement process gotten underway. The subsequent delays have been due to the standard AID reviews and controls over major computer hardware purchases, and to the time lag between ordering and receiving such equipment. Possibly a few months could have been saved, therefore, had the consultants developing the first RFP been better able to elicit IRSIT's anticipated needs; however the rest of the time involved is in no way the fault of the contractor.

## Chapter 8

### POLICY CLIMATE FOR INFORMATICS IN TUNISIA

The policy climate in Tunisia encourages the introduction of information technology. The government has substantial control over the economy, which means that new technology cannot spread without high level support. At present that support seems to be growing, both for public sector use of information technology, and for privatization of the informatics industry.

This chapter covers three areas relevant to the policy climate. First, it discusses recent national level actions which encourage the spread of the technology in the public and private sectors. Second, it considers the role of IRSIT in this environment and its potential for impact on national policy. Third, it considers the appropriateness of further information systems activity for AID/Tunisia's country development strategy.

#### 8.1 Policy Actions

A variety of recent policy actions indicate the support of the Tunisian government for increased use of information technology in the country.<sup>6</sup> First, the major information systems organizations are under the direct authority of the prime minister, which gives them much better access to decision-makers than they would have were they lower in the hierarchy. The elevation of the CSIT to a position directly under the prime minister, with only a small number of highly-placed members, indicates the importance given to it. There is interest in computers at the highest levels of government; President Ben Ali has a microcomputer in his office, and the presidential palace is being rewired so that its operations can be automated.

Second, a new regulation promulgated in August 1988 has substantially simplified public sector use of information technology. Until 1988, all public sector purchases of computer hardware or software valued at more than about \$10,000 had to have the authorization of CNI, which was contingent on CNI approval of an information systems plan for the organization. Under the new rules, parastatal organizations no longer need to prepare information systems plans, although they are recommended to do so anyway. Purchases of microcomputers no longer require any authorization beyond the normal controls on public sector capital investments, and neither hardware nor software imports require CNI approval. Only government agencies systems larger

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<sup>6</sup> See Appendix F for further details about the laws regulating information systems use.

than microcomputers are required to submit information systems plans, and those plans are approved only by the permanent subcommittee of the CSIT mentioned above, not by the CNI.

Third, several enacted and proposed changes in the tax laws are designed to encourage the growth of firms providing information systems services (data entry, data processing, and applications development) as well as to increase demand for the services of these firms. As of 1987, reductions in the value added tax which previously applied only to firms producing at least 80% for export may now be applied to all software development activities. A law currently under development will allow all firms to subtract some proportion, possibly 50%, of their information systems expenditures from the tax base for the VAT. This would apply as well to expenditures on information systems consulting activities, providing an incentive for firms to contract out systems development instead of creating in-house data processing staffs. Another proposed law would give new software houses a five to ten year rebate on some portion of the taxes paid on their employees, in order to encourage the development of new firms in the industry. CNI is taking a lead role in pushing the information systems agenda in the development of these new laws.

Fourth, the customs duties and import regulations on computer hardware and software have been eased somewhat. While tariffs are still high, averaging around 25% depending on the type of machine, they were reduced from close to 50% by laws passed in 1987 and 1988. Moreover, since January 1988, licensed hardware and software importers no longer need import licenses to obtain foreign exchange for their purchases. Instead of having to go through the Ministry of Economy and Finance for approval of each purchase, a lengthy bureaucratic procedure, they now simply file a certificate of imports at their bank and the banks will automatically provide the foreign exchange needed. Hardware and software vendors must be licensed, however; the Ministry of Commerce regulates what may be sold by whom, apparently in order to ensure that adequate support will be available for all the computer equipment sold in the country.

## 8.2 IRSIT Role in the National Arena

Two issues are important in considering IRSIT's role in the national arena: its influence on national policy, and possible national decisions affecting the organization. Concerning the first consideration, IRSIT is not likely to have a direct influence on national policy on informatics in the immediate future. The organization's mandate for research and development does not give it a policy role. This role is already filled by CNI, through its positions as the secretariat of CSIT, the developer of the five-year informatics plans, and the largest

software development house in the country. At present IRSIT is not sufficiently established to have an influence on national policy, and it will probably be several more years because before the institute produces results or products of sufficient value to give it more influence. IRSIT's political influence may also be reduced because of the position of its president, Habib Bourguiba jr. While Bourguiba (senior) was the president of Tunisia, his son had considerable influence, so his role as the president of IRSIT gave the organization some importance. In the past few months, however, President Ben Ali has asked Bourguiba jr. to retire, and a new president of IRSIT has not yet been designated. This leaves significant unknowns with respect to the future ability of IRSIT to influence national policy. Moreover Nouredine Ellouze, IRSIT's director general is, at least at present, much more oriented towards developing and carrying out research projects than towards entering the battle on information systems policy. Thus IRSIT's influence on the direction of national policy in the future, perhaps in the development of the eighth five-year plan, will depend both on its having proven its importance through development of products of obvious value, and on its director general and new president moving into an active role in the political arena.

The question of policy actions influencing IRSIT also faces some unknowns. IRSIT is developing an organizational structure which will involve significant increases in staffing over current levels, particularly in order to provide the overhead services needed to manage the organization and market its products. Moreover, if IRSIT wishes to sustain the kinds of activities initiated under the AID computer technology project it will need significant amounts of foreign exchange for travel, consultants, and publications, as well as funds to pay for international telephone calls. There is no assurance yet that the government of Tunisia will be willing to authorize any of these expenditures. A commitment has been made that IRSIT will receive the funds to increase its staff by ten people each year. However, the institute's budget must be negotiated each year, and is subject to political whim.

The seventh five-year plan, written just after the creation of IRSIT, acknowledges its existence as a regional institution and asserts that it will be "endowed with the necessary means", but does not go any further into how its needs will be met. IRSIT's survival may therefore depend on the ability of its president and director general to obtain the necessary funds, and on whether it can show enough results from its first few years to receive more attention in the eighth five-year plan. The prime minister's office is committed to IRSIT as a regional institute, and appears to be pushing this model as a source of funds and as the justification for its existence as an independent organization. In the meantime, funding depends on the prime minister's office being convinced of the worth of ongoing

projects, or on IRSIT's ability to find resources elsewhere.

### 8.3 Relevance of IRSIT to AID/Tunisia's Objectives

The primary axes of AID/Tunisia's development strategy, as set forth in 1986, and as anticipated for the next CDSS, are agricultural policy, privatization, and technology development. If these continue to be the mission's objectives, then further reliance on and possibly support for IRSIT is definitely appropriate. In light of Tunisia's position as a middle-income developing country and its relatively strong cadre of trained information systems professionals, support for information systems activities seems appropriate and desirable as a next step in development activities. Moreover, the national interest in encouraging both the spread of the technology and the development of a private information systems industry fits particularly well with AID's interests both in technology and in privatization. The only unknown with respect to the appropriateness of AID support for IRSIT will be the support at national levels for the institute in particular. It will therefore be important for AID to monitor the position of the institute to ensure its stability before giving it further funds.

## Chapter 9

### MAJOR FINDINGS AND RECOMMENDATIONS

#### 9.1 Findings

This section sets out the major findings of the evaluation, with respect to the accomplishment of project goals, and with respect to the development of IRSIT as an institution. The next section will then make recommendations to AID, AED, and IRSIT for future actions in this area.

##### Overall project design:

- >> Because IRSIT did not exist before the resident advisor arrived in Tunis, a significant amount of time and effort had to go into the routine development of the institution before substantive work could begin on pilot projects. Consequently they are not as far along as might have been hoped by this stage of the project.
- >> The focus and orientation of IRSIT is towards developing a center which carries out its activities in-house. This is different from the model anticipated by the computer technology project, in which IRSIT operates like a foundation giving grants to other institutions which propose and initiate projects. IRSIT has explicitly considered and rejected the foundation model, and prefers to develop its own capacity to do research and development.

##### Technical Support:

- >> Because they are interested in undertaking in-house activities rather than funding outside ones, IRSIT staff are developing their skills in working with clients to define clear, feasible projects, rather than in evaluating proposals submitted by others. They have gained some experience in this area, which they should now reflect on in order to assimilate what they have learned.

##### Pilot Projects:

- >> Because the project began later than anticipated, most of the pilot projects are still in incipient stages, and it is not yet possible to evaluate results. However their progress so far shows that most of them are being carried out by enthusiastic and well-trained staff, who are gradually defining manageable tasks which should lead to useful products or results. Because the project began late, a variety of tasks still remain to be accomplished which will depend on the support of the computer technology project over the next

year, for hardware and software purchases, travel, and training.

- >> IRSIT is selecting pilot projects in response to a wide range of criteria, some of them explicit, and many of them left unstated. Some of these criteria conflict with each other, and many are responses to political pressures on the institute. It may be advisable to explicitly sort these out, even though balancing these external pressures will probably continue to be the norm for how projects are chosen.
- >> Most of the work currently underway at IRSIT is not research, but may better be described as technology transfer and adaptation. Some of the work on Arabization is the only clear exception to this pattern. In view of Tunisia's inexperience in cutting edge research, and its focus on applications which will benefit the domestic economy, serving as a vehicle for technology transfer may be a more appropriate role for IRSIT than research. (We will continue to use the word "research" to refer to IRSIT's activity despite this observation.)
- >> The education and research components of the computer technology project are totally separate, reflecting the organizational structure of these activities in Tunisia and the personalities of the individuals involved in carrying them out. Future informatics projects in Tunisia would do well to separate them entirely, instead of trying to link them into one general effort.

#### Training and U.S. Linkages:

- >> The ability to travel overseas and to fund consultants in Tunisia has proven essential for IRSIT to develop linkages with individuals and institutions in the U.S. In-country training has not played a major role in the project, because the training offered by the project is too individualized to permit grouping people together to offer courses in Tunis.
- >> The linkages created with U.S. institutions mostly involve bringing consultants to Tunisia in order to learn from them, rather than locating people with whom IRSIT staff can work as colleagues. This dependence on rather than equality with U.S. consultants may not be IRSIT's objective, but it is not surprising given the experience level of the IRSIT staff.
- >> The ability to sustain the linkages established under the project will depend on the continued availability of foreign exchange for travel, and on whether IRSIT staff can take the initiative for establishing and maintaining contacts without a resident advisor to help them. So far they have taken little such initiative in most areas.

>> IRSIT has not yet established projects in private sector industries, nor has it begun working in the area of management information systems rather than technical systems. These lacks reflect the orientation of IRSIT staff, who are all engineers rather than managers, and the institute's position as a governmental organization. In the future IRSIT may be able to expand its focus, although the current staffing patterns would not allow them to work on management systems.

#### IRSIT Organization and Management:

>> Organizational structure and management have been major problems as the institute was getting underway. Recently, however, IRSIT staff have begun efforts to deal with these problems, developing a more hierarchical organizational structure, recruiting mid-level management and research staff, and introducing a project management system for keeping track of the research projects. If these efforts are effective, they will go a long way to resolving some of the major problems of the institute. The computer technology project itself has not been able to contribute directly to resolving these problems, as it was not within their authority, although the resident advisor did make some efforts to address IRSIT's management problems.

>> Staffing remains a problem at IRSIT. Because staff are hired on contract, and because recruitment is primarily among students returning from Europe or the United States, it is hard for the institute to hire and retain skilled people, especially people with enough experience to manage research projects.

#### Policy Environment:

>> The policy environment for development of informatics in Tunisia is very positive, as demonstrated by the new laws being passed which encourage the use and importation of computer hardware and software. Policy makers seem convinced that information technology will play a role in Tunisia's overall economic development, both as an input to other activities and as a productive sector itself.

>> IRSIT does not have a major role to play in informatics policy in the foreseeable future. The institute's mandate does not give it a role in this area, and the planning and national coordination functions are already clearly assigned to other institutions.

## Performance of Contractor and Resident Advisor:

- >> The contractor and resident advisor have effectively met most of the demands placed on them, particularly with respect to linking IRSIT with U.S. institutions, interfacing between IRSIT and AID, and handling the logistical details of extensive travel between the U.S. and Tunisia. The problems which have arisen may be attributed to the problems a conventional development consulting firm has when working in a high-tech field. This applies to procurement, to identifying the best consultants for technical tasks, and to convincing those consultants to work at AID rates. These are problems which will have to be addressed over time by both AID and the firms, as AID undertakes more work in this field.

## 9.2 Recommendations

### Continued Work on the Project: Recommendations to IRSIT and AED

- >> IRSIT has grown rapidly in the last year, and established a number of activities which seem to be progressing well. This is a good time for the institute as a whole to sit back and reflect on what they have learned so far and where they want to go in the future. Such reflection might focus on the experience in defining projects, the criteria for choosing projects, and the choices to be made in setting a course for the next few years. The object of this process would be not to produce a formal report planning document, but to establish an internal understanding which could guide the choices about projects, technology, or staffing to be made in the future.
- >> The steps which IRSIT has taken recently towards strengthening its organizational structure and management are very important. The introduction of more management staff and research directors is essential, and should be given high priority. The use of project management tools should be accompanied by training in this area for all team leaders, to help them use the tools as effectively as possible.
- >> IRSIT currently relies heavily on the assistance of the resident advisor and the contractor in selecting computer technology. In order to make them more independent in the future, we recommend that the project arrange for training, possibly in Tunisia, in the evaluation and selection of information technology. This will better equip institute staff to take on this responsibility once the project ends.

### Extension of the Project:

- >> We recommend that the project termination date be extended to

continue the projects now planned or underway. This is important because a number of the pilot projects still have significant expenditures to make which may not be completed before the March, 1989 deadline.

- >> The extension of project funds should include a component directly targeted at organizational and management support. It should focus on building the marketing and fund-raising capability of the IRSIT staff, introducing a strategic planning process, and analyzing more clearly the options for making the institute self-financing in the near future. It should include development of a realistic five-year budget for IRSIT, detailing anticipated funding sources and commitments. Project funds should be used to bring in consultant assistance in developing this planning process. Appendices L, M, and N suggest the approach which this assistance could take, and the steps required to implement it.
- >> The funding extension should be used to focus on continuing and perhaps slowly adding to the projects already undertaken, rather than on establishing a range of new projects. In particular, if funds with which to obtain assistance in strategic planning are limited, IRSIT should cut out the higher education pilot projects, since they entail significant commitments of resources to new endeavors.
- >> In extending the funding AID must recognize that the Tunisian government and the IRSIT staff are interested in creating an institute that carries out its own activities, not a foundation that gives grants to others. This will have implications both for project staffing and for how funds are to be spent.
- >> Future support for secondary school education or CIT should be separated from support to IRSIT. CBMI already has a significant commitment from the Tunisian government and other donors, and its ventures are likely to be quite successful. The CIT does not yet have the strong support of the Tunisian government; in view of the costs involved we do not recommend that AID support it further without that commitment.
- >> Future AID assistance should include funds for travel and consultants, as these have proven very valuable in to IRSIT in developing linkages with the U.S. Even if IRSIT can raise funds from its activities in Tunisia, it will not be able to access the foreign exchange needed for these activities. The same argument applies to continuing to fund development of the IRSIT library, which, although a small part of Tunisian budget, offers a unique resource not available in the universities.

- >> In designing the technical support component of future projects, AID should consider the possibility of providing long-term technical staff to work on the development of specific research projects. This could help address IRSIT's current problems recruiting experienced research managers, and provide an opportunity to train existing junior staff to take on this role in the future.

#### Application of the Computer Technology Project Model:

- >> Information technology may be expected to play an important role in the national strategies of mid-level developing countries in the next decade. It will be crucial as a direct input to productive activities, as a form of infrastructure on which both the public and private sectors will depend. It may also be a productive sector itself, as more developing countries move into production of software and possibly manufacturing of electronics equipment. Consequently, AID must investigate the role which informatics may be expected to play, how it can best support this development thrust.
- >> Support for the introduction of informatics in the developing world will also further U.S. government objectives to disseminate its products and its skills internationally. This can help strengthen the country's position as a worldwide leader in information technology, and build a reliance on U.S. products which may prove valuable in the long run.
- >> The computer technology project offers one model for AID involvement in the introduction of informatics in the developing world. Although this is an interesting project for Tunisia, because the government was already planning to create IRSIT, it may not be directly applicable elsewhere. Several factors are at work here. First, most developing countries should focus more on technology transfer and adaptation than on research, so development of a research institute is not an appropriate strategy. Second, if an institution like IRSIT--whether for technology transfer or for research--does not already exist, it may be very difficult to build from scratch. The experience of the computer technology project suggests that it would be preferable to work with an existing institution if one exists.
- >> The project does offer some insights into elements of a donor-agency informatics strategy which may be transferable elsewhere. One key element of this project is the focus on identifying opportunities to benefit from the introduction of new information technology. Although AID may want to begin its efforts by working directly with client institutions, using U.S. experts, rather than creating this capacity in the

country, this project does highlight the need to assess how information technology can contribute to economic development. Another important aspect of this project is its reliance on extensive short-term travel to the United States in order to train and establish linkages to U.S. institutions. This is an effective way to broaden the scope of people's thinking, and introduce them to new ideas. Thus although this project may not be directly transferable to other countries, the principle of supporting the introduction of information technology certainly is, and we can look to the project itself to suggest forms which that transfer may take.

**APPENDICES**

## Provisions for Logistic Support (Continued)

## B. Additional Facilities Available From Other Sources

 Diplomatic pouch PX Commissary Other (specify, e.g., duty free, entry, tax exemption)

## C. Comments

## Relationship of Contractor or Participating Agency to Cooperating Country and to AID

A. Relationships and Responsibilities Consultants will report to USAID/PM and work with selected staff of IRSIT.

B. Cooperating Country Liaison Officials Dr. Farouk Kamoun, GOT Project Manager  
Dr. Nourradine Ellouze, Director of IRSIT

C. AID Liaison Officials Mark H. Karns, PDO  
Louis F. Macary, Asst. Program Officer/Evaluation Officer

## Background Information (additional information useful to authorized agent)

Attached. See Attachment No. 1, sections I to VIII.

Block 13: Mission References:

- Project Paper for 664-0334.
- PROAG 664-0334.
- IRSIT publications
- Contract 664-0334-C-00-6034-00
- Project Grant Agreement dated 9/27/85
- Letter of appointment between Dr. Michael Danny and AED dated 3/6/87.

## I. Summary of attachments that accompany the PID/T (check applicable boxes)

- A. Detailed budget estimates in support of increased funding (Block 12)
- B. Evaluation criteria for competitive procurement (Block 14A) N/A
- C. Justification for procurement by other than full and open competition or noncompetitive assistance
- D. Statement of work or program description (Block 16)
- E. Waiver(s) justification(s), clearance(s), certification (Block 18) (specify number N/A)

PIO/T Number 664-0334-3-70114

Attachment No. 1

EVALUATION TERMS OF REFERENCE

Tunisia Computer Technology  
Project 664-0334

I. Project Data

Project Title: Computer Technology  
Project Number: 664-0334  
LOP USAID Funding: \$3.5 million  
PROAG Date: September 27, 1985  
PACD: March 31, 1989  
Implementation method: AID Direct Contract with the Academy  
for Educational Development (AED).

Summary Project  
Description:

The project is implemented by Dr. Farouk Kamoun, Centre National d'Informatique (CNI) and by Nourreddine Blouze, Director of Institut Regional des Sciences, de l'Informatique et des Télécommunications (IRSIT), which coordinate all project activities. IRSIT works with concerned ministries and public and private institutions in carrying out pilot activities in industry, secondary and higher education.

The project focuses principally on strengthening the capacity of IRSIT to lead in planning, managing and conducting research strategies for a broader, contextually appropriate, application of computer technology in Tunisia. Through training, technical support and the support of research and development and formal planning exercises, the resource base of IRSIT will be improved. A key vehicle for the project is the selection and execution of pilot activities introducing computers into the higher, secondary and non-formal educational systems of the country. While these subprojects will themselves be developmentally and economically important, they are justified primarily as providing the experience to the GOT in innovation in computer technology to allow forceful future efforts on a larger scale.

## II. Evaluation Purpose

The objective of the evaluation is to (1) determine the extent to which the project's goal and purpose are being or can be met within the life of the project; and to provide USAID and IRSIT with guidelines for changes needed in project design and implementation.)

A major focus of the evaluation will be on policy changes affecting the introduction, spread and use of computer technology, important assumptions affecting achievement of the project purpose, and the general socio-political-economic setting for computer technology use. Recommendations pertinent to IRSIT activities which should continue to be supported or emphasized should be made. Recommendations should include discussion of the range of project modification options available in prioritized order.

Project components will be evaluated against End of Project Status (EOPS) and output indicators. Available information on computer technology impacts and use related to this project will be reviewed. The evaluation will identify special or on-going problems impeding progress in achieving outputs and determine if implementation plans and/or strategies need to be modified.

## III. Project Description

The long-term goal of the project is the generation of effective widescale utilization of information technology to improve socio-economic performance in achieving Tunisia's development goals. Specifically, this comprises:

- Introduction of innovative computer technology in public and private sectors such as extractive industries and telecommunications, etc.
- More widespread and effective use of computer technology in education at appropriate levels.

These goals will be achieved through development of:

- Widespread utilization of micro-computers in effective and efficient applications
- Training workforce to assume computer-related roles.
- Indigenous capability to manage various phases of computer-Oriented society
- Enhanced research and limited manufacturing capacity (CNI)
- Improved access to information and services
- Greater private sector role in the spread and use of computer technology.
- Adapted computer technology to specific social economic environment, (e.g. arabized computer interfaces)
- Development of an applied research capacity in computer technology (eg as noted in VII Plan).

The project's purpose is to assist plan, design, modify, implement and evaluate computer applications, primarily through public education and research, in an appropriate manner, through four project components:

1. Technical support
2. Pilot Projects and Applications Research
3. Training
4. Institutional Planning, Development and Analysis

These four components are described in Project Paper 664-0334 and in the Project Agreement plus amendments.

#### IV. Statement of Work

The evaluation will review two levels of achievement.

First, it will consider the appropriateness of activities undertaken under the project and their contribution to attaining the project's intended purpose and outputs. This aspect also will consider the social and political environment in which project activities have been taking place; examine the validity of assumptions made during the project design; and document impediments encountered in implementation of project activities.

Second, the evaluation will assess the contribution of the project to overall Tunisian objectives and strategy for the spread of computer technology in Tunisia and to IRSIT's ability to translate computer technology objectives and strategies into appropriate action programs. This review will recommend modifications in on-going project activities, to the extent appropriate, to develop/improve these capabilities; and for identification of focus areas after termination of AID financing for the project.

#### A. Project Activities, Implementation Status, and Implementation

1. Implementation progress in each of the four project activity areas and status vis-a-vis indicators in the PP logframe. These project components are discussed in the PP, ProAg and contract documents.

The consultant shall review and briefly discuss:

- a. Major activities undertaken to date.
- b. The changing political and economic environment in Tunisia, and view of computer technology relative to that changing environment.
- c. Status of each, vis-a-vis implementation plan and project targets.

d. Problems encountered in undertaking activities.

e. Assessments: IRSIT's institutional development to date, ability to perform/constraints; availability of personnel; quality of contract TA; involvement of USAID; contractor role; relationship of IRSIT to other computer-related institutions.

f. Basic findings and Recommendations.

2. Project Comments and Implementation Issues.

a. Project Technical Support.

Assess IRSIT's institutional capacity to:

- (1) Develop and critically assess the feasibility of computer technology research undertaken.
- (2) Develop activities leading to computer applications appropriate and necessary for Tunisia.
- (3) Apply, as appropriate in the country and target for intervention, cost benefit and cost effectiveness, and practicality of applications criteria.
- (4) Disseminate computer technology benefits awareness.
- (5) Evaluate hardware and software technologies.
- (6) Modify hardware and software for the Tunisian context (ongoing economic structural readjustment in Tunisia with an increasing emphasis on the production and distribution of goods and services by the private sector).
- (7) Establish linkages with:
  - regional institutions
  - U.S. and other international institutions
  - domestic industrial users, both public, government, and private sector.
- (8) Link Tunisian research capacity in computer technology with Tunisian industry and other sectors such as academia so that research can be driven by specific applications needs.
- (9) Develop clear plans for applied research in computer technology and for introducing and spreading computer technology.

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**b. Pilot Projects and Applications Research**

Assess IRSIT's capacity to:

- (1) Develop an institutional capability in each pilot project area of focus with the objective of IRSIT developing/selling its expertise, under contract(s), to potential users, in future years.
- (2) Determine project feasibility, funding, design, evaluation and necessary implementation steps.
- (3) Generate sustained systems for review and analysis of pilot projects in:
  - higher education sector
  - secondary education
  - applications research
  - industrial sector
- (4) Develop expertise of client companies in information and telecommunication
- (5) Apply cost effectiveness and efficiency criteria in the analysis of projects.
- (6) Examine proposals for computer applications in education and other sectors.

Assess pilot projects undertaken to date with respect to:

- (1) Estimated economic and developmental importance of the pilot project.
- (2) The needs for innovative in the computer technology used in the pilot project.
- (3) The applied scientific research merit of the pilot project.
- (4) Cost effectiveness of the computer technology used.
- (5) The presence of and importance of the industry or university linkage involved.
- (6) Quality of linkages with U.S. institutions.
- (7) The pilot projects potential contribution to economic structural readjustment.
- (8) For education sector pilot projects in general: The integration of the activity with the educational process, its appropriateness and cost effectiveness, its utility in teaching.

The above assessment should focus both on pilot projects which have been started and those in the planning stages which have a serious chance of being implemented. Pilot projects underway as of June 1988 are:

1. IRSIT Projects:

Industrial

- Planning the Gafsa Phosphate Company (CPG) surface mines
- Oil exploration (with ETAP, the national oil company)
- Financial data base for the Tunisian Stock Exchange

Telecommunications

- Telephone line rationalization and transmission improvement with the Tunisian Poste, Telegraphes, Telephones (PTT)
- Videotext with PTT
- Providing data communications mode service to Tunisia
- Installation and operation of a local area network in IRSIT as a part of an office automation system

Arabization

- Arabic character recognition
- Arabic speech research

2. Secondary Education

- Procurement of personal computers for CBMI
- Training of trainers program for CBMI

3. Higher Education

- Planning and feasibility study of Carthage Institute of Technology (CIT)

New Initiatives

- Satellite Imagery Analysis for Locust Control
- Technical Assistance Program to National Center for Informatics (CNI)

Contracts or agreements of intent have been signed with C' PTT, ETAG and Direction Generale de l'Informatique (DGI). These agreements have evolved from the above pilot activities. The contractor shall assess the ability of IRSIT to fulfill their contractual terms of reference and to develop future contract fee-based business.

c. Training

The project has financed four types of training activities:

- (1) U.S. based short-term training
- (2) In-Tunisia training
- (3) Observational Tours by IRSIT and other Tunisian personnel
- (4) Conferences.

The contractor shall assess:

- (1) Whether or not training received has increased identifiable skills.
- (2) The relative utility and cost effectiveness of U.S. based training vis-a-vis training offered in Tunisia.
- (3) The comprehensiveness and appropriateness of IRSIT's overall training plan for the project including review of training objectives.
- (4) Whether training was appropriate for the person selected.
- (5) Compliance of trainees with AID rules and regulations.
- (6) Overall institutional benefit from training.

For observation tours and conferences, the contractor shall assess:

- (1) Their design and objectives. Does completion of a tour or attendance at a conference contribute to expansion of the participants' capability with respect to increasing skills needed to develop appropriate computer technology for the Tunisian context?
- (2) The cost-effectiveness of the tour or conference, i.e. would a short-term specific training course have been more appropriate to impart the knowledge required?
- (3) The fundamental desirability of tours/conferences as vehicles for enlarging the personnel capability and institutional capacity.

d. Institutional Planning, Development and Analysis

Project activities under this component aim to develop a capacity within Tunisian institutions to maintain relevant research and other activities in Computer Technology after the PACD is reached (March 31, 1989).

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IRSIT has worked with the Ministry of Higher Education, the Ministry of National Economy and various other institutions such as CBMI, CNI, CPG, ETAP and PTT.

The consultant will assess the degree of achievement of the specific outputs expected from this project component, especially:

- (1) Development of an applied research institute which should have a major technical, economic, industrial, social and cultural impact on Tunisia and the region.
- (2) Clear coordinating mechanisms between IRSIT and its co-operating institutions in U.S. and Tunisia.
- (3) A GOT statement of priorities in computer applications, especially in computer based education and for introducing computers at various levels in the teaching process.
- (4) Determination of alternative educational approaches, such as the development and operation of the CBMI and the institutional assessment and feasibility study of the Carthage Institute for Technology (CIT)
- (5) Plans for developing feasible and (for the private sector), commercially viable linkages, which lead to increased computer technology dissemination, innovation and use.

3. The Implementing A.I.D. Financed Contract with the ACADEMY for EDUCATIONAL DEVELOPMENT

The contractor shall assess:

- a. The overall performance of the prime project contractor as determined by comparison of actual actions performed with the terms of reference of contract 664-0334-C-00-6034-00 dated August 1, 1986.
- b. The effectiveness of the contract resident advisor for IRSIT as a growing institution with an applied research mandate, in a third world setting with a tri-lingual socio-cultural environment (English, French, Arabic).
- c. The overall performance of the resident advisor as determined by comparison of actual work output versus terms of reference of the resident advisor's contract.

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**d. Specific actions undertaken by the contractor as follows:**

- (1) Assisting IRSIT to develop bona fide linkages with U.S. and Tunisian and regional institutions.
- (2) Developing exchange of teachers and scientists.
- (3) Providing guidance to IRSIT management in organization development.
- (4) Providing assistance to IRSIT to engage in analysis of computer technology activities for:
  - feasibility determination
  - identification of impact
  - cost effectiveness
  - potential for commercial usage and exploitation
  - appropriateness.
- (5) Assistance in developing pilot projects.
- (6) Overall coordination of project activities.
- (7) Timeliness of project activities such as:
  - deployment of consultants
  - supervision of consultants
  - coordination with IRSIT and USAID.
- (8) Arrangements for training and development of an appropriate and logical training plan over the project.
- (9) Arranging for procurement and shipping of hardware and software as determined by:
  - appropriateness to local context
  - ability of IRSIT staff to use quickly
  - cost effectiveness.
  - timeliness
- (10) Project/contract administration for both home office and field office.
- (11) Adequacy and timeliness of reports.

**4. Policy Issues**

The contractor shall briefly assess the extent to which:

- (1) Tunisia has elaborated a legal, fiscal, regulatory, and institutional (LFRI) framework which is conducive to the further development, spread, and use of computer technology for the Tunisian economic and social environment.
- (2) The extent to which the project has, at least in part, motivated/caused or otherwise assisted in positive changes in the LFRI framework.
- (3) The outlook over the rest of the 7th 5-year plan for the spread and use of computer technology in Tunisia.
- (4) The extent to which USAID support for IRSIT has been developmentally appropriate for Tunisia and consistent with AID's Four Policy Pillars.

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### 5. Project Management and Design:

- What strengths and weaknesses characterize management of this project for USAID, the Contractor and IRSIT? (management of TA; development and processing of documentation; monitoring of performance; responding to concerns, problem resolution etc.).
- What steps, regarding project design or project implementation structure, need to be taken to increase project effectiveness?
- Has IRSIT management and staffing been adequate to provide the necessary leadership, support, supervision and monitoring required to administer the project?
- What coordination has been undertaken with other donors also supporting computer technology development?
- Project financial pipeline. How timely have been disbursements? Will there be an estimated uncommitted balance by the PACD?
- Given initial delays in beginning project implementation, is the LOP sufficient? Should the PACD be extended to permit full commitment of funds to enable achievement of project objectives?

### 6. Unintended Consequences

Briefly identify unintended consequences of the project and note whether they are positive/negative, assist in meeting project objectives, change the project or its components in a significant way, and have any ramifications on AID financing, management, and policy. Discuss the impact of these unintended consequences on achievement of project objectives.

### 7. A Look to the Future

Briefly assess the appropriateness of USAID's role in financing computer technology projects given AID/W and USAID policy and discuss the relative need for further AID financing in the context of:

- (1) Use of computer technology in the future development of Tunisia
- (2) GOT structural adjustment.
- (3) AID policy.
- (4) Extremely limited annual FY funds availability.
- (5) Competing developmental priorities.
- (6) The possible spur to U.S. exports by introduction of U.S. hardware and software.
- (7) The integration of a computer technology project with USAID's portfolio, especially the private sector.
- (8) Ways to improve AID's involvement in computer technology projects.

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## V. Team Planning

The contractor will arrange and conduct team planning in Washington, D.C. The team will be responsible for gathering and disseminating all relevant documents, contacting individuals and arranging for participation at the team planning meeting, and preparing a report on the proceedings for USAID/Tunis to be given to USAID/PM on arrival in Tunisia. This team planning is expected to take 2 days and preparation time an additional 2 days, for a total of 4 days planning and preparation in Washington, D.C.

## VI. Suggested Methods and Procedures

1. Duration: The evaluation is planned to take place o/a September 6 to October 6, 1988. It will consist of an estimated 4 day preparatory phase in AID/W; on-site field work in Tunisia; and report completion in the field and in AID/W. These phases are described below with an illustrative schedule for each.
  - (a) Preparatory phase: proposed dates o/a September 6-9. During this phase the team will review documents and meet with AID/W, ABD staff, and U.S. co-operating institutions to discuss the project, its objectives and the Terms of Reference for the evaluation. During this time the team will review the Terms of Reference; plan methods to collect data/information, developing any forms and/or questionnaires to be used in the interviews and field work; and assign specific team responsibilities.
  - (b) On-site field work: proposed dates o/a September 12-28. Based in Tunis, the team over and approximate 2 and one half week period will collect and review data, hold discussions with IRSIT and Tunisian institutions and contractor representatives, make field trips as required, and review and assess pilot projects. Given the breadth of material to be covered, it is suggested that the team observe a six day work week. During their stay in Tunisia, the team will draft the evaluation report for USAID and IRSIT review.
  - (c) Report writing and review: Proposed dates o/a September 28 - October 6. This review will be used to complete the draft report and recommendations, and to review the document with USAID and IRSIT. Following this, the team will complete a final version of the report in the U.S. The team leader will be allotted a additional week to finalize the report immediately upon return to the U.S.

(d) Debriefing: The Team will debrief USAID/Tunis and IRSIT executives and project management prior to departure from Tunisia and schedule a debriefing in AID/W with the S & T bureau and ANE/TR ASAP upon return. It will also leave behind a final draft Evaluation Summary (AID form 1330-5) following AID/W guidelines for preparation of the ES.

2. Methodology: The team will have access to all project related USAID, IRSIT and CNI information and data, including USAID files. The Team is expected to develop its own methodology to complete the Terms of Reference.

## VII. Evaluation Team Composition

USAID plans to obtain the necessary skills for the evaluation through a work order with a qualified IQC firm.

- A. Team composition: The Team will be composed of three U.S. or International experts, including the Team Leader. Also, two IRSIT representatives at a mid to senior level, will participate in the evaluation on a part time basis, with representatives from other Ministries taking part, as appropriate. Team members should have some fluency in French. Translators are available locally for translation of the report into French. Additional information on the required qualifications and expertise of the planned evaluation team is presented below.

1. Team Leader: The team leader should be well versed in the development, implementation and evaluation of computer technology programs; and have experience with computer technology services, training and communications programs for applied researchers and IRSIT computer science professionals. The team leader must have a solid grasp of the policy framework issues surrounding computer technology in a third world setting. The team leader should have a Ph.D. or equivalent in either computer science, a related discipline, or a management/business field, and be current on recent developments in computer technology and commercial use or have direct experience with the successful management of an applied research institution. The team leader must have significant overseas experience, particularly in the Third World. Fluent French is desirable although a FSI S-3/R-3 is acceptable. Some familiarity with the unique problems of arabization of hardware and software is desirable. The team leader should have a minimum of ten years experience in computer science, management or related work, and have proven management skills.

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2. Computer Scientist/Engineer: One professional, with a computer science degree and/or a computer engineering degree, preferably at the graduate level, is required to assist the team leader. The professional should have five years of identifiable experience in computer applications and have experience in working with start-up organizations. He/she should be familiar with a wide variety of hardware systems, software packages, WAN's, LAN's, Telenets, data digitizers and use of these (and other technologies in both academic and commercial applications). French at S-2/R-2 is desirable but not required. Familiarity with the Third World is highly desirable and some knowledge of Arabized hardware and software is preferable.
3. Institutional Development Specialist: Desired qualifications are ten or more years experience in management of organizations, especially those with computer applications and those in the start-up phase. The specialist should be familiar with the introduction of computer technologies in a number of businesses and other institutions. The specialist should be familiar with the management and organizational requirements of start-up organizations, including training and staffing needs. A graduate degree in management, an MBA, or a degree in industrial engineering are examples of the type of academic training considered appropriate. French at the S-3/R-3 level is desirable but may be waived if the individual selected meets the above profile and has a combined technical and management academic background and has solid experience with start-up institutions. Some prior experience in the Third World is required.
4. AID/W Representatives: It is desirable that an appropriate A.I.D. scientist or computer specialist with knowledge of computer applications, computer hardware and software systems, computer-related training, and computer-related institution development experience be a member of the team to provide the AID perspective in terms of project objectives, design, implementation steps and development policy. It is anticipated that the AID/W representative may be a co-team leader depending on who is selected/available and the relative qualifications of the IQC Team Leader. French language capability at the S-2/R-2 level is desirable but not required. Probable sources of an appropriate AID/W representative are the S&T Bureau, IRM and ANE/TR.

B. Administrative Arrangements: The USAID/PM Office will serve as the liaison for the team, facilitating contacts and providing information as needed; the USAID Program/Evaluation Officer will work with the team to assure that the evaluation is progressing according to the terms of reference.

1. Secretarial Support, Word Processing/Office Space: The preparation of the draft and final evaluation report is the responsibility of the Team Leader. Local secretarial and translation assistance can be obtained, if requested far enough in advance.

IRSIT will provide office space and use of word processing equipment during normal working hours. However, team members should come equipped with word processing capability, if possible, or be prepared to rent equipment on the local market for non-working hours.

2. Funding: Except for the AID/W representative, to be funded out of AID/W Operating Expenses, USAID will finance the evaluation with project funds earmarked for that purpose. Funds are earmarked under this PIO/T to finance costs associated with the services of the non-AID/W members of the IQC firm team, including the participation of the Tunisian representative (per diem only, if required).

The estimated cost includes salaries for technical assistance, per diem, international and domestic travel, car rental/ground transportation, secretarial/translation services, xeroxing, team planning support, other miscellaneous expenses and contingencies (see Attachment 2 for budgetary details).

### VIII. Report Content and Format

A. Format of the Report: The team will prepare a written report that conforms to the Asia/Near East Bureau Guidelines for Evaluation. A set of these guidelines is available in AID/W, ANE/DP. The report will include sections as stipulated by these guidelines. The major sections and suggested length are briefly described below:

1. Basic Project Identification Data Sheet: One page.

2. Executive Summary: Three to five pages, single spaced using the AID Evaluation Summary format and directions found in the above guidelines.

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3. The Report: The report is to include a description of the country context in which the project was developed and carried out, and provide the information (evidence and analysis) on which the conclusions and recommendations are based. The body of the report should not exceed 50 pages in length although the team may include details in annexes, if found to be necessary.
4. The report should contain a full statement of conclusions, options, and problems identified. Conclusions should be short and succinct, with the topic identified by a short sub-heading related to the questions posed in Terms of Reference. Whenever possible, the recommended option should specify what agency or individual should take action and in what time plan.

The team will distinguish between findings, conclusions, options that follow from the findings and conclusions. This information may be expressed schematically in a matrix in the evaluation report. "Lessons Learned" and "Unintended Consequences" from project activities should be included in this section.

5. Annexes: These are to include, at a minimum, the following:
  - a. The evaluation scope of work;
  - b. The project logical framework, together with a brief summary of the current status/statement of the original inputs and outputs;
  - c. Methodology of the evaluation, including copies of any instruments and questionnaires used;
  - e. A list of persons/agencies contacted with addresses and phone numbers.
  - d. A bibliography of documents consulted.
  - e. A list of persons/agencies contacted with addresses and phone numbers.

Other appendices may include more details on special topics as required.

- B. Submission of Report and Asia/Near East Evaluation Summary:

The team will submit an outline of the draft report to USAID/Tunis 10 or more days before departure, and a preliminary draft to USAID at least 2 days prior to departure from Tunisia. USAID and IRSIT will review the draft and provide commentary to the team prior to departure. Twenty copies of the final report in English will be due in USAID/Tunisia not later than four weeks following receipt of comments from USAID and IRSIT. The contractor will submit 10 copies of a translation in French of the final report, including the Executive Summary, but excluding annexes.

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The team also will be required to complete the Asia/Near East Evaluation Summary (Abstract and Part II) for submission at the same time as the final report. This requirement is explained in the guidelines mentioned in Part VIII, section A.

- C. Debriefing: Prior to departure from Tunisia, the Team will conduct a debriefing for the USAID Mission Director, or his designee, and for IRSIT officials. Upon receipt of Mission approval of the draft report the team/team leader will debrief AID/W personnel after departure from Tunisia.

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## Planning the Phosphate Mines

**Client:** Compagnie Des Phosphates De Gafsa (CPG)

### **Background:**

On September 30, 1987, the Compagnie Des Phosphates De Gafsa (CPG) signed an accord with IRSIT agreeing to jointly pursue applied computer research to improve the CPG's position in international markets. This accord is seen by the CPG as one aspect of a major restructuring of the CPG in accord with World Bank recommendations.

### **Project Goal:**

Improve the productivity of the CPG by introduction of informatics to the mining engineering staff and management.

### **Activities:**

The following activities were recommended by a team from Colorado School of Mines following their visit to CPG in January, 1988:

1. Installation of a training center at the CPG for training of the engineering staff.
2. Selection, installation and training in the use of mine planning software at the CPG.
3. Investigation of CPG drilling and blasting techniques and recommendation of improvements and use of informatics techniques to improve this process in CPG.

### **Status:**

1. Training center installed in May, 1988. CPG has been requested to discuss software for this center with IRSIT staff.
2. Software selection group consisting of IRSIT/CPG staff and executives visited the U.S.A in April. Their report shortlisted 3 mine planning packages. IRSIT/AED have recommended that a final selection be made soon so installation/training can begin.
3. Initial investigation and follow-up visit to CPG to observe and recommend improvements in drilling and blasting completed. Final report in preparation.

### **Staff:**

**CPG:** Mr. Ridah Ben Mosbah (Dir. of Data Processing)  
Mr. Nejib M'Rabet (Asst. Manager for Open Pit Mines)  
Mr. Abdelhamid Elamri (Mine Planning Engineer)

### **IRSI:**

Mr. Fethi Tenzakhti (until November 1, 1988)  
Mrs. Najoua Dridi

## **Hardware**

80386-based PC (from Compaq or IBM)  
-80 MB hard disk  
-EGA display  
-1 MB memory (on above board)  
-small format plotter (Hewlett Packard)

## **Software in use:**

Slam II simulation system has been demonstrated to CPG.

## **Prospective software:**

### Training Center

Excel  
Windows  
Windows/In\*V\*ision  
GEM/Draw and Gem/Graph  
Basic and Fortran compilers

### Mine Planning

SURPAC from Mine Development Association. (Recommended by IRSIT)  
Minecom from Minecom Inc.  
Minemap from Minemap North America Limited.

## **Consultants to date:**

Dr. Matt Hrebar and Dr. Donald Gentry (Colorado School of Mines)  
in January, 1988.

Dr. John Floyd (Blast Dynamics) in May, 1988 and October, 1988.

## **Training:**

April, 1988 visit to Colorado School of Mines and survey of  
approximately 20 mine planning software packages:

## CPG:

Mr. Kais DALY (Director of Technology)  
Mr. Tahar Mehari (Director of Planning, Research and Development)  
Mr. Ridah Ben Mosbah (Director of Informatics)  
Mr. Nejib Hammadi (Director of  
Mr. Abdelmajid S'himi (Chief of operations, Om El Khecheb)  
Mr. Abdelhamid El Amri (Chief Engineer responsible for planning  
the mine at Kef Schfaier)

## IRSIT

Mr. Fethi Tenzakhti  
Mr. Imed Jamoussi

29.

## **Computer-Aided Petroleum Exploration**

**Client:** Enterprise Tunisienne d'Activities Pétrolières (ETAP)

### **Project Goals:**

To introduce advanced oil exploration and exploitation techniques to ETAP so that they will be better able to utilize the data collected by oil companies in Tunisia.

### **Activities:**

1. Technology survey of workstations and micro/mini computer software for oil exploration.
2. Project definition in cooperation with ETAP staff and management.

### **Status:**

Technology survey of workstations and workstation-based software completed by Mr. Aleya Ben Aicha (January, 1988).

Technology survey of Vertical Seismic Profiling (VSP) software characteristics and preliminary negotiations with vendors completed by Mrs. Sophia Hedda (July, 1988).

Review of proposals from CogniSeis and SSE complete (July, 1988)

Preliminary definition of project to transfer VSP technology to ETAP completed (September, 1988).

### **Staff:**

**ETAP:** Mr. Mustapha Haddad (Director General)  
Mr. Tahar Zaghouni (Chief Geophysicist)

**IRSIT:** Mrs. Sophia Hedda  
Mr. Aleya Ben Aicha

### **Hardware:**

Vertical Seismic Profiling software from Seismic Services Limited and CogniSeis Development Corporation has been analyzed. Both require:

Digital Equipment Corporation VAX  
8-18 MB RAM  
300 MB Disk  
9-Track Tape drive  
Large format plotter

### **Software:**

Proposals have been received from:  
CogniSeis Limited (DISCO and VSP)  
Seismic Services Limited (VSP)

### **Consultants:**

Mr. Ali Garrouch (IRSIT staff member completing his PH.D. at the University of Texas/Houston). January, 1988 to December, 1988.

**Training:**

Mr. Aleya Ben Aicha (October, 1987) To attend National Conference of Geophysicists and survey oil exploration workstations.

## **Measurement of the Telephone Network Service Characteristics**

**Client:** Direction General Telecommunications (DGT) of the Tunisian Post, Telephone, and Telegraph (PTT).

### **Project Goals:**

**Long Term:** To rationalize the Tunisian voice telephone network in support of its plan to double the number of subscribers in the early 1990's.

**Short Term:** To measure the service characteristics of the voice telephone network as actually perceived by the subscribers.

### **Activities:**

1. Technology survey to assess available measurement equipment, analyze major designs, and compare with PTT's requirements.
2. Equipment analysis of existing PTT switching equipment to determine interface requirements with measurement equipment.
3. Identify joint project with PTT staff and management.

### **Status:**

IRSIT/PTT team formed, technology survey complete and PTT equipment study complete (1Q88)

Measurement system requirements study and review of previous proposals for service measurement complete (2Q88)

Straw man design for measurement system complete (2Q88)

Project reviewed with AT&T and AT&T Ireland (3Q88)

Draft proposal completed in cooperation with PTT (3Q88)

### **Staff:**

**PTT:** Mr. Sahli

**IRSIT:** Mr. Mondher Makni

### **Hardware:**

The design presently being considered uses "single-board PC's" in a passive backplane configuration.

**Software:** To be determined.

### **Consultants:**

Mr. Adel Labib (AT&T International Marketing)

Mr. Jerry Reid (AT&T Ireland)

**Training:**

**Mr. Mondher Makni (July, 1988) To participate in telephony seminars and present IRSIT's draft project with PTT to AT&T.**

## Videotext

**Client:** Director General of Telecommunications (Tunisian PTT)

**Project Goals:** Introduce bilingual (Arabic/Latin) videotext service to Tunisia, and promote videotext services in public and private sectors.

### Activities

1. Develop a prototype of an inexpensive bi-lingual (Arabic/Latin) videotext terminal.
2. Develop a bilingual (Arabic/Latin) videotext presentation level protocol standard.

### Status:

Minitel videotext terminal design analyzed and basic Arabic language features designed, tested and demonstrated. (3Q88)

Survey of major videotext systems (NAPLPS, MINITEL, CAPTAIN) underway (analysis of Minitel system complete 3Q88)

Joint project plan with PTT finalized (3Q88)

### Staff:

**PTT:** Mr. Zitoun (Director of Equipment)

**IRSIT:** Mr. Fethi Anane  
Mr. Mustapha Garbi  
Mr. Imed Gorbel

### Hardware:

A modified Minitel terminal is presently being designed for the Arabic/Latin videotext terminal. The Computer Technology project is contributing a basic hardware design laboratory (oscilloscopes, digital analyzer, multimeter), and equipment to run computer-aided design tools (an IBM PC/AT with a small format plotter).

It is anticipated that an 80386-based PC (used as a videotext server) will be necessary to demonstrate the Arabic/Latin presentation level protocol after it is defined.

### Software:

Computer Aided Design Software: PSPICE and ORCAD.  
Prodigy videotext software

### Consultants:

Mr. David Waks, Director of Research and Development at Prodigy Services Inc. (an IBM/Sears company) has agreed to provide demonstrations of the PRODIGY service and participate in a videotext seminar at IRSIT.

**Training: To be determined.**



## **Informatizing the Tunisian Bourse**

**Client:** Tunisian Bourse

**Project Goals:**

To assist the Bourse promote ownership of equity in Tunisian private industry through the distribution of information on Tunisian companies through the national X.25 network.

**Activities:**

To design and implement a prototype of a public information network containing financial information on companies offering equity on the Tunisian Bourse. Ultimately, this prototype will accommodate some 150 users in the public and private sectors.

**Status:**

Analysis of 1989-1990 national plan for X.25 network to determine number and characteristics of ports supported complete. (3Q88)

Project definition with Bourse underway.

Technology Survey to locate a real-time UNIX underway.

**Staff:**

Bourse: Mr. Ben Zerti

IRSIT: Mr. Fethi Anane  
Mr. Chedly Fehri  
Ms. Vivian Boudhaouia

**Hardware:**

Initial examination of the requirements for designing a prototype indicates that the following hardware will be required:

80386-based personal computer

300 MB Hard Disk

4 MB memory

VGA display

Intelligent controller for interface to 16 telephone lines  
(from Connect Tech, Inc.)

X.25 controller card

15 Minitel terminals

5 intelligent terminals (based on single-board PC technology)

**Software:**

Server Operating System: QNX (under evaluation)

Server Database: Oracle or Zim

Videotext software from Formic or Alphatel Inc.

Telecommunications software from Corman Technologies Inc.

**Consultants:** To be determined

## **Location of Cricket Using Satellite Technology (LOCUST)**

**Clients:** National Remote Sensing Center,  
Ministry of Agriculture.  
National Institute of Meteorology

### **Background**

In March, 1988 it became apparent that conditions in the Sub Saharan countries would produce potentially dangerous numbers of locusts ("Cricket") in Tunisia in the fall of 1988 and probably in subsequent years.

Because of this USGS (EROS Data Center) was contacted to determine if remote sensing via satellite could be effective in locust control. USGS indicated that satellite mapping of the highly vegetative areas ("greenness maps") had been successfully used in the subsaharan countries to locate probable regions of locust infestation. Ground and air extermination teams would then be sent to these areas to commence spraying. This approach seemed promising for Tunisia.

Further conversations indicated that Tunisia had access to the satellite data, and possessed much of the equipment and skills necessary to process such satellite images in Tunisia. This could not only represent a source of hard currency, but would also allow Tunisia to construct geographic data bases for its own and for regional agricultural and marine use. It appears that IRSIT is the ideal "technology gateway" for transferring this exciting technology to Tunisia.

### **Project Goals:**

To transfer the technology of processing satellite images to Tunisia so that the Government of Tunisia can engage in activities such as the production of greenness maps (for locust control and drought strategies), and the production of geographic databases.

### **Activities:**

1. Coordinate the delivery of greenness maps to GOT and instruction in their use in the 1988, 1989 locust campaign.
2. Transfer the technology for the production of these maps to the National Remote Sensing Center via IRSIT.

### **Status:**

Project Plan and feasibility analysis complete. (3Q88)

Assessment of Tunisian technology and skills complete. (3Q88)

Equipment analysis complete and integrated with IRSIT Core Computer Center. (3Q88)

**Prospective Training:**

It is anticipated that Mr. Ben Zerti or a member of his staff will visit the New York Stock Exchange to observe its operation and discuss its data-processing architecture with senior financial experts and system designers.

Production of first greenness maps by USGS/EROS Data Center and initial instruction in their use underway. First maps expected in November, 1988.

#### **Staff**

National Remote Sensing Center: Colonel Gammar

Ministry of Agriculture: Malek Ben Salah

National Meteorology Institute: Mr. Hammadi Trabelsi

IRSIT: Mr. Naceur Chemmam

#### **Hardware**

DEC VAX 6210 with VMS version 4.7 or later

1 Tape Drive

500 MB disk

Calcomp 5835 color printer

Schlumberger 1603 digitizing tablet

IVAS color image display (from International Imaging Systems)

In addition, if a satellite receiving station (cost \$300,000) is placed in Tunisia, maps could be produced more rapidly. Tunisia has the ideal geographical location for such receiving station to cover all of North Africa from Egypt to Morocco, and the sub-saharan countries.

#### **Software**

VMS version 4.7 or later (from DEC)

ADAPS (from USGS)

LAS (from USGS)

ARC/Info (from Environmental Systems Research Institute)

#### **Consultants**

Mr. Tom Loveland (USGS EROS Data Center) (October, 1988)

Mr. Bruce Quirk (USGS EROS Data Center) (October, 1988)

Mr. Gray Tappan (USGS EROS Data Center) (July, and November, 1988)

#### **Training**

Mr. Naceur Chemmam (August, 1988) To attend SIGGRAPH and establish relationships with USGS/EROS data center.

Mr. Mohammed Bousemma (August, 1988) To participate in seminars at ERIM and University of Michigan on geographic data bases.

## Arabization

### A. Arabic Speech Processing

**Client:** IRSIT (AT&T Bell Laboratories has expressed a strong interest in jointly developing an Arabic text-to-speech system using IRSIT staff and research results. However, no formal agreement has yet been made.)

#### **Project Goals:**

Long term: The development of speech analysis and synthesis applications such as text to speech. Such applications are used in medicine (for the visually impaired), industry, and the public telephone system.

Short term: The building at IRSIT of a speech analysis and syntheses capability.

#### **Activities**

1. Installation at IRSIT of a speech analysis workstation and associated software.
2. Demonstration of a basic speech recognition system.

#### **Status**

Technology survey of speech analysis workstations and IRSIT's workstation requirements completed.(4Q87)

Analysis of software for speech analysis underway (analysis of SUN workstation and AT&T software complete).

Construction of phase I IRSIT speech workstation complete.(2Q88)

Demonstration of basic speech recognition system complete.(2Q88)

Initial training of IRSIT staff on UNIX and WAVES software complete.(3Q88)

#### **Staff**

IRSIT: Dr. Salem Ghazeli

#### **Hardware**

Phase I speech analysis workstation:

IBM PC/AT

EGA display

40 MB Hard Disk

Data Translation DT 2701 analog-digital card

Phase II speech analysis workstation to be identified from:

SUN 4/110

-141 MB disk

-19 inch grayscale display  
-connection to DEC 6210 via NFS software

**MAC 2**

-100 MB hard disk  
-13 inch color display

**Software**

Phase I speech analysis software: ILS from Signal Technology Inc,  
and PCLAB from Data Translation Inc.

Phase II speech analysis software: to be identified from  
WAVES (from AT&T Bell Labs)  
Speech Lab (From GW Instruments)  
Speech analysis (from MIT speech processing lab)

**Consultants**

Dr. Mark Liberman (AT&T Bell Labs) (July, 1988)

**Training**

Dr. Salem Ghazeli (January and October, 1988) To establish  
relationships with Bell Laboratories, observe speech analysis  
software, and observe the use of UNIX in a speech research  
laboratory.

## B. Arabic Character Recognition

**Client:** IRSIT

**Project Goals:**

Long term: to develop a low cost bi-lingual character recognition system.

Short term: To develop a low cost Arabic character recognition system.

**Activities**

Development of a PC-based prototype of an Arabic character recognition system.

- develop algorithm
- implement on personal computer
- refine algorithm and hardware configuration

**Status:**

Algorithm developed and implemented on IBM PC/AT, transferred to 80386-based PC, tested, demonstrated, and reported in the First International Conference on Informatics and Arabization (scan recognition rate is 98%)(1Q88)

Hardware refinements in PC configuration identified, and equipment selected.(2Q88)

**Staff:**

IRSIT: Mr. Maher Khemakhem

**Hardware:**

- IBM PC/AT or Compaq 80386 PC
- Microtec 300 AC scanner
- EGA display
- 40 MB disk

**Software:**

Microtec latin character recognition software  
Wordstar Professional text editor  
Proprietary software developed by IRSIT for Arabic character recognition.

**Consultants:**

All work has been done by IRSIT staff.

**Training:** None.

## **C. Arabic-English Translation**

**Client:** No "client". IRSIT has entered into a joint development and marketing agreement with PC Linguistics (Houston, Texas)

### **Project Goals:**

**Long term:** To develop a low-cost English-Arabic-English translation system for sale in North Africa and the region.

**Short term:** To develop a low-cost English-Arabic translation system.

### **Activities**

Construction of an Arabic-English dictionary (base: 20,000 words)

Description of Arabic grammar in a simple way which can be implemented in a rule-following procedure.

### **Status:**

Investigation of PC-Linguistics and WCC as candidates for cooperative projects with IRSIT completed. (2Q88)

Proposal from PC-Linguistics accepted and joint agreement signed. (3Q88)

PC-Linguistics supplied with Arabic alphabet and simplified Arabic grammar. (3Q88)

Bi-lingual text editors surveyed and one selected for use. (3Q88)

### **Staff**

IRSIT: Dr. Salem Ghazeli

### **Hardware**

IBM PC/AT

-40 MB disk

-640 KB RAM

-EGA display

### **Software**

Arabized DOS

Alkatib text editor

### **Consultants**

Mr. George Mallard (PC Linguistics) (June, 1988)

### **Training**

Dr. Salem Ghazeli (October, 1988) To finalize the joint development plan between IRSIT and PC-Linguistics, identify major grammar rules of Arabic for PC-Linguistics, and agree on an Arabic alphabet for use in the project.

The following projects with the CNI have been provisionally accepted as pilot projects in higher education.

## **CNI Technical Assistance Program**

### **Background:**

The Center Nationale Informatique (CNI) has embarked on two projects with the assistance of the Computer Technology Project: Arabstar (an Arabic display card for the IBM PC and bilingual (Arabic/Latin) word processing program which uses this display), and the development of an Arabized software development environment based on UNIX.

### **A. Arabstar display card**

**Client:** Centre Nationale d'Informatique (CNI)

**Project Goals:** To assist CNI in gaining expertise in hardware design of PC add-in cards, manufactured outside Tunisia, for sale in the region.

#### **Activities**

Assistance to CNI in designing the Arabstar display card for mass production using modern manufacturing techniques.

Assistance in debugging the Arabstar display card.

#### **Status**

Design review of Arabstar display card completed. (2Q87)

Printed circuit board manufacturing process described to CNI staff and process for selecting a manufacturer outlined. (2Q87)

Prototype of manufactured product reviewed and recommendations made to changed design and supplier of memory chips. (1Q88)

#### **Staff**

CNI: Mr. Karim Bouhlila

**Hardware** None supplied by project.

**Software** None supplied by project.

#### **Consultants**

Mr. Hugh Applewhite (Microfield Graphics, Portland OR.) (July, 1987, and April, 1988)

#### **Training**

In country training by Mr. Hugh Applewhite of CNI and IRSIT staff (July, 1987)

## **B. Arabized Software Development Environment**

**Client: CNI**

### **Project Goals:**

Development of a bi-lingual, adaptable, software development environment based on modern operating system and graphics standards.

### **Activities**

Development of a prototype bi-lingual software development system based on UNIX and X-Windows.

### **Status**

Review and categorization of services available on UNIX complete. (2Q88)

Initial design requirements for software development environment complete. (3Q88)

Initial selection of hardware platform and systems software for implementation of bi-lingual software development environment complete. (3Q88)

Development of an audience requirement statement incorporating a user profile for diverse users in process.

### **Staff**

CNI: Mr. Mohamed Ben Sassi  
Mr. Othman Chaouchi

**Hardware:** To be determined, however present identification is:

HP 9000 model 330 MH workstation  
4 MB RAM  
19 inch monochrome display  
300 MB hard disk  
backup tape  
DOS co-processor  
3 1/2 and 5 1/4 inch flexible drives

### **Software**

UNIX, C, and X-Windows.

### **Consultants**

Dr. Albert Badre (Georgia Tech) (May, 1988)  
Dr. Michael McCracken (Georgia Tech) (May, 1988)

### **Training**

Mr. Mohamed Ben Sassi and Mr. Othman Chaouchi (August, 1988)  
To attend X-Windows seminar, develop a draft design for an

Arabized Windows environment (at Georgia Tech), and participate in seminars on software development.

The following activities of IRSIT are not "projects", because they have no clients. Rather, they are classified as "activities" which build IRSIT's expertise and informatics infrastructure.

## **Hardware**

Minicomputer selection complete:

DEC 6210  
32 MB RAM  
1.2 GB disk  
9-Track tape drive  
10 Arabized terminals  
Ethernet

Workstation selection in process (but following equipment likely)

Sun 4/110  
8 MB RAM  
141 MB disk  
19 inch grayscale monitor  
Ethernet  
Sun 3/50  
4 MB RAM  
diskless  
19 inch monochrome monitor

## **Software**

### DEC

VAX/VMS operating system  
Pascal, C and Fortran compilers  
FMS database software

### SUN

UNIX operating system  
C compiler  
X-Windows graphics environment  
Network File System (NFS) communication to DEC 6210

## **Consultants**

Dr. Paul Plourde (August, 1987)

## **Training**

Mr. Khaled Sellami (April, 1988) To attend courses in computer system management and engage in practical training in George Washington University.

**Office Automation and Software for Informatics Systems  
(OASIS)**

**Client:** No client. It is anticipated that after IRSIT staff has completed this project, they will be able to serve as advisors to others attempting office automation projects for the first time.

**Project Goals**

1. To develop the skills at IRSIT to analyze IRSIT's office automation requirements, and select and install appropriate office support equipment.

2. To improve the productivity of the IRSIT staff and management through the use of tools such as text editors, spread sheets, an on-line database, electronic mail, and the connection of IRSIT staff to BITNET.

**Activities**

Identification of IRSIT's office automation requirements.

Identification of project management, organizational and administrative issues at IRSIT,

Selection and installation of a local area network (LAN) at IRSIT.

**Status**

Identification of requirements for IRSIT's office automation system completed. Professional staff and administrative staff consulted. (4Q87)

Selection of LAN and associated software complete (4Q87)

Installation of LAN begun. (2Q88)

Electronic mail installed (2Q88)

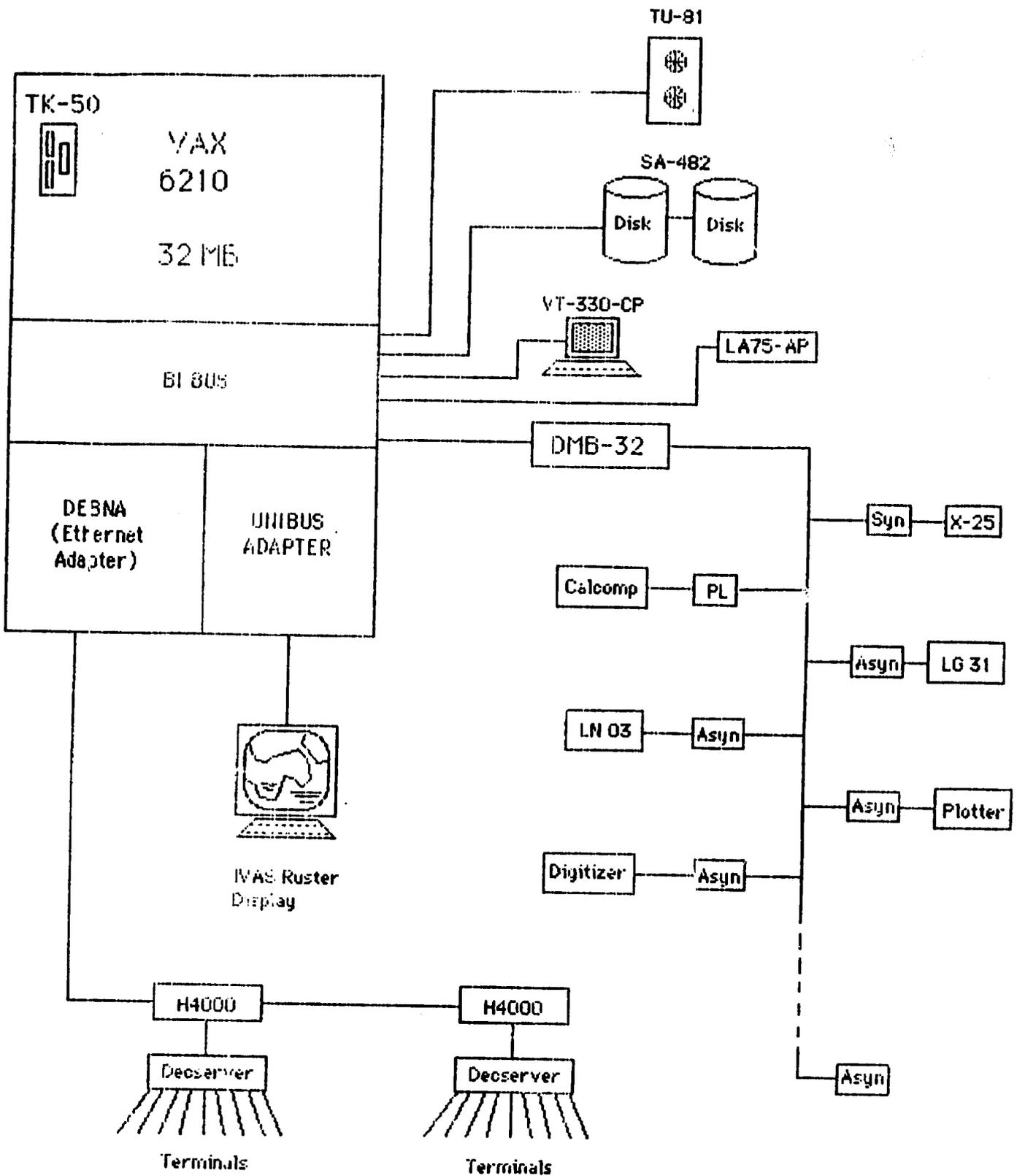
Software library installed (3Q88)

On-line database of telephone numbers installed (3Q88)

Connection of IRSIT staff members' workstations to X.25 and to BITNET completed. (3Q88)

Desktop Publishing hardware and software selected. (2Q88)

**Staff:** Ms. Vivian Boudhaouia  
Mr. Nabil Sahli



## INSIT 6210 CONFIGURATION

## **IRSIT's Core Computer Center**

**Client:** No client. It is anticipated that after IRSIT staff has selected and installed the core computer center, they will be able to offer advice and assistance to others embarking on similar projects for the first time.

### **Project Goals**

1. To develop IRSIT's skills at analyzing the requirements for a core computer center, selecting and installing the appropriate equipment.
2. To build IRSIT's computational infrastructure through the installation of a modern computer center.

### **Activities:**

1. Design of a computer center architecture
2. Selection hardware and software:
  - modern minicomputer
  - personal workstations
  - project-specific workstations.

### **Status**

IRSIT core computer center architecture complete (4Q87)

Minicomputer selection complete

RFP complete (1Q88)

Bidders' meeting held in Tunis (2Q88)

Selection process complete (with GOT and USAID approval)  
(3Q88)

Contract negotiations with DEC/CDG for delivery of DEC 6210 in final stages.

Contract negotiations with Africa Systems for maintenance complete. (3Q88)

RFP for site preparation complete -- selection of vendor in process.

### **Staff**

**IRSIT:** Mr. Khaled Sellami

**Hardware**

PC/AT, or 80386-based workstations for professional staff  
MacIntosh workstations for administrative staff  
3COM '386 network server  
3COM Multiconnect repeater  
Add-in cards for PC/AT's and Macintosh computers

Viking Moniterm high resolution monitor for Mac 2.

**Software**

3COM LAN software  
First Choice (integrated word processing, database, spreadsheet)

**Text editors:**

Wordstar Professional  
Wordperfect  
Professional write  
Word

**Spread Sheets**

Lotus 1-2-3  
Excel (for IBM PC/AT and Macintosh)

**Telecommunications**

BITNET software

**Desktop Publishing**

Pagemaker

**Project Management**

Harvard Project manager  
Timeline

**Software Development**

Turbo Pascal  
RM/Fortran  
Turbo Basic

**Consultants**

Dr. Jane Lucas (December, 1986)

**Training**

Mrs. Vivian Boudhaouia (December, 1987) To participate in workshops for 3COM systems administrator.  
Mr. Nabil Sahli (February, 1988) To participate in workshops in 3COM architecture and graduate seminars at UCLA in network systems.

IRSIT Short-Term Participant  
Training Program

Participant:

Dates:

Program:

NOUREDDINE ELLOUZE

May 30 - June 18, 1987

Meetings with the following organizations:

Academy for Higher Educ., Higher Education Div.,  
Washington, D.C.;

USTTI, Washington, D.C.;

Embassy of Tunisia, Washington, D.C.

Georgia Institute of Technology, Atlanta, GA;

Colorado School of Mines, Golden, CO;

Houston Contechs, Houston, TX;

Columbia University, New York, NY;

Polytechnique Institute, New York, NY;

At&t Bell Laboratories, Murray Hill, NJ;

Massachusetts Institute of Technology, Cambridge, MA;

Pennzoil, Houston, TX;

National Computer Conference, Chicago, IL

Participant:

Dates:

Program:

HABIB BOURGUIBA, JR.

October 1 - 9, 1987

Meeting with the following:

IBM, Armonk, NY;

Stevens Institute, New York, NY;

Bankers Trust, New York, NY;

Rutherford Oil, New York, NY;

Various Members of Congress, Washington, D.C.;

Hariri Foundation, Washington, D.C.;

Council for International Exchange of Scholars,  
Washington, D.C.

U.S. Information Agency, Ofc. of Director, Ofc. of Near East,  
South Asia and North Africa, Washington, D.C.;

International Management Development, Washington, D.C.;

Acad. for Educational Dev., Washington, D.C.;

CACI, Fairfax, VA;

Overseas Private Insurance Co., Ofc. of President,  
Washington, D.C.;

American Assn. of Advancement of Sciences,  
Washington, D.C.;

East-West Financial Services, Washington, D.C.;

U.S. Dept. of State, Ofc. of Political Affairs,  
Washington, D.C.;

Johns Hopkins University, Ofc. of Provost, Baltimore, MD.

Participant:  
SS:  
RA :

FAROUK KAMOUN  
October 3 - October 11, 1987  
Meetings with the following:  
Acad. for Educ. Dev. staff, Washington, D.C.;  
Hariri Foundation, Washington, D.C.;  
Council for International Exchange of Scholars,  
Washington, D.C.;  
U.S. Information Agency, Washington, D.C.;  
George Washington Univ. School of Business,  
Washington, D.C.;  
CACI, Inc., Washington, D.C.;  
Center for Dev. Information and Evaluation, Rosslyn, VA;  
Several Members of Congress, Washington, D.C.;  
East-West Financial Services, Ltd., Washington, D.C.;  
U.S. Dept. of State, Ofc. of Political Affairs,  
Washington, D.C.;  
Johns Hopkins University, Ofc. of Provost, Baltimore, MD.

Participant:  
SS:  
RAM:

AIEYA BEN AICHA  
October 7 - November 8, 1987  
SEG Conference, New Orleans, LA;  
Meetings at geophysical laboratories in New Orleans area;  
Colorado School of Mines, Golden, CO;  
U.S. Geological Survey, Sicux Falls, S.D.

Participant:  
SS:  
RA :

KACEM BEN HAMZA  
October 22 - November 7, 1987  
Meetings with Acad. for Educational Dev., Washington, D.C.;  
Meetings with U.S. Information Agency, Washington, D.C.;  
Meetings with George Washington Univ., Washington, D.C.;  
Meetings with State Univ. of New York, Binghamton, NY.

Participant:  
SS:  
RA :

VIVIAN PERINI-BOUDHACUIA  
January 18 - 29, 1988  
Meetings with BO, Inc., Washington, D.C.;  
3+Comm, 3+Network, courses, Rockville, MD;  
Networking Personal Computers course, Arlington, VA.

Participant:  
SS:  
RA :

SALEM GHAZALI  
January 24 - February 14, 1988  
Meetings with the following organizations:  
MAASCOMP, Bethesda, MD;  
Univ. of Calif. Los Angeles, Dept. of Linguistics,  
Los Angeles, CA;  
AT&T Bell Laboratories, Linguistics, Murray Hill, NJ;  
M.I.T., Elec. Eng. & Computer Sci., Linguistics,  
Cambridge, MA;  
Univ. of Massachusetts, Amherst, MA.

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8.  
Participant: NABIL SAHLI  
Dates: February 13 - March 21, 1988  
Program: Hands-On X 25 course, Irvine, CA;  
3System Installation & Support course, Santa Clara, CA;  
3+Network Comm course, Santa Clara, CA;  
3Wizard Advanced Systems course, Santa Clara, CA;  
Univ. of Calif. Los Angeles, Mario Gerla, Los Angeles, CA.
9.  
Participant: IMED JAMOUSI  
Dates: March 31 - April 30, 1988  
Program: Colorado School of Mines, Golden, CO;  
Successful Program & Project Management course,  
Washington, D.C.;  
How to Manage Software Development Projects course,  
Washington, D.C.
10.  
Participant: FETHI TENZEKHTI  
Dates: March 31 - April 30, 1988  
Program: Colorado School of Mines, Golden, CO;  
CASES course, Boston, MA;  
How to Manage Software Development Projects course,  
Washington, D.C.
11.  
Participant: ABDELHAMID EL AMR  
Dates: March 31 - April 22, 1988  
Program: Colorado School of Mines, Golden, CO;  
Morrison-Knudsen Co., Boise, ID;  
Mine Development Assn., Sparks, NV.
12.  
Participant: ABDELMAGID S'HIMI  
Dates: March 31 - April 22, 1988  
Program: Colorado School of Mines, Golden, CO;  
Morrison-Knudsen Co., Boise, ID;  
Mine Development Assn., Sparks, NV.
13.  
Participant: MOHAMMED NEJIB M'RABET  
Dates: March 31 - April 22, 1988  
Program: Colorado School of Mines, Golden, CO;  
Morrison-Knudsen Co., Boise, ID;  
Mine Development Assn., Sparks, NV.
14.  
Participant: RIDHA BEN MOSBAH  
Dates: April 17 - 22, 1988  
Program: Colorado School of Mines, Golden, CO.

15.  
Participant: TAHAR MAHARI  
Dates: April 17 - 22, 1988  
Program: Colorado School of Mines, Golden, CO.
16.  
Participant: KAIS DALY  
Dates: April 19 - 24, 1988  
Program: Academy for Educational Development, Washington, D.C.;  
Colorado School of Mines, Golden, CO
17.  
Participant: KHALED SELLAMI  
Dates: April 10 - May 2, 1988  
Program: George Washington Univ., Computer Center, Washington, D.C.;  
ADA Programming & Software Engineering Hands-on Intro.  
course, Boston, MA;  
EDP Computer Operations Management course, New York, NY;  
EDP Computer Performance Measurement & Capacity  
Planning course, Rockville, MD;  
ICS Management & Control Workshop course, Vienna, VA;  
University of Michigan, Computer Center, Ann Arbor, MI.
18.  
Participant: MOHAMMED RACHED B. JUSSEMA  
Dates: June 21 - August 13, 1988  
Program: Center for Research on Econ. Dev. seminar, Univ. of Mich.,  
Ann Arbor, MI.
19.  
Participant: MONDHER MAKNI  
Dates: July 6 - August 19, 1988  
Program: Data Comm I course, Orlando, FL;  
Network Management course, New York, NY;  
Telecom I, II courses, New York, NY;  
AT&T, Adel Labib, Basking Ridge, N.J.
20.  
Participant: SAMI KRICHEN  
Dates: July 21 - August 16, 1988  
Program: AMA Senior Project Management seminar, Washington, D.C.;  
DELTEL Management Skills for First-Line Supervisors course,  
New York, NY;  
Columbia University, New York, NY;  
Teachers College, Columbia University, New York, NY;  
Columbia University Presbyterian Medical Center,  
New York, NY;  
Control Data Corp. Negotiating Computer Vendor Contracts  
course, Boston, MA.

21.

Participant:

Dates:

Program:

NACEUR CHEMMAM

July 28 - August 17, 1988

Siggraph '88 Conference, Atlanta, GA;  
Meeting with A.I.D., Cfc. of Foreign Disaster Assistance,  
Washington, D.C.;

Meeting with A.I.D., Africa Desk, Washington, D.C.;

U.S. Geological Survey, Sioux Falls, S.D.;

Univ. of Calif. Los Angeles, Los Angeles, CA.

22.

Participant:

Dates:

Program:

MOURAD EZZINE

July 17 - September 11, 1988

BRIDGES Workshop (Harvard), Cambridge, MA;

American Council on Education, Washington, D.C.;

Academy for Educational Development, Washington, D.C.;

University of Pennsylvania, Director of Planning,  
Philadelphia, PA

23.

Participant:

Dates:

Program:

MOHAMMED BEN SASSI

August 17 - September 8, 1988

Contel ASC, Rockville, MD;

XHIBITION '88 Conference, Cambridge, MA;

M.I.T., Cambridge, MA;

G.T.E., Waltham, MA;

Artificial Intelligence: A Practical Overview course,  
St. Paul, MN;

Georgia Institute of Technology, Dept. of Computer Science,  
Atlanta, GA

24.

Participant:

Dates:

Program:

OTHMAN CHAOUACHI

August 17 - September 8, 1988

CONTEL ASC, Rockville, MD;

XHIBITION '88 Conference, Cambridge, MA;

M.I.T., Cambridge, MA;

G.T.E., Waltham, MA;

Artificial Intelligence: A Practical Overview course,  
St. Paul, MN;

Georgia Institute of Technology, Dept. of Computer Science,  
Atlanta, GA

25.

Participant:

Dates:

Program:

SALEM GHAZALI

September 12 - October 17, 1988

AT&T Bell Labs, Linguistics Dept., Murray Hill, NJ;

PC Linguistics, The Woodlands, TX;

University of Texas at Austin, Dept. of Linguistics,  
Austin, TX

26.

Participant:  
Dates:  
Program:

RIFAAT CHAABOUNI  
September 15 - 30, 1988  
Cornell University, School of Operations Research,  
School of Industrial Engineering, Ithaca, NY;  
University of Michigan, Dept. of Industrial Engineering,  
Ann Arbor, MI;  
Georgia Institute of Technology, School of Industrial and  
Systems Engineering, Atlanta, GA;  
IBM Manufacturing Institute, Education Center,  
Thornewood, NY.

27.

Participant:  
Dates:  
Program:

ROMDHANE BEN MIMOUN  
September 30 - October 20, 1988  
Academy for Educational Development, Washington, D.C.;  
Georgia Institute of Technology, Atlanta, GA;  
Brookings Institute, Center for Public Policy Education,  
Washington, D.C.;  
General Service Administration, Ofc. of Deputy Director of  
Training, Washington, D.C.;  
AT&T, Hands-on database management, Basking Ridge, N.J.

28.

Participant:  
Dates:  
Program:

FAOUZI BEN SEDRINE  
October 9 - 30, 1988  
AMA Basic Program Management Planning, Scheduling, and  
Control course, Orlando, FL  
AMA The Controller's Job in Today's Environment course,  
New York, NY;  
Columbia University, School of Management, New York, NY;  
Academy for Educational Development, Washington, D.C.;  
Small Business Administration, Ofc. of Dir. of International  
Programs, Washington, D.C.;  
George Washington University, School of Public  
Administration, Washington, D.C.

ACADEMY FOR EDUCATIONAL DEVELOPMENT  
 DETAILED BUDGET SCHEDULE IN RESPONSE TO  
 SOLICITATION NO.: TUNIS 86-001  
 USAID/TUNIS COMPUTER PROJECT

| CATEGORY   | UNIT COST   | PROJECT YEAR 1 UNITS | PROJECT YEAR 2 UNITS | PROJECT YEAR 3 UNITS | GRAND TOTAL UNITS  |
|--|-------------|----------------------|----------------------|----------------------|--------------------|
| <b>9. PARTICIPANT EXPENSES:</b>  |             |                      |                      |                      |                    |
| • A. Research Spec Exchange in U.S.<br>17 Specialists @                          | \$3,000 /ea | 9,000                | 22,050               | 23,153               | 54,203             |
| • B. Observation Tours in U.S.<br>10 Tours @                                     | \$3,000 /ea | 12,000               | 12,600               | 6,615                | 31,215             |
| • C. Short-term Training in U.S.<br>18 Specialists @                             | \$7,000 /ea | 42,000               | 44,100               | 46,305               | 132,405            |
| • D. Research Project Support<br>6 Pilot Projects @                              | \$4,000 /ea | 4,000                | 12,000               | 8,000                | 24,000             |
| 11 Pilot Projects @  | \$2,000 /ea | 6,000                | 8,000                | 8,000                | 22,000             |
| <b>TOTAL PARTICIPANT EXPENSES</b>  |             | <b>73,000</b>        | <b>98,750</b>        | <b>92,073</b>        | <b>263,823</b>     |
| <b>10. SUBCONTRACT EXPENSE:</b>  |             |                      |                      |                      |                    |
| Sperry Corp. (procure. of computer hardware)<br>(May be expended over YEARS 1-3) |             | 1,400,000            | 0                    | 0                    | 1,400,000          |
| <b>TOTAL SUBCONTRACT:</b>  |             | <b>1,400,000</b>     | <b>0</b>             | <b>0</b>             | <b>1,400,000</b>   |
| <b>11. SUBCONTRACT G&amp;A @ 2%:</b>   |             |                      |                      |                      |                    |
|  |             | 28,000               | 0                    | 0                    | 28,000             |
| <b>SUBTOTAL 1 - 11</b>   |             | <b>1,992,931</b>     | <b>621,437</b>       | <b>656,126</b>       | <b>3,270,494</b>   |
| <b>12. FIXED FEE @ \$1,000/ea</b>  |             |                      |                      |                      |                    |
|  |             | 12,000               | 12,000               | 12,000               | 36,000             |
| <b>GRAND TOTAL</b>   |             | <b>\$2,004,931</b>   | <b>\$633,437</b>     | <b>\$668,126</b>     | <b>\$3,306,494</b> |

| PARTICIPANT TRAINING MODULES:       |                | COST |                                    | COST           |
|-------------------------------------|----------------|------|------------------------------------|----------------|
| • A. Research Spec Exchange in U.S. |                |      | • C. Short-term Training in U.S.   |                |
| U.S. Travel                         | \$500          |      | U.S. Travel                        | \$500          |
| U.S. Per Diem (30 days @ \$75/day)  | \$2,250        |      | U.S. Per Diem (60 days @ \$75/day) | \$4,500        |
| Miscellaneous Costs                 | \$250          |      | Training Costs                     | \$1,500        |
| <b>Total Module</b>                 | <b>\$3,000</b> |      | Materials                          | 500            |
|                                     | *****          |      | <b>Total Module</b>                | <b>\$7,000</b> |
| • B. Observation Tours in U.S.      |                |      |                                    | *****          |
| U.S. Travel                         | \$500          |      |                                    |                |
| U.S. Per Diem (30 days @ \$75/day)  | \$2,250        |      |                                    |                |
| Miscellaneous Costs                 | \$250          |      |                                    |                |
| <b>Total Module</b>                 | <b>\$3,000</b> |      |                                    |                |
|                                     | *****          |      |                                    |                |
|                                     |                |      | • D. Research Project Support      |                |
|                                     |                |      | Telecommunications:                | \$1,000        |
|                                     |                |      | Expendable Supplies                | \$1,000        |
|                                     |                |      | Research Assistance                | \$2,000        |
|                                     |                |      |                                    | \$4,000        |
|                                     |                |      |                                    | *****          |
|                                     |                |      |                                    | \$2,000        |
|                                     |                |      |                                    | *****          |

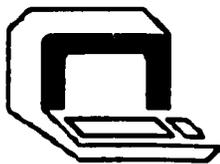
| NAME                | DATES OF EMPLOYMENT   | LOCATION   | PURPOSE OF ASSIGNMENT   |
|---------------------|---|--|---|
| ELSHAFEI, AHMED     | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| AL-MUHTASEB, HUSNI  | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| BADAWI, MERVET      | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| BEKKOUCHE, DRISS    | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| DITTERS, EVERHARD   | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| EL-IMAM, YOUSSEF    | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| FAHKROU, SAMIR      | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| HEGAZI, NADIA       | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| HYDER, SYED         | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| MAHJOUB, AHMED      | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| MESSAOUIDI, LEILA   | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| MOHAMED, ABDELLATIF | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| NAJIM, MOHAMED      | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| NOUH, ADNAN         | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| EL-JABIRI, RAJEB    | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| TAYLI, MURAT        | MAR 9-11, 1988  | TUNIS  | ARABIZATION CONFERENCE  |
| SULEIMAN, FUAD      | MAR 4, 7-11; 18; 25;<br>MAR 28-30, 1988<br><br>APRIL 11; 26-29, 1988<br><br>MAY 2; 17-19; 24;<br>MAY 26; 31, 1988 | WASHINGTON, D.C<br>TUNIS<br>CASABLANCA<br>WASHINGTON, D.C<br>TUNIS<br>WASHINGTON, D.C<br>CAIRO | CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT |
| STRICKLAND, SAMIRA  | MAR 1-3; 7-10; 14-17;<br>MAR 21-24; 28-31, 1988   | WASHINGTON, D.C<br>TUNIS<br>CASABLANCA   | CIT DEVELOPMENT<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT   |

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| NAME              | DATES OF EMPLOYMENT   | LOCATION   | PURPOSE OF ASSIGNMENT   |
|-------------------|---|--|---|
| MOSES, KURT       | OCTOBER 7-31, 1986<br>DECEMBER 9-17, 1986   | TUNIS<br>TUNIS   | PROJECT MANAGEMENT<br>PROJECT MANAGEMENT  |
| GEISERT, BRUCE    | DECEMBER 8-12, 1986   | WASHINGTON   | RECRUITMENT AND PROCUREMENT SERVICES  |
| WYATT, DAVID      | DECEMBER 4-21, 1986<br>DECEMBER 22-JAN 5, 1986<br>JAN 6 - FEB 27, 1987<br>MARCH 2-30, 1987<br>APRIL 13, 20, 21, 1987<br>MAY 2-29, 1987<br>JUNE 1987<br>MAY 16-24, 1988  | TUNIS<br>WASHINGTON<br>WASHINGTON<br>WASHINGTON<br>WASHINGTON<br>WASHINGTON<br>TUNIS   | TRAINING OF TRAINERS<br>ANALYSIS AND INVESTIGATION OF HARD AND SOFTWARE<br>INFORMATION GATHERING FOR CBMI RFP DEVELOPMENT<br>DEVELOP BID EVALUATION FORM OF RFP FOR CBMI, PREPARE WA!<br>PREPARE FINAL RFP FOR CBMI PROCUREMENT<br>RESPOND TO BIDDERS & CBMI REQUESTS, BIDDERS MTGS<br>EVALUATE BIDS<br>CBMI TRAINING/PROCESSING  |
| LUCAS, JANE       | NOV. 18-DEC. 31, 1986   | TUNIS  | DEVELOP PRELIMINARY OFFICE AUTOMATION PLAN (OASIS)  |
| DENNY, MICHAEL    | FEBRUARY 7-13, 1987   | TUNIS  | RECOMMEND PILOT PROJECTS/INTERVIEW  |
| RIFKIN, STAN      | FEBRUARY 13-19, 1987  | TUNIS  | INTERVIEW   |
| SACHET, ELENA     | JUNE 2-10, 1987   | WASHINGTON   | DEVELOP COMPUTER CODING SHEET, CODE 400 COMPUTER RESUME   |
| APPLEWHITE, HUGH  | JULY 8-20, 1987   | TUNIS  | CNI GRAPHICS  |
| PLOURDE, PAUL     | JULY 18-25, 1987  | TUNIS  | DEVELOP IRSIT COMPUTER CENTER RFP   |
| HOELSCHER, HAROLD | FEB 16-MARCH 12, 1987<br>JUNE 23-JULY 20, 1987<br>AUG 3-7, 10-11, 1987<br>AUG 17-21, 1987<br>SEPT 1-2, 10-19, 1987<br>SEPT 21-23, 29-30, 1987<br>OCT 1-10, 12-14, 1987<br>OCT 15-16, 19-23, 1987<br>OCT 26-30, 1987<br>NOV 4-12, 14-19, 1987<br>NOV 29-30, DEC 1-5, 1987<br>DEC 7-13, 14-19, 1987<br><br>DEC 21, 1987<br>JAN 4-6, 20-23, 1988<br>JAN 24-30, FEB 1-5, 1988<br><br>FEB. 6-8, 1988<br>MAR 7-30, 1988<br>APR 11 4-28 1988 | TUNIS<br>TUNIS<br>HOUSTON<br>HOUSTON<br>TUNIS<br>NEW YORK<br>NEW YORK<br>HOUSTON<br>HOUSTON<br>TUNIS<br>NEW YORK<br>NEW YORK<br>TUNIS<br>HOUSTON<br>HOUSTON<br>TUNIS<br>HOUSTON<br>HOUSTON<br>TUNIS<br>TUNIS | INSTITUTIONAL ANALYSIS<br>PHASE II INSTITUTIONAL ANALYSIS<br>CIT DEVELOPMENT<br>CIT DEVELOPMENT |

Colleges





REPUBLIQUE TUNISIENNE

PREMIER MINISTERE

L'INFORMATIQUE  
EN TUNISIE

PUBLIE EN OCTOBRE 1988

CENTRE NATIONAL DE L'INFORMATIQUE

17 , Rue Belhassen Ben Châabane el Omrane - 1005 TUNIS

Tél. : 783 . 055 - Télex 13 . 904

# STRUCTURES

## LE PREMIER MINISTERE

Décret N° 87-1298 du 27 Novembre 1987 rattachant les structures du Ministère de la Fonction Publique et de la Réforme Administrative au Premier Ministère.

• **MISSIONS** (relatives au secteur de l'informatique):

-Introduire les méthodes nouvelles de gestion administrative et financière , et les technologies administratives modernes dans les services publics.

A cet effet, il veille à :

-l'utilisation rationnelle de l'informatique et de la bureautique dans les services publics;

-la mise en place d'un système de communication de l'information et de liaison entre les services publics;

-la coordination entre les cellules d'organisation, méthodes et informatique.

Le Premier Ministère exerce la tutelle sur le Centre National de l'Informatique.

## LE CONSEIL SUPERIEUR DE L'INFORMATIQUE ET DES TELECOMMUNICATIONS (CSIT)

• **CREATION** : Par décision du Conseil Interministériel du 4 décembre 1987

(Décret n° 88-1289 du 15 Juillet 1988 ).

• **MISSIONS** :

-Elaborer, mettre en oeuvre et suivre la politique nationale en matière d'informatique et de télécommunications;

-Assurer la coordination et l'impulsion nécessaires à la promotion et au développement des secteurs de l'informatique et des télécommunications notamment au niveau de la formation, la recherche, le développement industriel, l'utilisation, la sensibilisation et la diffusion de la culture des technologies de l'information auprès du grand public.

## LE COMITE PERMANENT DES PROGRAMMES ET DES BUDGETS D'INFORMATISATION (CPBI)

• **CREATION** : Par arrêté du Premier Ministre du 22 Juillet 1988

Le CPBI est un comité spécialisé issu du CSIT

• **MISSIONS** :

-Examiner les plans informatiques des administrations, des collectivités publiques locales et des établissements publics;

-Veiller à une cohérence entre les programmes d'informatisation et la politique Nationale en informatique et recommander les mesures correctives et de coordination nécessaires;

-Donner son avis sur les programmes soumis à la coopération internationale ;

-Suivre la réalisation des grands projets d'informatisation programmés .

Il siège au Premier Ministère . Son secrétariat est assuré par le Centre National de l'Informatique .

## LE CENTRE NATIONAL DE L'INFORMATIQUE (CNI)

• **CREATION** : Loi N° 75-83 du 30 Décembre 1975 portant Loi des Finances pour la Gestion 1976.

• **ORGANISATION** : Décret N° 79-796 du 21/9/1979 modifiant le décret N° 76-590 du 12/7/1976 portant organisation administrative et financière du CNI

• **TUTELLE** : Le Premier Ministère.

• **MISSIONS** :

-Participer à l'élaboration et au suivi du Plan National de l'Informatique;

-Donner son avis sur les projets qui lui sont soumis en matière d'introduction de systèmes informatiques;

-Réaliser et exploiter des applications informatiques pour les administrations, entreprises et établissements publics;

-Promouvoir la formation et le recyclage en informatique.

# PROCEDURES ET REGLEMENTATION

## LA PROCEDURE D'ETUDE ET DE REALISATION DES PROJETS INFORMATIQUES

\* **REGLEMENTATION** : Circulaire du Premier Ministre N° 85-5 du 16 Août 1988 portant simplification de la procédure d'étude et de réalisation des projets informatiques.

\* **DISPOSITIONS** :

1) Au niveau des administrations, collectivités publiques locales et établissements publics:

a) **Etude et réalisation de projets informatiques:**

Elaboration d'un plan informatique pour tout projet dont l'exploitation nécessite l'utilisation de systèmes informatiques autres que les micro-ordinateurs, et soumission du plan à l'examen du CPBI.

Les plans informatiques doivent être élaborés avec le concours de centres spécialisés ou de sociétés de services et d'ingénierie en informatique .

b) **Extensions de projets non prévues dans le cadre d'un plan informatique:**

Actualisation du plan informatique dans le cas où le coût de l'extension dépasse 25% du coût initial du projet . Dans le cas contraire , élaboration d'une étude d'opportunité .

2) Au niveau des Sociétés Nationales:

Il est fortement recommandé aux sociétés nationales d'élaborer des plans informatiques dont deux copies seront adressées au CNI en tant que secrétariat du CPBI pour information .

3) Dispositions communes à l'ensemble du secteur Public:

-La procédure d'agrément des acquisitions de matériels informatiques par les organismes publics est supprimée.

-L'acquisition de micro-ordinateurs est libre, qu'elle soit prévue ou non par un plan informatique.

4) Autres dispositions:

Les importations de matériels et de logiciels, pour les secteurs public et privé, ne sont plus soumises à l'avis technique du CNI.

## LA PROMOTION DES ACTIVITES DE SERVICES ET D'INGENIERIE EN INFORMATIQUE

-Les activités de services informatiques bénéficieront des avantages prévus par le projet de loi portant création d'un régime d'encouragement aux investissements dans les activités de services.

-La liste des industries manufacturières bénéficiant des avantages prévues par le code des investissements industriels (Réf: loi n° 87-51 du 2 Août 1987 portant code des investissements industriels ), telle qu'elle est fixée par le décret n° 87-1281 du 26 Octobre 1987, inclut les activités de "développement de logiciels" et de "saisie des données" .

-Les activités de services informatiques bénéficient du taux réduit (6%) de la Taxe sur la Valeur Ajoutée (TVA).

(Réf: loi n° 88-61 du 2 Juin 1988 portant promulgation du code de la Taxe sur la Valeur Ajoutée ).

-Les métiers relevant de l'informatique (bureaux de traitement informatique) bénéficient de l'aide du Fonds National de Promotion de l'Artisanat et des Petits Métiers (FONAPRA) sous la forme des concours suivants :

- \* Dotation remboursable n'excédant pas 90% du fonds propre, accordée sans intérêt et remboursable sur une période maximale de 11 ans dont un délai de grâce n'excédant pas la période d'amortissement des prêts d'investissement .

- \* Crédit d'investissement : pouvant financer jusqu'à un maximum de 60% du coût de l'investissement, le taux d'intérêt pratiqué sur le crédit est de 6,25% .

- \* Prise en charge des intérêts des emprunts au titre des crédits bancaires dans la limite d'une période d'une année .

-Association tunisienne des sociétés de services et d'Ingénierie en Informatique : ( en cours de création) a pour objectif l'étude, la représentation, la promotion et la défense des intérêts collectifs, professionnels, moraux et économiques des sociétés membres .

## **LA PROCEDURE D'AGREMENT DES DISTRIBUTEURS DE MATERIELS INFORMATIQUES**

Au cours du 6ème Plan, une procédure d'agrément des fournisseurs de matériels informatiques a été instaurée par le Ministère de l'Economie Nationale ( Réf. : Décret-loi N° 61-14 du 30 Août 1981 relatif aux conditions d'exercice de certaines activités commerciales ) en vue de veiller à l'existence d'un service après-vente adéquat et à la qualité des matériels à commercialiser.

## **LA PROCEDURE D'IMPORTATION ET TAUX D' IMPOSITION DE MATERIELS ET SERVICES INFORMATIQUES**

### **\* REGLEMENTATION :**

-Article N° 52 de la loi N° 87-83 du 31/12/1987 portant loi des finances pour la Gestion 1988, modifiant les taux de droit de douane en tarif minimum ad-valorem .

-Avis aux importateurs et aux exportateurs, du 29 Janvier 1988 portant extension de la liste des produits libres à l'importation .

-Loi N° 88-61 du 2 Juin 1988 portant promulgation du code de la taxe sur la valeur ajoutée

### **\* DISPOSITIONS :**

-Allègement des Droits de Douane (DD) dûs à l'importation de :

- \* matériels informatiques: le taux de DD est de 17% pour les matériels d'une valeur en Douane unitaire ne dépassant pas 8000 dinars, et de 22% dans le cas contraire ;

- \* pièces détachées et accessoires: le taux de DD est de 22% (de la valeur du produit en Douane).

-Importation de matériels informatiques sous le couvert de certificat d'importation.

-Importation de logiciels autres que les logiciels de gestion sous le couvert de certificat d'importation.

-Les matériels informatiques (machines pour le traitement de l'information, leurs pièces et parties ainsi que les supports magnétiques informatiques) et les services réalisés en matière informatique sont soumis à la taxe sur la valeur ajoutée en substitution aux taxes prélevées sur les chiffres d'affaires (taxe à la production, taxe à la consommation et taxe sur les prestations de services ) au taux réduit de 6%.

-Le taux de l'ensemble des taxes appliquées au coût CIF est le suivant :

- \* 23,35% pour les machines automatiques de traitement de l'information et leurs unités périphériques d'une valeur en douane ne dépassant pas 8000 DT;

- \* 28,42% pour les machines d'une valeur en douane supérieure à 8000 DT et pour les autres produits informatiques (modems, logiciel, pièces détachées et fournitures );

- \* les publications traitant l'informatique et les domaines connexes ne sont soumises à aucune imposition .

# INSTITUTIONS DE FORMATION ET DE RECHERCHE EN INFORMATIQUE

## **L'ECOLE NATIONALE DES SCIENCES DE L'INFORMATIQUE (ENSI)**

- ingénieurs concepteurs: depuis 1984 - niveau Bac + DUES (Diplome Universitaire des Etudes Scientifiques) ou 2 années préparatoires + 4 ans .
- ingénieurs techniciens: depuis 1984 - niveau Bac + 1 année préparatoire + 3 ans .
- Possibilité de passage de la filière moyenne à la filière longue .

## **LA FACULTE DES SCIENCES DE TUNIS**:(Département des sciences informatiques)

- ingénieurs concepteurs (options système et gestion): depuis 1975 niveau Bac + DUES ou deux années préparatoires + 4ans .
- ingénieurs techniciens: depuis 1984 - niveau Bac + DUES + 2 ans .

## **L'INSTITUT SUPERIEUR DE GESTION (ISG)**

- analystes: depuis 1978 - niveau Bac + 4 ans .
- programmeurs: depuis 1971 - niveau Bac + 2 ans .
- avec tronc commun de 2 années pour les deux filières.

## **LA FACULTE DES SCIENCES ECONOMIQUES ET DE GESTION DE SFAX (FSEG)**

- analystes: depuis 1975 - niveau Bac + 4 ans .
- programmeurs: depuis 1977 - niveau Bac + 2 ans .
- avec tronc commun de 2 années pour les deux filières .

## **L'ECOLE NATIONALE D'INGENIEURS DE TUNIS (ENIT)**

- techniciens de maintenance de matériel informatique: depuis 1984 - niveau Bac +2 ans .

# CENTRES SPECIALISES EN INFORMATIQUE

## **LE CENTRE INFORMATIQUE DES MINISTERES DU PLAN ET DES FINANCES (CIMPF)**

• **CREATION** : Loi N° 81-100 du 31/12/1981, portant loi des finances pour la gestion 1982 et notamment ses articles 78,79 et 80 .

• **ORGANISATION** : Décret N° 82-799 du 17/5/1982, portant organisation administrative et financière du CIMPF .

• **TUTELLE** : Ministère des Finances .

• **MISSIONS** :

- Elaboration et mise en oeuvre du plan informatique du Ministère des Finances ;
- Gérer l'ensemble des équipements informatiques des ministères du Plan et des Finances ;
- Assurer l'exploitation des applications informatiques .

Il est muni d'une cellule de formation pour l'animation de séminaires d'initiation à l'informatique et à la micro-informatique destinés aux fonctionnaires de ces Ministères.

## **LE CENTRE DE CALCUL << EL KHAWARIZMI >> (CIRIA)**

• **CREATION** : Loi N° 76-115 du 31/12/76, portant loi des finances pour la gestion 1977 et notamment son article 71

• **ORGANISATION** : Décret N° 86-321 du 1/3/1986, portant missions et organisation du centre de calcul << El khawarizmi >> .

• **TUTELLE** : Ministère de l'Enseignement Supérieur et de la Recherche Scientifique .

• **MISSIONS** :

- Favoriser et entreprendre des études et des travaux dans le domaine de la recherche par l'informatique et en informatique en mettant à la disposition des chercheurs les moyens et les services informatiques nécessaires ;
- Répondre aux demandes des services du Ministère de l'Enseignement Supérieur et de la Recherche Scientifique en matière de ressources informatiques nécessaires à leur gestion;
- Répondre accessoirement, dans le cadre du temps disponible, aux demandes de services émanant d'autres organismes et ce moyennant rémunération , et à tout travail qui lui sera confié dans le cadre de ces missions.

# INSTITUT

## A VOCATION INTERNATIONALE

### **L'INSTITUT REGIONAL DES SCIENCES INFORMATIQUES ET DES TELECOMMUNICATIONS (IRSIT)**

• **CREATION** : Loi N° 86-106 du 31/12/86 portant loi des finances pour la gestion 1987 et notamment ses articles 72, 73 et 74 .

• **ORGANISATION** : Décret N° 87-710 du 14/05/87 portant organisation administrative et financière de l'IRSIT.

• **TUTELLE** : Premier Ministère

• **VOCATION** :

L'IRSIT a une vocation **Internationale** pouvant couvrir la **région arabo-africaine** dans le cadre des conventions entre l'Etat Tunisien et un ou plusieurs Etats intéressés .

• **MISSIONS** :

- Ouvrir pour le développement de la recherche fondamentale et appliquée dans le domaine de l'informatique et des technologies associées;
- Assurer une formation post-universitaire , le recyclage aux techniques avancées et l'initiation à la recherche dans le domaine de l'informatique et des technologies associées;
- Contribuer à la sauvegarde et à la mise en valeur du patrimoine culturel et civilisationnel face à la transformation des structures économiques, scientifiques et culturelles dues aux mutations engendrées par l'informatique;
- Participer au développement de l'industrie informatique et des technologies associées par le transfert des innovations technologiques aux industriels.

# DIFFUSION DE LA CULTURE INFORMATIQUE ET PERFECTIONNEMENT

## **LE CENTRE BOURGUIBA DE MICRO-INFORMATIQUE (CBMI)**

\* **CREATION** : Loi N° 84-84 du 13/12/1984, portant loi des finances pour la gestion 1985 et notamment son article 71 .

\* **MISSIONS** : les missions du CBMI telles que définies par le décret N° 87-1255 du 27/10/1987, portant organisation administrative et financière du CBMI sont

- Promouvoir, dans le cadre de la politique informatique éducationnelle, la micro-informatique dans les milieux éducatifs ;
- Favoriser une meilleure connaissance de la culture informatique, notamment par des actions de sensibilisation à l'égard du grand public et dans les milieux socio-professionnels ;
- Définir une méthodologie d'introduction de l'outil micro dans le système éducatif ;
- Fixer des finalités et des objectifs au système éducatif en fonction de la méthodologie choisie ;
- Tester les outils didactiques les mieux adaptés à notre contexte et à notre culture ;
- Constituer en liaison avec les centres analogues et les clubs, un centre d'échange d'idées et d'expériences ;
- Entreprendre des actions de vulgarisation et de sensibilisation concernant les micros ;
- Coopérer, dans le cadre de ses attributions, avec des organismes nationaux et étrangers .

## **LES CENTRES DE MICRO-ORDINATEURS DANS LES LYCEES : OPERATION HB-1000**

Cette opération, menée par le CBMI, prévoit l'équipement de 100 établissements du secondaire dans tous les gouvernorats du pays par 1350 micro-ordinateurs destinés aux populations scolaire et socio-professionnelle. Le premier lot sera acquis en Janvier 1989, d'autres lots arriveront au cours du premier semestre de 1989.

Ces micros seront installés dans les sites suivants :

- Centres de formation des formateurs
- Lycées et clubs pilotes (recevront les stagiaires des nouveaux laboratoires)
- Centres régionaux de formation pédagogique (recyclage pédagogique des professeurs)
- Lycées et écoles normales d'instituteurs (70 établissements environ )

D'autres micros seront installés dans des sites destinés à des actions spéciales.

## **LE CENTRE DE FORMATION ET DE DOCUMENTATION DU CNI (CFD)**

Formation dispensée depuis la création du CNI en 1975 selon plusieurs formules:

-Recyclage des fonctionnaires en programmeurs et remise à niveau des programmeurs en analystes;

-Séminaires de perfectionnement, de sensibilisation pour décideurs et utilisateurs, et de formation des correspondants informatiques.

Ce centre dispose d'un atelier de micro-informatique ayant pour missions de:

-Former les décideurs et cadres du secteur public à l'utilisation des outils et des applications micro-informatiques et les aider à choisir leur solution informatique;

-Servir de "vitrine" de démonstration et de promotion pour des produits bureautiques et télématiques ; et servir aussi de champs d'expérimentation.

## **LES CLUBS D'AMATEURS DE MICRO-INFORMATIQUE**

-Les clubs micro-informatiques des Maisons de Jeunes et de la Culture de la Ville de Tunis promus par la Municipalité de Tunis pour les Jeunes dans le cadre du projet "IQADH 2001";

-Les clubs micro-informatiques créés dans les Maisons de Jeunes par le Ministère de la Jeunesse et des Sports;

-Le club "MICROCOM";

-Autres clubs dans certaines villes du pays.

# BILAN ET REALISATIONS DU VIÈME PLAN (1982-86)

## A- LE PARC DE MATERIELS INFORMATIQUES

Le parc de matériels informatiques, constitué de 285 machines à la fin du 5ème plan, est composé de 2535 machines à la fin du 6ème plan dont 2300 micro-ordinateurs. Soit 3,4 ordinateurs pour 10.000 habitants.

**Remarque:** Les micro-ordinateurs familiaux ne sont pas pris en compte dans ce nombre qui concerne les monos et les multipostes d'une valeur n'excédant pas 25.000 DT/HT.

| INDICATEURS SIGNIFICATIFS        |               |           |
|----------------------------------|---------------|-----------|
| INDICATEURS                      | à la fin du : |           |
|                                  | 5ème plan     | 6ème plan |
| Valeur du parc en Millions DT/HT | 18            | 50 (1)    |
| Taux moyen d'évolution annuel    | 40 %          | 22,5 %    |
| Valeur du Parc / P I B           | 0,43 %        | 0,71% (2) |
| Taux moyen d'évolution annuel    | 20 %          | 10,5 %    |

| REPARTITION SECTORIELLE DU PARC EN VALEUR EN 1986 |        |
|---|--------|
| -Administration                                   | 19 %   |
| -Agriculture-pêche                                | 1,5 %  |
| -Industries Manufacturières                       | 10 %   |
| -Ind. non Manufacturières                         | 8,5 %  |
| -Transport et communications                      | 5,5 %  |
| -Banques et Assurances                            | 22,5 % |
| -Autres Services                                  | 33 %   |

(1): en 1987,cette valeur est d'environ 65 millions de DT/HT

(2): en 1987,ce ratio est de 0,82 %

| REPARTITION DU PARC PAR GAMME |               |             |               |              |
|-------------------------------|---------------|-------------|---------------|--------------|
| PARC DE MATERIELS             | EN NOMBRE     |             | EN VALEUR (%) |              |
|                               | à la fin du : |             | 5è plan       | 6è plan      |
|                               | 5è plan       | 6è plan     | 5è plan       | 6è plan      |
| micro-ordinateurs             | 182           | 2300        | 12 %          | 37 %         |
| mini-ordinateurs              | 74            | 183         | 28 %          | 26 %         |
| ordinateurs moyens et gros    | 29            | 52          | 60 %          | 37 %         |
| <b>TOTAL</b>                  | <b>285</b>    | <b>2535</b> | <b>100 %</b>  | <b>100 %</b> |

## B-LES MOYENS HUMAINS

Au cours du 6ème plan, le secteur informatique a permis de créer 1900 postes d'emplois directs dont 900 informaticiens. L'effectif informaticien a augmenté de 10 % en moyenne par an durant le plan et représente 0,24 % de la population active.

NB: Il n'a pas été tenu compte de près de 800 emplois de soutien aux activités informatiques (gestion générale,...).

| EVOLUTION DES EFFECTIFS       |       |             |             |             |
|-------------------------------|-------|-------------|-------------|-------------|
| CATEGORIE                     | Année | 1981        | 1986        | 1991*       |
| Ingénieurs concepteurs        |       | 250         | 540         | 1060        |
| Analystes et Ing. Techniciens |       | 350         | 700         | 1800        |
| Programmeurs                  |       | 750         | 1000        | 2060        |
| Techniciens de Maintenance    |       | 90          | 210         | 500         |
| Opérateurs et Ag. de Saisie   |       | 1160        | 2050        | 4280        |
| <b>TOTAL</b>                  |       | <b>2600</b> | <b>4500</b> | <b>9700</b> |

\* : perspective sur la base d'un taux retenu de 1,2% ( Valeur du Parc / PIB )

## C-LES DEPENSES INFORMATIQUES

- Les dépenses informatiques sont estimées , en 1986, à 40 millions de DT soit 0,55% du PIB.
- 48% de ces dépenses sont des dépenses en logiciel et services (\*\*) dont 58% sont sous traitées auprès de SSII et Distributeurs. La part des SSII dans les dépenses sous traitées n'étant que de 30%.
- 80% de dépenses sous traitées sont générées par les prestations intellectuelles et 20% par les prestations machines.

(\*\*): élaboration de schéma directeur, développement et maintenance de logiciel, progiciel, assistance, formation, services bureaux,...

# BILAN ET REALISATIONS DU VIÈME PLAN (1982-86)

(Suite 1)

## D-LES APPLICATIONS AUTOMATISEES

### 1-AU NIVEAU DE L'ADMINISTRATION

Les principales applications automatisées sont :

| Désignation   | Caractéristiques  | Fonctions Assurées  |
|---|---|---|
| Système d'Information Douanier Automatisé (SINDA)                   | Réseau de terminaux en Temps Réel (TR) : Bureaux Douane, Transitaires . Nombre de terminaux en 1988 : 240 | Prise en charge des titres et déclarations en Douane<br>Calcul des taxes douanières, statistiques,...               |
| Système de gestion du personnel de l'Etat (INSAF)                   | Gère actuellement 70% des fonctionnaires de l'Etat  | Gestion de carrière: élaboration des actes,....<br>Gestion finan., Ordonnancement, Paie, Statist,...                |
| Système de gestion des chèques postaux                              | Réseau en TR, local et à distance dont 25% dans la région de Tunis  | Gestion des chèques postaux, des comptes d'épargne et des opérations financières                                    |
| Système de gestion des tribunaux (JAZA)                             | Traitement des données en langue Arabe  | Suivi des affaires pénales<br>Gestion des échéances des assises   |
| Gestion des titres du commerce extérieur                            | Traitement en Temps Différé (TD)  | Suivi du flux d'importation / exportation   |
| Gestion des stocks des hopitaux                                     | Utilisée dans un hopital (sera généralisée à l'ensemble des hopitaux)                                     | Suivi des consommations<br>Statistiques et calcul des coûts des prestations<br>Organisation de l'approvisionnement  |
| Comptabilité Publique   | Traitement en TD  | Centralisation comptable des opérations des receveurs des finances  |
| Système fiscal  | Traitement en TR  | Suivi du fichier des contribuables et prise en charge des liquidations des déclarations fiscales                    |
| Gestion de la dette extérieure                                      | Traitement en TD  |   |
| Gestion des examens nationaux (Bac,...) , orientation universitaire | Traitement en TD  | Examen d'entrée au secondaire, Bac, ...<br>Orientation des bacheliers vers les filières de l'enseignement supérieur |
| Système de gestion budgétaire                                       | Traitement en TD  | Suivi des dépenses de matériel de l'Etat  |
| Tenue de la comptabilité de la Trésorerie Générale                  | Traitement en TD  | Suivi des recettes et des dépenses des receveurs  |
| -Suivi de la taxe sur la valeur locative<br>-Gestion des moyens     | Exploitées dans les Municipalités de Tunis, de Slax et de l'Ariana  |   |

### 2-AU NIVEAU DES SECTEURS ECONOMIQUES

#### a- TAUX D'INFORMATISATION:

En 1985, le taux d'informatisation est globalement faible (moins de 10%). Le niveau d'informatisation sectorielle peut être mesuré par le taux d'équipement défini par le pourcentage d'entreprises équipées par rapport au nombre total d'entreprises du secteur (selon les statistiques du CNI et de l'INS). Le tableau met en relief :

- une assez bonne informatisation des banques
  - un faible niveau d'informatisation des secteurs des industries et de l'hôtellerie, et de certaines activités de services marchands.
- Il est à remarquer que certains secteurs tels que l'Administration sous-traitent une partie non négligeable de leur travaux informatiques auprès des centres et sociétés de services spécialisés en informatique .

| SECTEURS ECONOMIQUES                               | Taux d'équipement |
|--|-------------------|
| Agriculture et pêche                               | de 10 à 20%       |
| Industries manufacturières                         | inf . à 10%       |
| Mines et énergie                                   | de 10 à 20%       |
| Bâtiment et travaux publics                        | inf . à 10%       |
| Transport et communication                         | de 10 à 20%       |
| Hôtellerie   | inf . à 10%       |
| Banques et assurances                              | sup. à 70%        |
| Commerce et autres activités de services marchands | inf . à 10%       |
| <b>TOTAL</b><br>(tous secteurs confondus)          | inf . à 10%       |

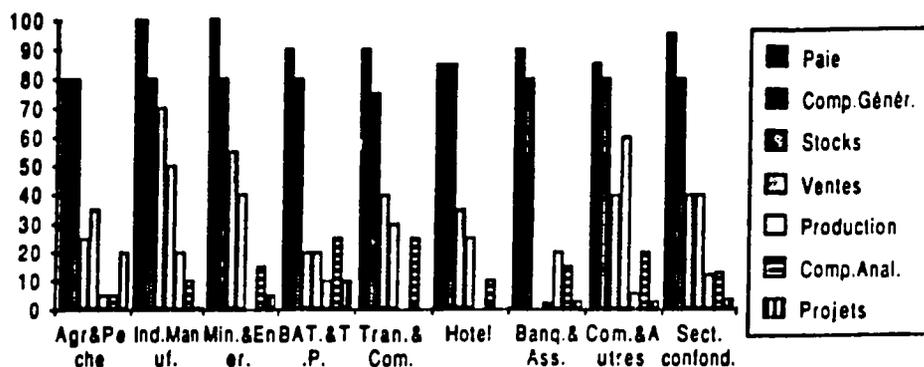
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# BILAN ET REALISATIONS DU VIÈME PLAN (1982-86)

(Suite 2)

## LES TYPES D'APPLICATIONS UTILISEES PAR LES ENTREPRISES INFORMATISEES:

Ce graphique présente le pourcentage des entreprises informatisées qui utilisent une application donnée (c.f. légende)



## E-LE SECTEUR DES SERVICES INFORMATIQUES

Le secteur des services informatiques (Sociétés de Services et d'Ingénierie en Informatique - SSII - et fournisseurs de matériels informatiques) compte environ :

| Nombre d'entreprises spécialisées | à la fin du 5ème plan | à la fin du 6ème plan | en 1988                             |
|-----------------------------------|-----------------------|-----------------------|-------------------------------------|
|                                   | 30                    | 60                    | 100<br>dont la moitié sont des SSII |

L'effectif informaticien de ce secteur est estimé, en 1986, à 460 soit 20% de l'effectif national.

Les activités de ces entreprises sont orientées essentiellement vers :

- le développement de logiciel sur mesure; l'assistance;
- la formation; la vente de matériels.

Certaines sociétés exercent une activité de Service Bureau qui subit un fléchissement dû à la baisse des prix des matériels et de l'apparition des micro-ordinateurs.

Ce secteur a bénéficié de certaines mesures d'encouragement pour la promotion de ses activités ( cf. chapitre : PROCEDURES ET REGLEMENTATION )

## F-LES BANQUES DE DONNEES OPERATIONNELLES OU EN COURS DE REALISATION

| DESIGNATION                 | NATURE   | PRODUCTEUR                                      | CENTRE DE TRAITEMENT (SERVEUR) | UTILISATEURS  |
|-----------------------------|--|---|--------------------------------|---|
| KINZ                        | Textes législatifs en vigueur<br>Arrêtés rendus par la cour de cassation | Ministère de la Justice                         | C N I                          | Ministère de la Justice   |
| TUNAGRI<br>CARIST           | Banque de données agricoles  | Centre NI Documenta-<br>tion Agricole<br>(CNDA) | C N D A                        | Administration, CNDA (public),<br>opérateurs économiques, agronomes,<br>universitaires, chercheurs, ... |
| TUNIDOC<br>ARCHIVES         | Banques de données scienti-<br>fiques et techniques                      | Centre NI Univ. Doc.<br>Sc. et Tech. (CNUDST)   | C N U D S T                    | Adm., CNUDST (public), services<br>univ., universitaires, chercheurs, ...                               |
| TANIT                       | Politique, informations généra-<br>les, discours du chef de l'Etat, ...  | Centre Documenta-<br>tion Nle (CDN)             | C N I                          | Adm., CDN (public), journalistes,<br>chercheurs, universitaires, ...                                    |
| TOURATH                     | Patrimoine culturel national   | Ministère des<br>affaires culturelles           | C N I                          | Adm., services culturels<br>universitaires, chercheurs, ...   |
| NORMES/MA-<br>ROUQUE/BREVET | Banque de données sur les nor-<br>mes et la propriété industrielle       | Inst. NI Norm. Prop.<br>Indust. (INNORPI)       | I N N O R P I                  | Adm., INNORPI (public), opérateurs<br>économ., techniciens, ingénieurs, ...                             |
| BDP                         | Banque de données pétrolières  | Entrep. Nne Activi-<br>tés Pétrol. (ETAP)       | E T A P                        | Administration, ETAP, ...   |

# PERSPECTIVES A L'HORIZON DU VIIème PLAN (1987-91)

## A-ELEMENTS CHIFFRES

| INDICATEURS D'INFORMATISATION            | BESOINS EN EQUIPEMENTS         | BESOINS EN INFORMATIENS           |
|--|--------------------------------|-----------------------------------|
| Valeur du Parc (en M DT/HT) : 145        | Micro-ordinateurs : 7600       | Ingénieurs concepteurs : 520      |
| Valeur du Parc/PIB (en %) : 1,2          | Mini-ordinateurs : 415         | Ing.techniciens/ analystes : 1100 |
| Nb:e d'informatiens pour 10.000 hab. : 6 | Moyens et Gros ordinateurs: 33 | Programmeurs : 1060               |
|  |                                | Techniciens de maintenance: 290   |

## B-PERSPECTIVES D'EVOLUTION

### 1-DANS L'ADMINISTRATION

| LES APPLICATIONS INTER-ADMINISTRATIVES  | LES PRINCIPAUX PROJETS SPECIFIQUES des différents départements  |
|---|---|
| <ul style="list-style-type: none"> <li>-le système d'information et de communication pour l'administration (SICAD) *</li> <li>-la gestion du parc roulant</li> <li>-la gestion des stocks et approvisionnement</li> <li>-le suivi de réalisation des projets</li> <li>-la gestion des bureaux d'ordre</li> <li>-le système d'Aide à la Décision Budgétaire (ADEB): actualisation de l'application gestion du budget de l'Etat en temps réel *</li> <li>-la gestion financière du personnel de l'Etat *</li> </ul> | <ul style="list-style-type: none"> <li>-la gestion intégrée du commerce extérieur</li> <li>-le système intégré impot-comptabilité publique *</li> <li>-le suivi des projets de développement</li> <li>-la banque de données pour la recherche et l'enseignement agricoles</li> <li>-la banque de données industrielles (API) *</li> <li>-l'informatisation des communes par recours aux logiciels (suivi de la taxe sur la valeur locative,...) : 40 à 50 communes prévues pour 1988 *</li> </ul> |

\* : action en cours de réalisation

### 2-DANS LES SECTEURS ECONOMIQUES

| DOMAINES D'INTERVENTION  | APPROCHE PRECONISEE  | APPLICATIONS A PROMOUVOIR   |
|--|--|---|
| Secteurs prioritaires:<br>-Agriculture et pêche<br>-Industries manufacturières<br>-Tourisme<br>Niveau d'intervention<br>-les PME et PMI<br>-les activités exportatrices et créatrices d'emploi | <ul style="list-style-type: none"> <li>-une action de sensibilisation de grande envergure pour les dirigeants et cadres de ces secteurs</li> <li>-la définition d'une stratégie sectorielle avec un chef de file sectoriel</li> <li>-le développement de logiciels d'applications standards</li> </ul> | Principalement:<br>-Comptabilité analytique<br>-Gestion des stocks<br>-Gestion de la production |

### 3-DANS LA RECHERCHE

| AXES DE RECHERCHES IDENTIFIES  | PRINCIPE RETENU  | PROJETS PROGRAMMES A L'IRISIT   |
|--|--|---|
| -l'Arabisation<br>-le Génie Logiciel et Industrie du Logiciel<br>-les Bases de Données et Systèmes d'Information<br>-le Développement de Réseaux<br>-la Conception Assistée par Ordinateur (CAO)<br>-l'Intelligence Artificielle et Systèmes Experts | L'orientation vers une coopération régionale que l'IRISIT pourrait promouvoir afin de favoriser la recherche et le développement d'une industrie informatique dans la région | -l'Arabisation de logiciels<br>-l'IRISINET: réseau de transmission de données pour chercheurs et ingénieurs de la région<br>-l'IRISIBANK: banque de données sur les ressources en matière d'informatique et de télécommunications |

### 4-DANS LA FORMATION ET L'ENSEIGNEMENT ( pour le 7ème et le 8ème plans )

|                            |  |   |  |
|----------------------------|--|---|--|
| ACTIONS                    | Introduction de modules d'enseignement informatique                  | Sensibilisation des enseignants et mise à la disposition de matériels nécessaires | Renforcement et extension des actions entreprises          |
| ENSEIGNEMENT SECONDAIRE ** | Pour les élèves du secondaire ( enseignement pratique )              | enseignants du secondaire   | action pilote d'Enseignement Assisté par Ordinateur ( EAO) |
| ENSEIGNEMENT SUPERIEUR     | Pour les étudiants de 2ème année de toutes les filières de formation | enseignants du supérieur  |  |

\*: voir opération HB-1000 ( cf. chapitre: DIFFUSION DE LA CULTURE INFORMATIQUE ET PERFECTIONNEMENT )

## PERSPECTIVES ( Suite )

### 5-RESEAUX DE TRANSMISSION DE DONNEES

| LE RESEAU NATIONAL DE TRANSMISSION DE DONNEES  | LES SERVICES TELEMATIQUES ET BUREAUTIQUES   |
|--|---|
| <p>L'objectif fondamental du 7ème plan en matière de télécommunication consiste en la mise en place d'un Réseau National de Transmission de Données (RNTD) couvrant l'ensemble du territoire et offrant des possibilités de connexions avec l'étranger.</p> <p>La mise en exploitation du RNTD est prévue pour 1989 (appel d'offres lancé en Janvier 1988).</p> <p>L'infrastructure de Transmission de Données sera améliorée et ce en renforçant le personnel et le matériel affectés à la maintenance.</p> | <p>Au cours du 7ème plan, il est prévu d'instaurer un système de communication inter-administratif utilisant les outils télématiques tels que vidéotex, messagerie, télétext,...</p> <p>De même pour soutenir le développement de la bureautique au sein de l'administration, il est prévu de:</p> <ul style="list-style-type: none"> <li>- lancer des expériences pilotes dans les départements motivés;</li> <li>- constituer une équipe d'assistance aux Ministères en matière de bureautique;</li> <li>- créer un " libre service " bureautique.</li> </ul> |

### 6-LES BANQUES DE DONNEES PROJETEES

| DESIGNATION ET NATURE   | PRODUCTEUR  | CENTRE DE TRAITEMENT ( SERVEUR ) | UTILISATEURS  |
|---|---|----------------------------------|---|
| Banque de Données "Cadastre"  | Office Topo. Carto. ( OTC )   | O T C                            | Administration, OTC (public), Opérateurs économiques, Ingénieurs, Bureaux d'études,...                  |
| Banque de Données Technologiques et industrielles                             | Agence de Promotion de l'Industrie ( A P I )                            | A P I                            | Administration, API (public), Opé. éco., Promoteurs industriels,...                                     |
| Banque de Données Socio-Economiques   | Inst. NI de la Statistique ( INS )<br>Inst. d'Eco. Quantitative ( IEQ ) | I N S / I E Q                    | Administration, INS/IEQ (public), Opé. éco., Economistes et Planif. Universitaires et Chercheurs,...    |
| Banque de Données " Aménagement du Territoire "                               | Ministère de l'Équipement et de l'Habitat                               | Min. Equipement et Habitat       | Administration, Min. Equip./Hab. (public), Promoteurs Urbanistes, Universitaires et chercheurs,...      |
| Banque de Données " Législation Fiscale, Douanière, Budgétaire et Comptable " | Ministères du Plan et des Finances                                      | Min. Plan et Finances            | Administration, INS, IEQ, Opé. éco., Planificateurs et Economistes, Universit. et Chercheurs,...        |
| Banque de Données Météorologiques   | Inst. NI de la Météorologie ( I N M )                                   | I N M                            | Administration, INM, Opé. éco., Spécialistes et Chercheurs,...  |
| Banque de Données sur l'Emploi en Tunisie                                     | Office de la Formation Professionnelle et de l'Emploi ( O F P E )       | O F P E                          | Admin., OFPE (public), Office des Travail. Tsiens à l'Etranger, Opé. éco., Gestionnaires, Entrepreneurs |

### 7-LE SECTEUR DES SERVICES INFORMATIQUES

**Organisation du secteur :** afin de garantir la qualité des prestations fournies, il faudrait organiser et moraliser la profession et particulièrement :

- définir des normes pour les prestations de services informatiques;
- établir des prix de référence pour les produits logiciels standards;
- élargir le champ des activités de services informatiques tout en encourageant l'exportation du savoir-faire dans le domaine des études, du conseil et de l'ingénierie.

**Promotion du secteur des services informatiques :**

Dans ce cadre, certaines mesures sont à l'étude dont notamment :

- des avantages prévus dans le projet de loi fixant le régime d'encouragement aux investissements dans les activités de services, et d'autres avantages spécifiques aux investissements dans les activités de services informatiques.
- un abattement fiscal des dépenses relatives aux activités informatiques sous traitées par les entreprises.

**Logiciels bilingues développés en Tunisie :**

- TEXTAR : Système de traitement de textes Arabe-Latin sur compatible IBM .
- ABCIX : UNIX arabisé (prévu pour 1989).
- ARABKIS : traitement de texte Arabe-Latin sur macintosh.

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## BUREAUX D'ETUDES EN INFORMATIQUE (\*)

### I-BUREAUX D'ETUDES AYANT ELABORE DES ETUDES D'INFORMATISATION APPROUVEES

| RAISON SOCIALE  | ADRESSE                                      | TEL    |
|---|--|--------|
| Sté d'Assistance en Management, d'Engenierie et de Formation: SAMEF | 45, Rue d'Iran - Tunis                       | 892322 |
| Sté d'Informatique de Gestion et de Mathématiques Appliquées: SIGMA | 6, Rue Mustapha Sfar 1002 le Belvédère Tunis | 238023 |
| Sté de l'Informatique, de Management et de Communication: SIMAC     | 124, Rue de Yougoslavie - Tunis              | 349616 |
| Sté d'Ingénierie pour le Développement Economique et Social: SIDES  | 10, Rue 7000 Montplaisir 1002 Belv. Tunis    | 236158 |
| Sté Générale Tunisienne de l'Informatique: GTI                      | 2, Rue Bach Hamba - Tunis                    | 247359 |
| Sté Tunisienne de l' Informatique et de l'Organisation: SOTINFOR    | 7, Rue de Khartoum - Tunis                   | 287000 |

### II-AUTRES BUREAUX D'ETUDES RECENSES

| RAISON SOCIALE                                     | ADRESSE                                    | TEL    |
|--|--|--------|
| Arab-International Informatics                     | 2,Rue Abdelmoumen Ibn Ali - Tunis          | 784452 |
| Assistance Informatique                            | 8, Rue Ibn Chabbat - Sfax                  | 23987  |
| Bureau de Conseil en Informatique                  | 10, R. Said Aboubaker-1004 El menzah Tunis | 231708 |
| Bureau de Réalisation d'Appl. Informatiques: BRAIN | 5, Rue Hooker de Little - Tunis            | 230961 |
| Bouraoui & Compagnies                              | 151, Av. de la Liberté -Tunis              | 890453 |
| Comète Engeneering                                 | 3, Rue Mahmoud El Materi -Tunis            | 281976 |
| Compagnie des Experts Associés de Tunisie          | 7, Rue d'Irak - Tunis                      | 288465 |
| Computer et Management                             | 22, Rue Broca - Tunis                      | 288704 |
| Computer Data Processing: CDP                      | 14, Rue Jamel Abdennacer - Tunis           | 248151 |
| Computer Software Products                         | 29, Rue 70360 - Tunis                      | 233293 |
| Conseils d'Etudes et de Réalisation Inf. CERI      | 12 bis, Rue de Palestine - Tunis           | 285929 |
| La Générale Informatique                           | 2, Rue El Métouia - Tunis                  | 248238 |
| Informatique, Services et Diffusion                | 76, Av. Habib Bougatfa - Sfax              | 30329  |
| Informatique Mohamed Dridi                         | Im. Ramla I Escalier B - Ariana            | 710392 |
| L'informatique                                     | 3, Rue Abdelmalek Ibn Marouane - Tunis     | 284341 |
| L'informatique Professionnelle                     | 5 bis, Rue du Mexique - Tunis              | 781593 |
| Informatique et Gestion de Tunisie                 | 1, Rue Jamel Abdennasser - Tunis           | 345810 |
| International Bureau Service (IBS)                 | 20, Rue Hassen Ibn Nomaân 1002 - Tunis     | 787301 |
| Jeta Informatique                                  | 43 - 45 Av. Habib Bourguiba - Tunis        | 346061 |
| Marketing et Informatique de Tunisie               | 10, Rue de la Clinique - Tunis             | 239158 |
| Matériel Bureau Informatique                       | 6, Rue Sénateur Gallim - Tunis             | 282593 |
| Méditerranée Marketing Services: MMS               | 43, Av. de Paris - Tunis                   | 255767 |
| Micro Informatique et Logiciel de Gestion          | 10, Rue Asdrubal - Tunis                   | 393640 |
| Micro Informatique Services Conseils: MISC         | 1, Rue de Sfax Mégrine - Ben Arous         | 299982 |
| MIELEC   | 9, Rue Mdella Houria - Medjez El Bab       | 60416  |
| L'Ordinateur                                       | 7, Rue Khartoum - Tunis                    | 287000 |
| Organisation et Gestion Informatique : OGI         | 2, Rue Borj Bourguiba - Tunis              | 346117 |
| Organisation et Services Informatiques             | 3bis, Rue de Grèce - Tunis                 | 340718 |

(\*): Classement par ordre alphabétique indépendamment des effectifs ou des références .

## BUREAUX D'ETUDES EN INFORMATIQUE (Suite)

| RAISON SOCIALE                                   | ADRESSE                                     | TEL    |
|--|---|--------|
| Programmes et Services Informatiques             | 1, Rue Taieb Slim - Nabeul                  | 87511  |
| Sté COMPUTER                                     | 63, Rue Tahar Sfar - Sfax                   | 25140  |
| Sté Glé. pour l'Informat. et les Systèmes: SOGIS | 18, Av. Habib Bourguiba - Tunis             | 248668 |
| Sté d'Etudes et Prestations Informatiques: SEPI  | 1, Rue Ibn Rachiq - Tunis                   | 890365 |
| Sté d'Inf., de Gestion et d'Organisation         | 4, Rue Ibn Rachiq - Tunis                   | 241020 |
| Sté Tun. de Traitement de l'Inform. STTI         | 40, Rue de Ghana - Tunis                    | 254873 |
| TOUTINFO   | 11, Rue de la Banque - Tunis                | 340365 |
| Traitement Rationnel des Informations: TRI       | 7, Rue Amilcar - Tunis                      | 256122 |
| Tunisie Consult                                  | 10, Rue de l'Alhambra Mutuelleville - Tunis | 890200 |
| Tunisie Engeneering et Conseils                  | 3, Rue de Touraine Belvédère - Tunis        | 894475 |
| Tunisie Informatique: TIF                        | 6, Rue Jebel El Fath - Tunis                | 254937 |
| Tunisie Soft                                     | 7, Rue d'Allemagne - Tunis                  | 244445 |
| Tunisie Software                                 | 2, Rue Abdel Moumen Ibn Ali - Tunis         | 784452 |
| Tunisie Système Service                          | 5, Rue de Crimée - Tunis                    | 257154 |

(\*)

# FOURNISSEURS DE MATERIELS INFORMATIQUES AGREES

## A-MINIS ET MOYENS ORDINATEURS

| RAISON SOCIALE              | MARQUE          | ADRESSE                               | TEL    |
|-----------------------------|-----------------|---------------------------------------|--------|
| AFRICA SYSTEME              | DEC             | 6, Rue Ibn Charaf Belvédère -Tunis    | 783888 |
| BULL-TUNISIE                | BULL            | 55, Av. Méd V -Tunis                  | 284721 |
| ELECTRO INFORMATIQUE (ELI)  | WANG            | Rue 8297-Bloc 25 Cité Olympique-Tunis | 787765 |
| IBM-TUNISIE                 | IBM             | 11, Rue Alain Savary-Tunis            | 282800 |
| IN - TUNISIE                | INTER-TECHNIQUE | 4, Rue Ibn Rachiq - Tunis             | 282862 |
| MASH                        | MOTOROLA        | 25, Av. Jean Jaures - Tunis           | 248470 |
| NCR-TUNISIE                 | NCR             | 23,Rue Nahas Pacha-Tunis              | 255511 |
| TUNISIE ELECTRONIQUE        | HP              | 94, Rue Jugurtha Belvédère-Tunis      | 280144 |
| UNISYS-TUNIS (ex.BURROUGHS) | BURR.           | 19, Rue de Koweit-Tunis               | 288515 |

## B-MICRO-ORDINATEURS ET PERIPHERIQUES

| RAISON SOCIALE         | TYPES DE MATERIELS      | MARQUES              | ADRESSE  | TEL    |
|------------------------|-------------------------|----------------------|--|--------|
| AFRICA-SOFT            | Micros                  | ALTOS                | 22, Rue Ahmed Tlili El Menzah V-Tunis                  | 230473 |
| ASA SYSTEME            | Terminaux Kits Arabisés | ALIS                 | 17, Rue Imam Rassaa-Tunis                              | 286473 |
| ASTER INFORMATIQUE     | Micros                  | IBM                  | GP1 Km 12- Ezzahra                                     | 482422 |
| BITS                   | Micros                  | NCR                  | Imm. Bargou III Appt.N° 18 Rue Teymour El Menzah-Tunis | 239542 |
| BMS                    | Micros                  | THOMSON              | 2, Rue du Kenya-Tunis                                  | 287776 |
| BSB                    | Micros                  | SHARP                | 11, Rue Kamel Ataturk-Tunis                            | 259155 |
| CHS                    | Micros                  | DAEWOO               | 12, Rue Camille des moulins 1002                       | 285474 |
|                        | Imprimantes             | CITOH                | Belvédère - Tunis                                      |        |
| CIMEF                  | Micros                  | CANON                | 17, Rue Talley Rand 1002 -Tunis                        | 286400 |
| CIT                    | Micros                  | APPLE                | 23, Rue de l'Irak-Tunis                                | 289926 |
| DIFFUSION INFORMATIQUE | Micros                  | GOUPIL               | 4, Rue Bechir Al Ibrahimi 1002-Tunis                   | 893073 |
| EGEM                   | Micros                  | IBM                  | 112, Rue de Palestine-Tunis                            | 782422 |
| ELECTRONIA             | Micros                  | TELEVIDEO            | 47, Rue Alain Savary-Tunis                             | 285514 |
|                        | Terminaux               | PERKIN-ELMER         |  |        |
|                        | Imprimantes             | MANNESMAN-           |  |        |
|                        | Cais.enreg.             | TALLY,PRODATA        |  |        |
|                        | Equip.Télé.             | SITINTEL, TRT        |  |        |
| EL ESLEK               | Terminaux graphiques    | TEKTRONIX            | 3, Rue de la Monnaie-Tunis                             | 244372 |
| ELI                    | Micros                  | WANG                 | Rue 8297- Bloc-25 Cité Olympique Tunis                 | 787765 |
| GAMMA                  | Micros                  | UNISYS               | 12, Rue Saint Augustin le Belv.1002 Tunis              | 287904 |
| GENERAL DATA           | Micros                  | DATA GENERAL         | Centre comm. Iness El Manar II -Tunis                  | 234073 |
| IACC                   | Micros                  | NCR                  | 14, Rue de Rabat Gammarth-Tunis                        |        |
|                        |                         |                      | Rue Salah Saad -Sousse                                 | 24655  |
| ICC                    | Micros                  | SANCO                | 35, Rue Asdrubal -Tunis                                | 893891 |
| IDERYET                | Micros                  | TANDY                | 40, Rue Méd Ali - Sfax                                 | 23936  |
| INTERNAT.DATA SOFT     | Micros                  | ATARI                | 4, Rue du Kenya -Tunis                                 | 785543 |
| INFO-COM               | Micros                  | NCR                  | 56, Rue d'Iran -Tunis                                  |        |
| INFORMATIQ.& GESTION   | Micros                  | COMMODORE DATA-POINT | 2, Rue Mahrajene El Menzah -Tunis                      | 283520 |

(\*): classement par ordre alphabétique indépendamment des effectifs ou des références .

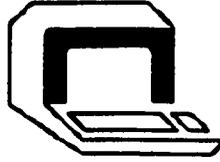
# FOURNISSEURS DE MATERIELS INFORMATIQUES AGREES

(Suite)

| RAISON SOCIALE       | TYPES DE MATERIELS | MARQUES           | ADRESSE                                   | TEL    |
|----------------------|--------------------|-------------------|---|--------|
| IN - TUNISIE         | Micros             | INTER-TECHNIQUE   | 4, Rue Ibn Rachiq - Tunis                 | 282862 |
| KAMTRONIC            | Micros             | VICTOR            | Rue 7185 Bat.3 Cité Akwas EIManar Tunis   | 233708 |
| MASH                 | Micros             | MDS               | 25, Av. Jean Jaures -Tunis                | 248470 |
| MIB                  | Eq. Téléinf.       | RACAL MILGO       |   |        |
| MICRO-SOFT           | Imp.Micros         | BROTHER           | 53, Rue Ech-cham - Tunis                  | 281161 |
| OLISYSTEME           | Micros             | AMSTRAD           | 37, Rue Nahas Pacha - Tunis               | 347135 |
| PRECISION INFORMATIQ | Micros             | OLIVETTI          | 12, Rue Mustapha Sfar - Tunis             | 785154 |
| TELEMATI. C          | Micros             | BULL              | 10, Av. d'Afrique El Menzah V - Tunis     | 237175 |
| PROLOGIC-TUNISIE     | Equipements        |                   | 50, Av.Habib Bourguiba Immeuble Africa    | 349899 |
|                      | VIDEOTEX           |                   | Bur. 491 - Tunis                          |        |
|                      | Micros             | IBM               | 7, Rue Dr. Burnet Mutuelleville - Tunis   | 781008 |
|                      | Périphériq.        | JKP               |   |        |
| SFII                 | Micros             | ZENITH            | 17, Rue de Talleyrand - Tunis             | 780471 |
| SIGES                | Micros             | TANDY             | 3, Rue d'Estrées Lafayette 1002 - Tunis   | 786183 |
| SINTEC               | Micros             | ALTOS, LOGABAX    | 19, Rue Imam El Ghazali -Tunis            | 280703 |
| SITEL                | Micros             | COMPAQ            | 25, Av.T.Mehiri complex el Mechtel Tunis  | 788788 |
| SOCOME-OLIVETTI      | Micros             | OLIVETTI          | 23 bis, Av. des Et. Unis d'AMERIQUE Tunis | 287700 |
|                      |                    |                   | et (12, Rue Salem Harzalla - Sfax )       |        |
| SOL                  | Micros             | NEC, ACORN, SAKHR | 4, Rue de l'Alhambra 1002 - Tunis         | 289809 |
| SPHERE INFORMATIQUE  | Micros             | IBM               | 3, Rue Abdelmalek Ibn Marouane -Tunis     | 893477 |
|                      |                    |                   | et ( Av. Hedi Chaker Le colisée - Sfax )  |        |
| SUD ELECTRONIQUE     | Micros             | SANYO             | Route de Teniour km 1 - Sfax              | 22877  |
| SUD INFORMATIQUE     | Micros             | IBM               | Rue Med Jamoussi Im. Sportis - Sfax       | 29545  |
| TMI                  | Micros             | BULL              | 3 bis , Rue de Grèce - Tunis              | 340718 |
| TSIE DATA SYSTEM     | Micros             | GOUPIL            | 18, Rue Louis Braille - Tunis             | 890574 |

**DISTRIBUTEURS DE FOURNITURES  
ET DE MATERIELS ANNEXES  
ET AMENAGEURS DE SALLE-ORDINATEUR**

| RAISON SOCIALE               | ACTIVITE   | ADRESSE  | TEL    |
|------------------------------|--|--|--------|
| Arabtel                      | Matériels télécom.   | Z.I. Ariana - Aéroport - Tunis                 | 710044 |
| Assad                        | Batteries pour ordinateur                                  | BP n°7 Z.I. Ben Arous - Ben Arous              | 381688 |
| BSF Tunisie                  | Fournitures informatiques                                  | Rue 7105 El Manar 2 - Tunis                    | 233443 |
| Bureau Service               | Aménagement de salles                                      | 22, Rue Lamine El Abassi - Tunis               | 288704 |
| Cablerie du Centre           | Faisceaux de cables pour ordin.                            | Sidi Naïja - Moknine                           | 76600  |
| CETIME                       | Réalisation de circuits électriques                        | 22, Av. d'Afrique El Menzah - Tunis            | 235312 |
| Cie Int. de Promotion Ind    | Cablage, cartes électriques<br>d'interface pour ordinateur | Z.I. Charguia , Rue n°14 - Tunis               | 230273 |
| COMPTO                       | Onduleurs , Régulateurs                                    | 15, Rue Jamel Abdennasseur -Tunis              | 249449 |
| La Disquette                 | Disquettes   | Imm. Colisée escalier A - Sfax                 | 20760  |
| Ets Ben Abdallah             | Rubans   | Z. I. Rue 2035 la Charguia - Tunis             | 237002 |
| Gargouri & fils              | Disquettes, Disques  | 34, Rue de la Monnaie - Tunis                  | 246558 |
| Général Data                 | Aménagement de salles                                      | Centre com. Iness El Manar - Tunis             | 234073 |
| IMUNELEC Tunisie             | Onduleurs  | 50, Av. H. Bourguiba - Tunis                   | 340373 |
| KORES Tunisie                | Encre , Rubans   | Z.I. Rue 14 la Charguia - Tunis                | 233715 |
| PROCHIM                      | Rubans , Papier  | 54, Rue 8601 la Charguia - Tunis               | 239322 |
| SAT Tunis                    | Modems , Multiplexeurs<br>Réseaux télécom , Téléinformat.  | 11, Av. de la République la Marsa -<br>Tunis   | 740652 |
| SEICO                        | Aménagement de salles                                      | 25, Av. Jean Jaurès                            | 248470 |
| Sté Tnne Elect. Electro.     | Faisceaux de cables d'ordinateur                           | Village Sahli la Soukra - Tunis                | 765295 |
| Support Infor. et Bureautiq. | Disquettes , Bandes  | 6, Rue el Métouia - Tunis                      | 347133 |
| TECHNIFER                    | Armoires ignifugées  | Z.I. de Radès Route du Lac - Tunis             | 297477 |
| TECHNI-METAL                 | Armoires ignifugées  | 23, Rue Asdrubal - Tunis                       | 289210 |
| TOPMEDIA                     | Supports informatiques                                     | 14, Rue de la Monnaie - Tunis                  | 347770 |
| Tunisian Informatic Comp.    | Disques , Bandes magnétiques                               | Complexe el Akwas Rue 7105<br>el Manar - Tunis | 233443 |
| Tunisian Télécom Electric    | Onduleurs  | 3, Av. Louis Braille - Tunis                   | 782892 |



## **GUIDES ET DOCUMENTS TYPES DISPONIBLES AU C. N. I.**

- La circulaire du Premier Ministre N° 65-5 du 16 Août 1988 portant simplification de la procédure d'étude et de réalisation des projets informatiques
- Le contenu d'un plan informatique.
- Le modèle de cahier des charges pour l'acquisition de matériel informatique.
- Le guide pour l'acquisition de micro-ordinateur.
- Le guide de dépouillement d'offres de systèmes informatiques :
  - . Tomes 1 et 2 : Guide d'évaluation technique et les caractéristiques principales à évaluer;
  - . Tome 3 : Rapport de dépouillement .
- Le modèle de contrat d'achat de matériel informatique.
- Le modèle de contrat de maintenance de matériel informatique.
- Présentation des méthodologies utilisées par le CNI.
- Répertoire des Banques de Données.
- Répertoire des matériels informatiques commercialisés en Tunisie.
- Le deuxième Plan National de l'Informatique (1987-91 ).

## **PUBLICATIONS ET SERVICES D'INFORMATION OFFERTS PAR LE C. N. I.**

- Les publications du Centre de Formation et de Documentation ( C F D ) du C N I
  - . Bulletin " Analytique "
  - . " Spécial micro "
- Les Services offerts par le C N I :
  - . Bibliothèque spécialisée ouverte au public avec possibilités d'abonnement
  - . Service de renseignement sur l'informatique.

**CENTRE NATIONAL DE L'INFORMATIQUE**

17, Rue Belhassen Ben Châabane El Omrane - 1005 TUNIS  
Tél. : 783.055 - Télèx : 13.904

Appendix G

LIST OF PEOPLE CONTACTED

Academy for Educational Development

Fuad Suleimann  
Kurt Moses  
Laurie Owens  
Bruce Clark  
Saida Zouiten, former AED employee  
Michael Denny, Resident Advisor, Computer Technology Project  
BEN SEDRINE Faouzi, Administrative Assistant to Denny

AID Washington

Peter Delp, ANE/TR/ENR  
Don Masters, ANE/PD/MNE  
John Schireich, ANE/DP/E  
Movhes Bachhom, ANE/DPIE  
Jay Hviehar. ANE/TRIHR  
David Hager, ANE/PSD  
Joseph Gueron, IRM/MPS  
Fred Bieganski, ANE/PD/ENGR  
John Daly, AID/SCI  
T.R. Mahoney, ANE/DP/PA

USAID/Embassy, Tunis

Mark Karns USAID Mission in Tunis, Project Officer  
Nancy Tumavick, USAID Mission in Tunis  
Robert Pelletreau, US Ambassador to Tunisia  
Fritz Weeden, Former USAID Mission Director in Tunis

IRSIT Staff

Dr. ELLOUZE Nouredine, Director General of IRSIT  
Dr. GHAZELI Salem, Research Director, Arabization  
Dr. CHEMAM Naceur, Project Leader, LOCUST  
Dr. BELGOUTH Abdelatif, Research Director, Telecommunications  
Mr. MAKNI Mondher, Telephone Service Project  
Mr. SELLAMI Khaled, Computer Center Systems Manager  
Mr. SAIDANI Samir, Maintenance and LAN Support  
Mr. KRICHEN Sami, Director of Administration and Finance  
Mr. ABIDA Nejib, IRSINET  
Mr. FETHI Anane, Videotext Project  
Mrs. Vivian Boudhaouia, Office Automation Projects  
Dr. HEDDA Sophia, Oil Exploration Project Leader  
Mr. KHEMAKHEM Maher, OCR Project Leader

Mr. CHEDLI Fehri, OCR Project  
Mr. ACHOUR Mohammed, Arabic Translation Project

Other Tunisian Government Officials

Dr. KAMOUN Farouk, President-Director General, Centre National de l'Informatique  
Mr. BEN FARHAT Nouredine, Director General of Administrative Reform  
Dr. EL HANNACHI Salah Brik, Economics Advisor, Ministry of Trade and Industry

Centre Bourguiba de la Micro-Informatique

Mr. LATIRI Mokhtar, Director-General  
Mme. HILA Lilia, Volunteer

Pilot High Schools

Mme LARBI Latifa, Vice President for Pedagogy, Lycee Ariana  
Mr. KACHOUINDI Khaled, Physics Teacher, Lycee Ariana  
Mlle. ROUAI Faten, Responsable de l'Informatique, Lycee Ariana  
Mme. BOULAHIA, Director, Lycee Bourguiba  
Mlle Kchouk, Supervisor, Lycee Bourguiba

Consultants to IRSIT

Mr. Tom Loveland, USGS (Locust Project)  
Mr. Bruce Quirk, USGS (Locust Project)  
Dr. John Floyd, Blast Dynamics (Phosphate Mine Project)  
Dr. Mark Liberman, AT&T Bell Laboratories (Arabic Speech Synthesis)

## Appendix H

### LIST OF DOCUMENTS CONSULTED

#### General Project Documents

1. IRSIT : Presentation of the Institute.
2. Convention of IRSIT.
3. Presentation of the Scientific and Technical Projects of the Institute.
4. Evaluation Terms of Reference, Tunisia Computer Technology, September 20, 1988.
5. USAID/Tunis Computer Project, Technical Proposal, Volume 1. March 14, 1986.
6. AID, Computer Technology Project, 664-0334
7. Contract : USAID - Government of Tunisia, 1985.
8. Contract : Michael Denny - AED, June 1987.
9. Contract : AED - USAID, August 1, 1986.

#### Informatics Policy

1. Informatique en Tunisie.
2. VIIeme Plan de Developpement Economique et Social  
Deuxieme Plan National de l'Informatique (1987-1991).
3. Decrets, Arretes (Premier Ministere).

#### IRSIT Core Computer Center

1. Appel d'offres pour le Centre de Calcul.
2. Minutes from meetings of the Selection Committee and meetings with vendors.
3. An invitation to tender for IRSIT, Computer Center.
4. Evaluation of the Proposals for IRSIT's Core Computer Center July 30, 1988.

#### Organigramme

1. Organigramme : Fiches de Fonction.
2. Organisation de Departement de Recherche.
3. Etapes d'Elaboration d'un Projet.

#### Higher Education Projects

1. Programme de Technologie de l'Informatique.  
Requete pour des Propositions de Projets Relatifs a l'Enseignement Superieur.
2. Proces verbal de la premiere reunion du comite d'organization et de suivi des projets pilotes.
3. Liste des Universites.

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4. Project Proposal: Computer-Assisted Teaching: The Manufacturing Engineering Games. Submitted by R. Chaabouni, June 1988.
5. Projet Pilote ENSET/IRSIT.
6. Projet Analyse Frequentielle et Temporelle de la Parole Arabe.
7. Projet Programme de technologie de l'informatique.
8. Creation d'un Departement de Micro-Informatique a l'E.N.A.
9. Proposition de projet relative a la mise au point de logiciels pour la maitrise et la gestion des ressources en eau.
10. Rapport d'activite du Departement d'Hydraulique 1986-1987.
11. Projets de developpement d'applications informatiques en Medecine Veterinaire, 24 Juillet 1988.
12. Projet O.R.A.P.A. : Optimisation des Ressources Alimentaires en Production Animale.

#### Carthage Institute of Technology

1. Summary of CIT Plan.
2. CIT Planning Report. September 30, 1988.
3. A Planning Study for The Carthage Institute of Technology.
4. CIT Planning Study Report. August 8, 1988.
5. An Analysis of Higher Education in Tunisia by Harold E. Hoelscher and Clifford D. Clark, April 1987.
6. An Institutional Development Strategy and Role for Carthage Institute of Technology in Tunisia.
7. A study prepared by C. D. Clark and H. E. Hoelscher for AED, July, 1987.
8. Carthage Institute of Technology. A Planning Study. Submitted by AED, June 1988.

#### C. B. M. I.

1. L'Institut National de Bureautique et de Micro-Informatique. Introduction.

#### Bourse

1. Etude Preliminaire du Reseau de Diffusion d'Information de la Bourse.

#### CNI Arabic UNIX

1. Constructing a Flexible Multilingual Interface Environment for Software Development.
2. Rapport de Mission aux USA, 18 Aout - 8 Septembre Mohamed Ben Sassi et Othman Chaouachi.
3. Comparision of DEC and HP workstations for possible use in the CNI Arabised UNIX project, September 20, 1988.

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## IRSINET

1. IRSIT Local Network (Technical Study), 1985.

## IRSIT Conference Proceedings

1. Mutations Industrielles et Nouvelles Techniques de Production  
Actes du seminaire national organise a Tunis, 7-8 Avril 1988
2. Regional Conference on Informatics and Arabization  
Tunis, March 9, 10, 11, 1988.  
Volume 1 and 2.

## LOCUST

1. Schedule and Content of greenness maps for Tunisia and the region.
2. Schedule Activities and Deliverables for LOCUST project.
3. Project : L.O.C.U.S.T., September 1988.
4. Preliminary Assessment of the Feasibility for Establishing the U.S. Geological Survey AVHRR Greenness Mapping System at IRSIT.

## OASIS

1. Oasis Project.
2. Results of the Needs Assessment Survey.
3. Procedural Problems and an effort to relieve them.
4. Resultats de l'Enquete de Priorites.

## O. C. R.

1. Reconnaissance Globale de Caracteres Imprimés Arabes et Latins par Comparaison Dynamique. Maher Khemakhem.
2. Arabic Optical Character Reader (AOCR), Project Summary by Maher Khemakhem and Michael Denny. December 7, 1987.

## Oil Exploration

1. Draft Proposal for Supply of Hardware and Software to IRSIT. June 8, 1988.
2. Projet de Recherche pour le Developpement de Logiciel de Traitement de Sismique de Puits.
3. Trip Summary, Mr. Aleya Ben Aicha. October 1987
4. Presentation of the Project to be conducted in Collaboration with the Exploration Department of the National Oil Company (E.T.A.P). March 2, 1988
5. Financial and Technical Proposal relating to the supply of a

- MicroVax based VSP processing capability. June 3, 1988
6. Financial Proposal for sale VSP Processing System.

### Phosphates

1. A Training Program for CPG. November 30, 1987.
2. Proposed IRSIT-CPG plan. May 27, 1987.
3. Project Mine IRSIT-CPG. December 12, 1987.
4. IRSIT-CPG Mine Pilot Project : Results of On-Site Vist.
5. IRSIT-CPG Mine Pilot Project : Evaluation of Geologic Modelling and Mine Planning Computer Software.
6. IRSIT-CPG Mine Pilot Project : Software Selection.
7. Report on Findings and Recommendations (CPG).
8. Summary of John Floyd's visit to CPG.
9. CPG Background Notes, June 29, 1988.

### Speech Synthesis

1. Advanced Speech Workstation Requirements Analysis. From Michael Denny. December 10, 1987.
2. Requirements for a Combined Speech, Image, and Seismic Analysis Workstation. Michael Denny, September 17, 1987.
3. Preliminary Comparison of Speech Workstations.

### Telephone Service

1. Mesure de la qualite de service du reseau telephonique commute.
2. PTT Project Status, July 4, 1988

### Translation

1. Linguistic Products, Computer Aided Language Translations. Proposal, July 1, 1988.

### Videotext

1. Proposition de fiche Projet pour le developpement d'un systeme Videotext Bilingue.

## Appendix I

### INTERVIEW METHODOLOGY

This section sets out in more detail the format used for the assessment interviews. The management interviews were organized into four segments:

- >> General Information: IRSIT's mission and operational programs, office responsibilities, information needs, current computer technology services and support, current office automation and LAN, MIS, and planned organization mission and program changes.
- >> IRSIT Future: short and long-term IRSIT activities, capabilities, resources (both internal and external), trends regarding IRSIT's growth and changes.
- >> Computer/Information Technology Activities: current computer/information technology support and usage trends, planned development growth rate, new applications and capability requirements, resource allocation, and external services.
- >> Office Automation: personnel definition, current hardware, software and network services, office automation techniques utilized, and additional capabilities.

The pilot project interviews were also organized into four segments:

- >> General Information: responsibilities, application data (name, code, users, purpose, authority), project technical support, linkages, beneficiaries, life cycle and pending changes.
- >> Current Computer Technology Operations: normal organizational description, inputs and outputs, processing, volume and frequency of use, software utilized, hardware needs, interface requirements and problems.
- >> Projected Changes: operational trends, conversion/transfer impact, documentation, and new applications and capabilities.
- >> Computer Technology Resource Usage: anticipated workloads, technology resources versus human resources, and long-term changes.

### Interview Process

Initial orientation and management interviews were conducted with IRSIT's top management and key staff. These interviews also identified the role of each of the computer technology support and services elements and included discussions concerning:

- >> IRSIT's mission and function
- >> IRSIT's information/computer technology resources
- >> Management tools and techniques (MIS, project management system)
- >> Long-term information/computer technology planning (strategy, development, implementation)
- >> Performance monitoring and evaluation (operation and implementation criteria, indicators, and measurements)
- >> Computer technology utilization and capacity and resources planning
- >> Methodology for handling project definition, feasibility, requirements, design and development. Customization, modification and in-house development, selection and acquisition.
- >> Interface with other projects, systems, organizations, and field organizations, (coordination, cooperation, integration, sharing, etc...)
- >> Outstanding requirements and needs (computer technology and human resources)
- >> Other areas of concern

#### Management Interviews

The structured interview process was initiated with all IRSIT managers, system managers, analysts, researchers, staff and identified system users. Interviews were scheduled at the convenience of the interviewees. These interviews were designed to define information/computer technology issues related to:

- >> Current IRSIT's mission functional responsibilities
- >> Planned or potential changes to the responsibilities
- >> Needs and requirements to support IRSIT's mission
- >> Current operational computer technology support and services
- >> New functional and technological requirements

- >> New national requirements or changes in existing programs
- >> Projections of future IRSIT's mission responsibilities and functional activities
- >> Existing information/computer technology and applications (capabilities, limitations, operational needs, performance requirements, special features, etc..)
- >> Planned modifications to these applications or required changes to meet evolving needs.
- >> Impact of changes on computer technology ( hardware and software) characteristics
- >> Other information defined as being relevant

#### Application Interviews

Application interviews were conducted with IRSIT's technical and research managers, analysts, and functional system users with primary system responsibilities. These interviews identified general information concerning:

- >> Project/application/system definition and description
- >> Project/application/system life cycle
- >> Current operating capabilities (human resources and machine resources)
- >> Current limitations
- >> Resources required
- >> Planned changes and impacts
- >> Other related data

Specific information collected included:

- >> Application/project identification and authorization
  - Project title
  - Project description
  - Organization and program supported
  - Project/application manager
  - Contractual, administrative and other authority
  - Budget and workload projections and history
  - Current budget
  - Computer sites used
- >> Performance Requirements
  - Interfaces with other applications

- Reliability
  - Hours of operation and support / training
  - Terminal supported (Local, Distributive)
  - Special hardware
  - Standard hardware
  - Special software (DBMS, statistical, graphics, etc...)
  - Support (training, documentation, etc...)
- >> Short-Term Projections
- Expected project / application life
  - Resource utilization changes
  - Planned related applications and other projects

In summary, several groups were interviewed to cover IRSIT's institutional vertical and lateral activities in meeting the scope and activities of the project.

## Appendix J

### ASSESSMENT AND EVALUATION ANALYSIS

This appendix assesses the impacts of the Computer Technology Project on the development of IRSIT using methods designed for planning and monitoring the introduction of information technology in organizations. It addresses the project's impacts on organizational behavior, management of information technology within IRSIT, institutional development, and personnel. This methodology is used to develop recommendations for IRSIT, and for future evaluations of the project.

#### 1. Organizational Impact

##### Analysis:

The project can impact IRSIT's organization through improvement of its information technology management, and more specifically through organizational and institutional influences.

##### Conclusion:

Management, organizational and institutional effects were identified during the main stages of the project. The collective organizational impact, so far, is not significant due to the short time that has elapsed since the completion of training and the establishment of IRSIT. However, the assessment demonstrates positive short term results as well as a positive attitude on the part of the staff and users.

##### Recommendation:

The organizational impact of the project should increase as staff and users learn more advanced techniques and apply these techniques to more complex R & D tasks. An assessment in approximately six months should indicate further organizational impact to match the target indicators and measure the changes in how IRSIT pilot projects are planned, designed, implemented and achieved in addition to the attitudes of the staff and users.

#### 2. Information Management Improvement

##### Analysis:

Improvement in information technology management was measured by analyzing the information management section of the impact criteria, by interviewing selected personnel. The results are described in terms of:

- >> Acquisition of information through international linkages
- >> Processing of information through technical assistance
- >> Production of outputs, selection and evaluation

>> Dissemination of information/outputs, utilization of information in the design and development of pilot projects, RFPs and proposals.

**Conclusion:**

All these indicators were found to be significantly higher at the time of assessment than at the start of the project. The greatest gain was in the areas contributing to the definition, design, and implementation of pilot projects. Quality, speed, appropriateness, accessibility, accuracy, ease, effectiveness and timeliness were the measurement of those criteria.

**Recommendation:**

The individual aspects of information management have improved significantly, i.e., processing and production of outputs; while those aspects that require interfacing with other sources has seen a lesser impact. This is to be expected in view of the timing of the assessment. A later assessment should show a more significant impact, as the capabilities of the pilot projects are used more as an integral part of the IRSIT's daily operations.

**3. Organizational and Institutional Impacts**

**Analysis:**

Organizational and institutional effects of the project are measured by analyzing the organizational and institutional section of the impact criteria. The results are categorized according to:

- >> relationships (i.e. internal and external linkages)
- >> flow of information
- >> impact on internal structure,
- >> management

**Conclusion:**

The changes in this area were found to be less than those of information technology or individual productivity. Within this category, both the flow of information, and internal relationships/linkages had a minor impact due to the timing and conditions accompanying the start-up and establishment of IRSIT.

**Recommendation:**

The timing of this assessment, in conjunction with the time required for the project to be assimilated into IRSIT and other agencies, produced expected reasonable results. It will be some time before the project will affect IRSIT linkages and internal management techniques and practices.

The flow of information, delegation, and procedures will be assessed by considering the implementation of several of the pilot projects. Internal departmental issues including strategy,

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direction, procedures, etc., will take time to be affected by the project. Global organizational and institutional effects also take time to accrue. However, the data collected show a positive trend in this area.

### 3.1 Internal/External Relationships and Linkages

#### Analysis:

Changes in relationships and linkages were measured by analyzing and assessing the following criteria:

- >> Quantity of requests for information
- >> Amount of operation support needed and required
- >> Effectiveness of Communications with relevant personnel to acquire the information
- >> Quantity and quality of coordination and cooperation
- >> Outcome and status of those linkages

#### Conclusion:

Changes in requests information and amount of support from other sources were found to be negligible. The greatest change was in the effectiveness of communication and linkages with relevant personnel.

#### Recommendation:

The minor changes regarding relationships and support from other sources are to be expected at this stage in the implementation of pilot projects. Later assessment should show greater impact in these two areas. As the technology becomes more pervasive within IRSIT, it will have a greater impact on relationships and linkages.

### 3.2 Flow of Information and Linkages Management and Control

#### Analysis:

Changes in the flow of information and linkages management and control were measured by analyzing and assessing the following criteria:

- >> Control of security and access to information
- >> Ease of information dissemination
- >> Timeliness of flow and control of information
- >> Accessibility of information required
- >> Effectiveness of communications with relevant personnel
- >> Quality of coordination and cooperation

#### Conclusion:

The assessment showed increased change for this category. The low rating was for the quality of cooperation regarding the flow of technology and information. Cooperation should increase with the establishment of well defined formal linkages and relationships with other internal and external sources. The amount of increased flow of information was unexpected, since the

network has not been implemented as yet. This demonstrates a positive trend and hope for even greater improvement.

### 3.3 Impact of Internal/External Operations of IRSIT

#### Analysis:

Changes in the impact of this dimension of IRSIT's operations were measured by analyzing and assessing the quantity, quality and attitude of:

- >> Policy
- >> Strategy
- >> Direction
- >> Procedures
- >> Operations
- >> Standards
- >> Staffing
- >> Management style

#### Conclusion:

The changes in this area were found to be higher than the other two categories within the organizational and institutional support components of the project. The greatest change was the impact on attitudes and human behavior, the least change was the impact on departmental policy, strategy and direction.

The responses and interviews with managers and staff at IRSIT verify the anticipated results: that the greatest impact of the project is on individual activity and attitude, and total departmental and institutional impact will occur later.

### 4. Personnel Impact

In assessing the impact of the project on personnel, we must consider the impact of training both on individuals and on overall productivity. This discussion covers results pertaining to information technology improvement, which not only affect IRSIT as an organization but also affect IRSIT's personnel, who are the agents of change and any improvement in information technology. The assessment addressed individual productivity, information technology management, and technology utilization.

#### Conclusion:

In all cases, the assessment shows a significant change since the implementation of the pilot projects, with training having the greatest impact. The impact on personnel has been significant. Their attitudes have improved as a result of the progress on the definition, design, and development of the pilot projects. As they learn more advanced techniques and become more proficient, not only will the personnel impact increase, but the organization will be affected as these tools become more of an integral part

of IRSIT. As appropriate, more staff and users should be trained and given access to these tools and techniques. At the same time standards and procedures should be introduced so that the greatest benefit can be achieved for everyone.

## 5. Individual Productivity

Improvements in individual productivity as the project progressed were assessed by analyzing the following criteria:

- >> Impact on use of human resources
- >> Changes in work performance
- >> Changes in decisions and other abilities and capabilities
- >> Modifications in efficiency and effectiveness of work

### Conclusion:

Assessment rated performance and efficiency as achieving the greatest change after the implementation of the pilot projects. The least significant change occurred in the use of human resources, although this result has been mixed. Individual productivity has been positively improved. Advanced training for current staff and users will serve to increase the complexity of problems that they can deal with, and addition training of new staff and users as appropriate will serve to widen the use of technology, and hence the productivity of IRSIT.

### 5.1 Use of Human Resources

Changes in the use of human resources were measured by analyzing the following criteria:

- >> Quantity/amount of travel, meetings, calls
- >> Staff morale
- >> Quantity/quality of personnel intervention needed
- >> Control over activities
- >> Quantity/quality of individual contribution to work activity
- >> Extent of dependence on other departments to supply information

### Conclusion:

The assessment found little change in the amount of travel, meetings, and telephone calls, and personnel intervention required. However morale, control over personal activities, and individual contribution to work were rated higher after the definition, design, and much more at the implementation and successful completion of pilot projects. The impacts on the use of human resources are mixed. Short term benefits are seen regarding morale and control over work, while impacts regarding meetings, travel, and telephone calls (linkages) should occur later.

## 5.2 Performance

Changes in work performance were measured by analyzing and the following criteria:

- >> Quantity of work performed
- >> Quantity of transfers of control over work
- >> Quantity of media transformations (e.g. from handwritten to typed; from typed to disk, etc.)

### Conclusion:

The assessment found a significant decrease in the media transformations. The quantity of work performed and number of transfers of control over work both increased. These changes are to be expected, when tools and techniques are provided to individuals to produce their own work. Work performance will increase significantly as a result of the implementation of the pilot projects. Increased individual control over the work will allow staff and users to increase productivity, which is a measure of work performance.

This category is/will be the most important criteria for measuring the individual and IRSIT success in achieving its objectives.

## 5.3 Ability and Capability

Changes in individual/organizational abilities were measured by analyzing the following criteria:

- >> Quality of decisions, work, products, and services
- >> Speed in making decisions
- >> Effectiveness of decisions.

### Conclusion

The assessment found average overall abilities. It may be expected to show the greatest impact on speed of decision-making, while the effectiveness of decisions changes the least. It is to be expected that impacts on decision-making capability will be seen at a later stage. However, a positive trend has started and will continue as the projects takes a more realistic and practical approach to the design and implementation of pilot projects and the improvement of local and international linkages.

## 5.4 Efficiency

Changes in individual/organizational efficiency were measured by analyzing the following criteria:

- >> Quantity of procedural steps
- >> Quantity in changes in follow-up procedures

>> Speed of task completion.

**Conclusion:**

The assessment found this category to be one of the most significant in terms of the impact of the project. Many factors contributed to the slow increase in efficiency. The speed of task completion was slow and the number of steps and follow-up procedures was minimally impacted or changed. Overall efficiency of individuals was improved. It is recommended that a later assessment be conducted to assess the overall efficiency in generating specific work products, for example the implementation of the pilot projects, the office automation, LAN, project management system, MIS, etc.

**5.5 Effectiveness**

Changes in individual/organizational effectiveness were measured by analyzing the following criteria:

- >> Control over events
- >> Quantity and amount of span (scope) of control
- >> Effectiveness of communications
- >> Quantity of coordination and cooperation

**Conclusion:**

The assessment found that effectiveness of communications achieved the greatest impact in this category in terms of internal flow and relations and linkages. This can be attributed to the use of word processing software and other packages, which contributes to increased quality of content. Coordination and cooperation were rated very low in amount of changes; however, they tend to occur more later in the final implementation cycle.

The results occurred were as expected with regard to effectiveness of communications, and all changes were positive changes. A later assessment should show increased benefits in the areas of coordination and cooperation, and hence, integration.

**6. Training**

The impact of training was measured by analyzing the following criteria:

- >> Training program (scope, type)
- >> Impact of training on training on trainees.
- >> Assessment of training program by trainees

**6.1 Training Program Summary**

**Conclusions:**

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- >> Prospective trainees should have the proper pre-requisites
- >> Trainees should attend only those classes that pertain directly to their own work
- >> A five to one trainer to trainee ratio should be maintained in formal training settings
- >> Trainees should have immediate access to information technology and time (PC, hands-on training) in order to practice what they have learned.

## 6.2 Impact of Training on Trainees

Measurement of the impacts of training on trainees was accomplished by analyzing and assessing the following criteria:

- >> Overall computer technology utilization
- >> Overall computer technology knowledge
- >> Overall proficiency
- >> Overall productivity
- >> Overall quality of work

### Conclusion:

The evaluation found all five categories to be low to very low prior to attending the training. The greatest increases were in overall computer utilization and overall quality of work. Training has provided the single most significant impact of the project. In discussions and interviews with staff, the same conclusion has been stated. Additional training is highly recommended, although IRSIT should ensure that the trainees have the work and the computers to allow them to make use of their training at once. IRSIT will benefit from this training only if it can be transferred and applied to daily work.

## 6.3 Assessment of Training Program by Trainees

The training programs were assessed by the trainees according to the following criteria:

- >> Course design and material
- >> Trainers
- >> Training environment
- >> Training program and schedule

### Conclusion:

The training package as a whole was rated better than average. Two prominent deviations from this were:

- >> Trainees has insufficient practice time
- >> The trainees rated the training as exceptionally helpful. The course design, the trainers, training environment, and training program was very favorable. In the future, additional practice time should be given to the trainees to deepen their understanding of the course material, scope, and

the utilization and application of such knowledge.

## 7. Information/Computer Technology Improvement

Technology improvement was assessed according to criteria related to the hardware and software acquired. Changes were measured by analyzing: utilization, knowledge, proficiency, productivity, and quality of work.

### Conclusion:

The assessment rated the above five categories uniformly. The greatest changes occurred in the utilization of technology and quality of work impacted by technology. In all cases, a slight increase was achieved comparing the impact of training on trainees. The measurement of technology improvement demonstrates a consistency of ratings. In both cases, utilization and quality showed the greatest change.

A significant improvement due to the introduction of technology was achieved with the reasonable results accompanying the transfer of technology. This also demonstrates that added experience as well as advanced training may yield even greater improvement.

### 7.1 Hardware and Software

Changes in hardware and software were measured for: word processing, spreadsheets, data base capability, and communications. The criteria used for analysis and measurement included: utilization, knowledge, proficiency, productivity, and quality of work.

Hardware and software technology improvements were achieved. It is recommended that an assessment in six months be conducted to determine learning curves for hardware and software technology.

Appendix K  
MATRIX OF FINDINGS AND RECOMMENDATIONS

| FINDINGS   | RECOMMENDATIONS  |
|--|--|
| PRIMARY  |  |
| 1. Management and organizational structure have significant problems for IRSIT. Little systematic planning has occurred.   | The current contractor's Resident Project Manager has been serving in a technical and coordinating capacity.<br><br>IRSIIT currently needs a technical, planning, marketing and public relations expert. USAID should review this issue in light of future directions for technology transfer in Tunisia.                      |
| 2. IRSIT management is now spread thin among many pilot projects.  | No new pilot projects should be developed. If funds are needed for the management assistance they should be taken from the higher education pilot projects, which have not yet begun.  |
| 3. Future IRSIT funding is uncertain.  | The planning process should be started. It should include development of marketing and financial plans which detail potential sources of funds (earnings and subsidies) and an anticipated 5 year budget.  |
| 4. Pilot projects (i.e., Arabitization, PTT, and Auto- and Tunisia Stock Exchange) show some promise of being successful.  | IRSIIT needs to establish the ability of clients to pay for IRSIT's services.  |
| 5. No dialogue or joint cooperation exists between IRSIT and CNI. Very little dialogue currently exists between IRSIT and CBMI.  | Communication needs to be established between IRSIT, CNI, and DBMI with a view to merging IRSIT and CNI.<br><br>CNI has the potential of being a paying client.<br><br>CBMI is the link to technology transfer training at the secondary school level which could promote computer technology throughout the Tunisian society. |
| SECONDARY  |  |
| i. IRSIT pilot projects meet many objectives and are selected according to many criteria.  | Planning process should include specification of criteria for choosing projects and identify funding.  |
| ii. IRSIT staff are interested in building in-house research capacity, not operating as a foundation which disburses funds.  | Funding extension should focus on in-house work, not grants through IRSIT to others.   |
| iii. Overseas travel has made it possible for IRSIT to develop linkages to U.S. institutions which would not have developed otherwise. IRSIT is not yet ready to sustain such linkages on their own. | Additional funding for IRSIT should be provided for overseas travel, training linkages, and promulgating IRSIT's informatics ideas.  |
| iv. IRSIT has played no role in informatics policy development, and this function is handled by other institutions.  | IRSIIT should be expected to play a role in policy formulation and have a higher profile in order to be identified with informatics.   |

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## APPENDIX L

### IRSIT PLAN AND STRATEGY Recommended Framework and Guidelines

For the effective management of plans, projects information technology programs, and activities, IRSIT needs to :

- 1- Develop and formulate an information technology policy which would govern the coordinated development, management, and utilization of its current and future resources.
- 2- Define the role of various information - related components in implementing the policy.
- 3- Provide adequate resources (technical assistance, equipment, know-how, etc....) to accomplish the programs to implement the policy.
- 4- Begin the planning and development of a global information technology operational and systematic approach - monitoring and evaluation systems for programs, pilot projects, budgets and implementation plans. This is to be used as a tool in plan preparation, reporting, and follow-up.

This global system will have the characteristics and capabilities to maintain and monitor the :

- Operational plans
- Annual Budgets / Costings / Expenditures
- Project plans and implementation
- Follow-up and performance
- Evaluation and selection

#### IRSIT's Plan and Strategy for Information Technology

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There are five major processes required for the development of the IRSIT's plan and strategy for information technology :

Process 1. Analysis of present conditions / status of information technology.

- Inputs :
- Present Conditions Information / Data
  - Follow-up reports
  - National strategy
  - Planning statements

Outputs : Present Conditions Statement

## **Process 2. Policy Formulation**

- Inputs :**
- Present Condition Statement
  - Projections
  - Policy Statement Proposals
  - National Strategy Planning Statement
  - Model Simulation Results

**Outputs :** Policy Statements

## **Process 3. Program Formulation**

- Inputs :**
- Sector Plan Proposals
  - Policy Statements
  - Model Simulation Results
  - Planning Guidelines

**Outputs :** Program Statement

## **Process 4. Program Budgeting**

- Inputs :**
- Program Statements
  - Project Statements
  - Financial Ceilings
  - Manpower Requirements and Availability
  - Sectoral Coordination Guidelines
  - Project Standard Cost
  - Project Resource Requirements
  - Sector Plan Proposals

**Outputs :** Program Budget

## **Process 5. Preparation of Plan Document or Operational Plan**

- Inputs :**
- Program Budget
  - Program Statement
  - Economic Overview

**Outputs :** Development Plan  
Operational Plan  
Implementation Plan

## Recommended Actions Required By IRSIT

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In order to define, develop, and implement information technology, the following actions are required at a minimum :

- 1- Develop an information technology policy.
- 2- Devise information technology strategic and operational plans.
- 3- Develop information technology requirements to match needs
- 4- Define the information technology scope, specifications, and configurations to match the requirements.
- 5- Plan and developd the information technology delivery vehicle, through training programs and pilot projects implementation
- 6- Estimate the costs and schedules associated with the development of the delivery vehicle, i.e the pilot projects costs and implementation plans.
- 7- Select applications / pilot projects that can be implemented and can be created for productive use.
- 8- Match information technology needs with resources

## APPENDIX M

### IRSIT INFORMATION TECHNOLOGY MODEL Management Functions and Support Services

#### IRSIT Planning Functions

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#### Necessary Support Services

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1. Establish and maintain Data Bank on Past Existing and Future Conditions of Computer Technology Planning, Development and Implementation.

- Surveys
- Data Collection
- Data Entry
- Data Processing
- Data Distribution

2. Policy Documentation

- Policy Formulation
- Define Policy Measures
- Policy Data Collection
- Policy Data Entry
- Policy Data Distribution

3. Computer Technology Modelling

- Model Development
- Model Calibration/Recalibration
- Model Input Data Entry
- Model Production Runs
- Model Output Distribution

4. Program Planning and Budgeting

- Program Definition
- Program Output
- Measure Identification
- Program Output Data Collection
- Program Output Data Entry
- Program Output Data Processing
- Program Output Data Distribution

5. Project Monitoring and Evaluation

- Project Identification
- Project Data Collection
- Project Data Entry
- Project Data Processing
- Project Data Distribution
- Special Project Reports

## Roles Within Information Technology Management

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Information Management roles are as follows :

1. Data Survey
2. Data Capture
3. Data Dissemination
4. Data Brokerage (sharing, acquisition, etc...)
5. Data Analysis
6. Automation Education and Training
7. Users Services Maintenance
8. Data Organization and Standards
9. Information Planning (Tracking Developments, Coordinating Improvements with needs and Requirements).

### INFORMATION PLANNING

If the goals of IRSIT and the technology to achieve them are to be reconciled, there is clearly to be a major planning function for information management. Three levels of planning should be considered as necessary to exist within IRSIT's information technology environment and are shown as follows:

#### 1. Function Planning

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IRISIT has a number of very specific goals, included in which is the design and development of applied research projects in the high technology areas and the associated follow-up, monitoring, evaluation and tracking reports during the implementation of those applied research projects and applications.

The current rate of advance in technology makes it unlikely that techniques used in any one project plan and implementation will be appropriate for the next. Information management must therefore review the changes in technology and assess its impact on the goals of IRSIT and include the findings in future strategic and operational plans.

Therefore, function planning should be considered as a dynamic process reflecting the implications of information technology on the current and future goals of IRSIT.

#### 2. Information Technology Planning

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The growth of information networks within IRSIT, and the expanding functionality of the networks, makes it essential to maintain a tight control over what is added to the network. Failure to achieve this will result in a collection of incompatible systems and tend to restrict, rather than ease, the coordination, integration, flow, and sharing of information.

From this level of the planning should emerge five strategies :

1- Application development strategy

- Information center
- Advanced development
- Traditional development
- Maintenance

2- Data management and administration strategy

3- Design of IRSIT's network (linkages)

- Internal
- External, to other agencies, local and international

4- Strategy of distributed processing

- Mainframe
- Minicomputer
- Microcomputer
- Security
- Standards

5- Strategy of office automation

- Wordprocessing
- Spreadsheets
- Graphics
- Statistics
- Electronic Mail
- Local Area Network

Therefore, information technology planning should concentrate on the evaluation of the technological infrastructure to match the needs and requirements.

3. Data Information Planning

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Although information technology may change, the data elements and their attributes will not vary to any great extent because the analysis function has been correctly and thoroughly done.

The data models should be stable, and may be used on any hardware and software, permitting the implementation of technologies without the viability of the data being changed or modified.

Therefore, data planning should focus on the creation of stable data models which are independent of changes in technology.

## IRSIT INFORMATION NEEDS AND REQUIREMENTS.

### 1. Information on Present Conditions

IRSIT operational plan may commence with a statement of the present state of development in the sector or subject area concerned. This statement serves as a base for developing objectives, targets, programs, and the information required by IRSIT to verify its assessment of the present conditions on information technology.

This will include, but not limited to the following :

- Census and surveys
- National Statistics and Plans
- International publications
- Agency Reports / Operational Plan
- Program Budgeting and Review
- Project Data ( project scope and parameters, project planning factors, project standard costs, estimates of manpower and materials, operations and maintenance costs).

## INFORMATION NEEDED FOR PLANNING AND DEVELOPMENT

### 1. Objectives and Policies

- Concise description of specific goals and objectives for computer technology.
- Identification of specific problem areas.

### 2. Planning - Sectoral Coordination

- Sectoral programs, in principle, should be reviewed and coordinated into a consistent national development strategy along with IRSIT plans.

### 3. Regional Development

- Through linkages.
- Country Cooperation with other nations
- Treaties
- Other relevant relationships

## PROGRAM BUDGETING INFORMATION

The program budgeting information required for IRSIT's planning should be specified in terms of one or more of the following kinds of data dimensions :

- Program Output Measures ( Economic Resources, Infrastructural Development, Human Resources, Social Development etc.)
- Level of Service and Capacity Utilization
- Manpower Requirements (Man Years)  
( Management / Administrative, Professional, Sub-professional and Technical, Clerical and related, Skilled Workers, Manual and Service Workers)
- Investment Costs (Study / Design, Land, Construction, Equipment / Plant)
- Recurrent Expenditure (Life Cycle, Cost Models)
- Program Revenues and User Charges.

## APPENDIX N

### IRSIT CURRENT AND FUTURE FUNCTIONAL REQUIREMENTS

This section presents an overview of the functional responsibilities of IRSIT. Information is presented in functional terms addressing the functional mission, information technology needs, changes in the mission support environment, users functional support requirements, and office automation support.

#### Functional Needs

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- \* Provide programmatic and managerial direction
- \* Address Overall and sector-specific Contribution to National Economy
- \* Gather, analyze, and maintain information on information / computer technology in both public and private sectors
- \* Maintain data base on pilot projects
- \* Recommend policies and strategies as well as plans for development and implementation of such recommendations
- \* Monitor the implementation of operational plans in information technology through a tracking and evaluation system
- \* Perform economic analysis on proposed plans and projects
- \* Produce annual reporting
- \* Maintain annual strategic and operational plans
- \* Regional and local market analysis tracking system
- \* Coordinate regional advocates and identify new issues
- \* Interface with outside organizations for local programs
- \* Respond to local / national relevant inquiries
- \* Participate in the development of national and regional goals and objectives
- \* Evaluate performance of all internal / external activities and projects related
- \* Planning, procedures, administration, monitoring and control of projects and Fiscal activities
- \* Develop and coordinate budgetary and financial planning
- \* Procedures and standards for accountability
- \* Establish operating policy and procedures for financial activities and systems
- \* Analysis and design of programs, projects, etc...
- \* Develop and recommend policies for personal programs, recruitment, selection, promotion, and management activities.
- \* Training, records management
- \* Logistics support
- \* Develop plans, policies, operating procedures and standards for applied research programs
- \* Support and expertise for selection and procurement process
- \* Program analysis and review results
- \* Central and regional problem-related resolution tracking capability

- \* Establish policy and standards for management of :
  - 1. Information Technology
  - 2. Data communications
  - 3. Computer system analysis
  - 4. Office automation
- \* Perform projects / systems feasibility studies
- \* Develop an annual information / computer technology plan
- \* Conduct studies for :
  - 1. Acquisition
  - 2. Installation
  - 3. Operation of information technology
  - 4. Data communications
  - 5. Related peripheral equipment
- \* Develop agency and office policies to enhance IRSIT's services and research programs
- \* Evaluate the latest automation technology
- \* Analysis of work distribution
- \* Coordinate training needs and plans
- \* Develop plans for procedures for maintaining computer and information technology hardware and software
- \* Develop plans and operating procedures for central computer and communications operations, including DBMS, network, executive support, user program assistance
- \* Evaluate automation needs of agency programs
- \* Effectively implement the agencies procurement assistance programs
- \* Negotiate with government agencies for contracts
- \* Liason with government agencies and international agencies
- \* Review procurements
- \* Develop plans, procedures and standards for research and development programs
- \* Establish goals for government agencies to increase business opportunities for IRSIT
- \* Mobilize the resources of all IRSIT programs for development and expansion of enterprise
- \* Enter into contracts with other government agencies
- \* Negotiate subcontracts
- \* Provide management and technical aid / assistance to eligible businesses
- \* Coordinate and recommend policies to other agencies
- \* Formulate policy of eligibility for companies seeking contract assistance in computer technology
- \* Promote nationwide IRSIT's procurement programs

**Innovation, Research and Technology Functional Needs**  
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- \* Develop and implement IRSIT innovation development plans
- \* Monitor goal-setting programs
- \* Publish policy directives for conduct of IRSIT programs
- \* Maintain research and development mailing lists
- \* Coordinate schedules with other agencies

- \* Foster private and public sector concerns in technology innovation
- \* Develop plans and operating procedures to acquaint staff and outside agencies with IRSIT's technology assistance program

#### Business Development Function Needs

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- \* Develop plans, procedures and standards for utilizing outside resources to foster business development
- \* Sponsors business management training and counseling services
- \* Recommend policy and procedures for administration of business program
- \* Develop and recommend policy for external resources from private sector
- \* Recommend policy and procedures for other institutions in computer / information technology programs
- \* Conduct impact measurements of effectiveness of outside resources
- \* Conduct market research studies to target needs

#### Private Sector Initiatives Functional Needs

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- \* Solicit government for agency programs
- \* Integrate private sector initiatives into agency programs
- \* Implement national strategy for recruiting private sector
- \* Develop policy and procedures to utilize private sector
- \* Procedure records of activities and results on private sector initiatives
- \* Produce mailings of program participants and program activities

#### International Trade Functional Needs

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- \* Develop agency policy for international trade
- \* Measure effectiveness of programs
- \* Provide international trade counseling
- \* Ensure business participation at trade shows, trade fairs, overseas missions, etc...

#### National Advisory Council Functional Needs

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- \* Advise administration on ways to improve effectiveness of programs
- \* Counsel regional administration on relevant economic conditions

- \* Evaluate proposed regional programs
- \* Coordinate activities of national and regional advisory councils
- \* Recommend and implement council programs
- \* Develop plans and procedures for liaison with business and professional associates
- \* Processing appointments of selected persons to council

**Representative Regional Functional Needs**  
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- Regional Counsel

- Assistant regional administrator for administration of :

- \* Execution of all administrative management functions
- \* Budget planning and execution
- \* Facility management
- \* Records, terms, reports management
- \* Procurement property
- \* Personnel staffing
- \* Regional training and development
- \* Employee and labor relations
- \* Information and technology support

- Assistant regional administrator for private sector development :

- \* Development and implementation of the program
- \* Respond to regional inquiries
- \* Expand regional participation
- \* Overview regional programs

- Assistant regional administration for procurement assistance :

- \* Interface with government agencies for contracts
- \* Develop procurement center statistics

- Assistant regional administrator for business development

- \* Marketing assessment of the region
- \* Targeting programs to meet regional needs
- \* Define demographic characteristics of the region
- \* Monitor the implementation and performance of region business plans.

## Appendix O

### SURVEY INSTRUMENT

(Used as a guide for the Interviewer, not distributed to the Interview

Questions for low-level staff:

Name

Project(s) working on

Educational background

What do they actually spend their time doing? Programming? Administration?  
Push paper?

Ask them to describe what their project is about, what part of it they are  
actually doing themselves. Is their project actually off the ground, or still  
negotiating and discussing?

Do they think their project is good, has potential, makes sense, will come up  
with interesting results?

Is your education relevant to the project?

Did you get any training from IRSIT, in Tunis or in USA? If so, what kind? Do  
you think it was valuable (aside from getting to go to the USA...)? Is it  
useful for your work?

Who supervises them? Do they feel like they get what they want from their  
supervisor? Do they feel like their project is well managed?

Do they work on several projects at once? Is that okay, or a problem?

How long have they been at IRSIT?

Did they come straight out of school?

What do they think of their position at IRSIT, i.e. do they expect to stay  
there, move on, etc.?

Do they think working at IRSIT will help them getting their next job? Is IRSIT  
a prestige place to work? Do they think it looks good on the resume? Do they  
think training gotten at IRSIT will improve their skills for the next job?  
Does this experience increase their marketability?

How do they feel about working on contract instead of in a permanent position?  
Why does it bother them (or not bother them)?

Do they like being at IRSIT? Is it a congenial atmosphere? Do people seem  
excited about their work? Does the atmosphere seem different from other  
Tunisian institutions?

What about the way it is managed; does that seem acceptable, too loose, etc.?

What is their impression of the way the organization is coming together and  
developing? Does it seem reasonable? What are the problems?

Do they think the problems are going to get resolved in due course, and are the  
natural result of being new and growing fast? Or are they unresolvable?

What is going well at IRSIT? What do they like about it?

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Information on pilot projects and research activities:

Which project (name)

General description of what the project aims to do

What are the development steps required to get it going?

What has already been accomplished?

Who are the actors in this project, and what is the role of each? (i.e. IRSIT staff, client staff, U.S. consultants, other organizations) (N.B.: This question should enable us to understand what kinds of links with U.S. or Tunisian institutions are involved in this project, and what the nature of the link is, e.g. paying for services, paying for training or technical advice, equal collegial relationship, IRSIT being hired for services, etc.)

How has the project been funded? What money from AID project, IRSIT funds, client funds, etc.? In this question it would be nice to distinguish between AID and GOT money, e.g. for hardware, etc.

What hardware is required for this project? Has it been purchased? Will it be? AID money or GOT money or some other source?

What technical skills are required for this project? Are they available among IRSIT staff?

Has training been required or carried out? Is it sufficient/effective?

How did this project get initiated or selected?

What is the rationale for IRSIT involvement in this project (e.g. Arabization was part of the original mandate of IRSIT, locusts are politically desirable, phosphates and oil generate FX, raise money for IRSIT, etc.)

How were the contacts with clients and consultants established?

Is there a contract with the client for this project? Will/should there be?

Does this project look a reasonable one for IRSIT to be involved with? Why or why not? (related to the rationale for the project)

Does this project look like it has a reasonable chance of success? What are the problems and the advantages?

How much does this project depend on AID support within the period of the 6-9 month extension, or in the longer run? What kinds of AID support would be needed (e.g. FX for travel and consultants, in-house technical support, more hardware, etc.)

Appendix P

RESUMES OF EVALUATION TEAM:

Team Leader - Stephens A. Cappa  
Computer Scientist - Salim M. Hammoud  
Institutional Development Specialist - Joy E. Hecht

## Resume

**NAME:** Stephens A. Cappa  
**DATE OF BIRTH:** 1940  
**CITIZENSHIP:** U.S.A.  
**EDUCATION:** Doctor of Business Administration, Brown University, 1964.  
M.S., MIS, Georgia Tech University.  
B.S., Business Administration and Accounting, Central State University.

**LANGUAGES:** Arabic, French, Spanish, Thai, Chinese

### **TECHNICAL EXPERIENCE:**

**Languages:** COBOL, RPG 11 and I11, FORTRAN, PL/1, BASIC, NEAT 3, PASCAL, ASSEMBLER, APL, ALGOL, C.

### **Hardware:**

Digital: DEC 10/20, DEC 310, VAX 11/730, 11/750, 11/780  
IBM: 32, 34, 36, 38, 3031, 3033, 3090, 3375, 3278, 4331, 4341, 4361, 4381  
DCDI: CDC CYBER  
BURROUGHS: B6700, B4700, BG000, B80; B1955; B5920, B8130  
NCR: 8200, 8550, 1-9050, v8555M Criterion, V8565, 8600, V-8568.  
HEWLETT PACKARD: HP3000, HP3400

Also, familiarity with Honeywell; Univac; Data Gen.; Wang; Nisdorf; Collins (aviation system); Singer, Prive; Intergraph; Graphics; Sciences/Geology; Geophysics; Seismicdata; Voice Command; NEC; Wesdan; Raytheon; Westinghouse; Micro.

### **Software:**

A wide range of applications programs, operating systems, utilities, and communications packages for mainframes, minis, and micros.

EMPLOYMENT:

1987 - 1988

Senior Systems Analyst, International Labor Organization, Colombo, Sri Lanka.

Established comprehensive financial systems for the Department of Finance, the National Design Center, and National Construction Corporation. Set up networking systems using a variety of hardware and software packages.

Through the National Design Center, also designed and introduced computer systems with Air Lanka, the national airlines of Sri Lanka, and with eleven other export-oriented companies.

1985 - 1986

Computer Systems Specialist, Ministry of Electricity and Ministry of Finance, Riyadh, Saudi Arabia. With UNIDO, worked with computer systems in various ministries of the Saudi government and in the national utility company. Computer systems were entirely in Arabic, and all training programs were conducted in Arabic.

1983 - 1985

Senior Executive for Computer Services, National Electricity Corporation (N.E.C.); Khartoum, Sudan, East Africa.

Analyzed and completely redesigned the entire accounting and MIS program. Evaluated the existing computerization of accounting and MIS. Determined suitable hardware and software, wrote an accounting manual detailing procedures and controls, trained EDP staff.

Followed up to make sure new procedures were implemented properly. Personally designed software packages for accounts payable and receivable, purchasing, inventory control, and economic forecasting.

Supervised the entire financial reorganization of N.E.C. and prepared a revised budget for approval. Appointed the liaison with the Ministry of Energy. Also supervised a staff of over 43 employees for the Bank of Sudan. Prepared recommendations

for hardware and software systems, implemented changeover to new equipment, established training programs for permanent EDP staff, developed financial controls, and designed and implemented preventive maintenance systems.

1981 - 1983

Gulf Air, Manama Bahrain, Middle East, Data Processing Planning Manager.

Developed short- and long-range plans for implementing state of the art computerized MIS and financial systems. Evaluated existing computerization of accounting and MIS, determined suitable hardware and software requirements, wrote procedures manuals, and trained personnel.

Also prepared financial statements -- both short-term budgets and long-term forecasts. Designed and implemented a special software package for projecting alternate economic models for purchase of aircraft.

1980 - 1982

NADCO/AVCO DHARAN International Airport and King Abdul Aziz Airbase, EDP Director.

Supervised the design and implementation of computerized systems for accounts payable and receivable, payroll, finance, and forecasting. Established financial procedures, developed MIS procedures, selected new hardware and software, and was closely involved in implementing a mini-computer system.

1966 - 1979

World Wide Business International (Consulting Firm), Director EDP Operations of Middle East and Asia.

Supervised all aspects of EDP: analyzing and designing systems; purchasing hardware and software; hiring and training personnel; and maintaining systems.

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**SALIM M. HAMMOUD**

**INFORMATION MANAGEMENT AND TECHNOLOGY SPECIALIST**

**EXPERIENCE SUMMARY:**

Dr. Hammoud is a Senior Management and Technology Consultant specializing in professional management, planning and development, organizational analysis, information systems, data base management systems, data communications, and office automation. Has over fifteen years of experience covering all aspects of general management practices, information systems and electronic data processing services, in addition to special educational and training services under the domain of information management, information technology, and mainframe and micro computer systems. Major activities include feasibility and requirements analysis studies; and development methodologies including coordination, management, administration and development, analysis, design and implementation of various agricultural, medical, health, financial, economical and statistical projects involving staff at all levels.

**EDUCATION:**

- Ph.D. :Professional Degree Applied Scientist/Engineer. The George Washington University, 1979;Washington D.C.,USA; Computer Management Sciences and Operations Research.
- M.S. :Masters of Science. The American University, 1976; Washington D.C.,USA;Computer Science and Operations Research.
- B.S. :Bachelors of Science.The Lebanese University, 1971; Beirut, Lebanon; Mathematical Sciences.
- Diploma:Marketing For Executives, Institute of Management; 1962.

**CURRENT EMPLOYMENT:**

Ministry of Planning/Kingdom of Saudi Arabia (1/1986-Present)  
Follow-up & Information Department  
Office Automation Manager/Project Coordinator

Provided services in all aspects of automation within the Ministry of Planning. Responsibilities include, but not limited to the evaluation, selection, and procurement of Micro-Computers Hardware and Software to meet the evergrowing needs and requirements of the Ministry. Involved in preparing feasibility studies, requirements analysis and specifications for products, programs and projects contracts. A major activity was the coordination of the high technology project in information management improvement and office automation throughout the Ministry. The objectives of the project are to improve on the management and processing of the fast growing volumes of data and information utilizing the state-of-the-art information technology both hardware and software in a distributed environment of local area networks. Hence improving the quality and standards of information handling and the design and implementation of information systems in support of the plan preparation, planning process, annual reporting and follow-up reporting which constitutes the major functions and activities of the Ministry.

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**PROFESSIONAL EXPERIENCE HISTORY:**

- O United States Treasury Department/JECOR (10/1984-1/1988)  
Academy For Educational Development/Middle East Division  
Senior Technical Advisor**

Advisor to the U.S. Treasury Department through an activity of the U.S.-Saudi Arabian Joint Commission On Economic Cooperation, under contract with the Academy For Educational Development; to strengthen the Department of Studies and Organization (DSO) at King Saud University in Riyadh, Saudi Arabia. Assistance provided covers areas of management, administration and technology.

In this capacity, responsibility ranged from providing planning, design, and analysis to development and implementation of current and future information systems. Three high technology projects were undertaken, leading to the development, implementation, customization and arabization of the University Hospital Information System, Human Resources Information System, and Financial and Budgeting Information System. Hardware and Software evaluation and selection were made to ensure full compatibility and adaptability for current and projected needs and requirements for automation throughout the University. Office Automation utilizing distributed processing and Local Area Networks along with the information systems; were to increase the efficiency and effectiveness of the DSO and other units, making them more aware of the University's continued development of systemization and automation.

- O AMTRAK/National Railroad Corporation (1/1984 - 9/1984)  
Information Systems/Marketing Divisions  
Senior Technical Consultant**

Designed, developed and implemented various automated administrative functions and procedures leading to the master plan for a corporate management and marketing information system. Utilized advanced systems analysis and DBMS techniques and computerized procedures in the areas of project proposals, sizing, costing, estimation, and budgeting for Fiscal year 1985. Other responsibilities include management, financial, cost-benefit, and other fiscal analysis; advisory research; statistical surveys; budgeting; financial and personal management; and accounting.

0 U.S. AID/United States State Department (10/1981-10/1983)  
Information Technology Division  
Senior Systems and Programs Advisor

Technical assistance services, U.S. AID / JAMAICA, Ministry(s) of Agriculture and Finance under the U.S. Grant to A. L. NELLUM and Assoc. as Contractor. The Agricultural Planning Project provided assistance in expanding the capability of the Jamaican Government to manage, develop and implement programs for increased agricultural production and productivity as well as building the infra-structure of the Ministries. In this capacity, Dr. Hammoud was responsible for providing managerial, administrative, technical and educational assistance, feasibility studies and requirements analysis, system analysis, functional specifications, and implementation of master plans, Ministry-wide management information system, and other computer-based systems. This enabled the Ministries to plan, project, and forecast economic developments marketing analysis, demand, and consumption, as well as production. Designed and refined models in cost-benefit analysis, financial and economic analysis, and project planning. Developed and supervised various techniques for planning, monitoring, and evaluating research programs and disseminating research results emphasizing the design and evaluation of information systems and data base management systems.

0 University of the West Indies (9/1982-8/1983) Concurrent  
with work above. Computer Science Department  
Senior Committee Member and Lecturer

As Committee member for Information Systems Development and Applications, Dr. Hammoud was responsible for providing management reviews and systems analysis of specific operations with the goal of improving productivity through increase automation. Designed specific systems and processes including but not limited to automation of existing financial management systems, management information systems. Prepared, designed, and conducted educational and training conferences on various topics related to MIS and DBMS applications.

0 Computer Sciences Corporation (9/1980-10/1981)  
Systems Sciences division  
Senior Member of Technical Staff

Senior managerial, administrative and technical responsibilities for providing services to the Science and Applications Operation of the National Aeronautics and Space Administration (NASA). Specialized experience in planning programs, including supervision of program analysis, systems analysis, DBMS interfaces, and research staff. This included analyzing objectives, policies, work operations, and progress. Identified actual and potential problem areas, trends, significant program accomplishments, merit and deficiency situation, and areas of imbalance. Major applications included data communications, DBMS, networking, and high speed archival systems.

0 Electronic Data Systems Corporation (1975-1980)  
Office Automation Division  
Senior Program Development Consultant

As Senior Consultant, provided management and technical consulting services in specification, analysis, design, development, implementation, and operation of office automation, electronic data processing, DBMS, MIS, and computer network communication systems. Directed the development of innovative system solutions to information applications; integrating hardware, software, and organizational capabilities to effectively satisfy the requirements of administrative, technical, professional, and managerial personnel for cost effective information resource management. Duties included: project planning; proposal writing and documentation; developing tools and techniques for quality assurance; cost effectiveness and evaluation/selection of hardware and software; building and refining mathematical models for cost-benefit analysis, financial analysis and decision making; monitoring and evaluating research programs emphasizing the design/configuration and implementation of data base management systems and local area networks.

0 Management Technology International Corp. (10/1978-8/1980)  
Systems and Office Automation Division  
Senior Systems Analyst/Team Leader

Conducted systems analysis and cost-benefit analysis on micro- and mini-computers for the computer center; involved in the development of corporate MIS and Financial systems, Commercial software Products, and Translators supporting Electronic Test Equipments. Was directly responsible for evaluating/selecting both hardware and software and preparing feasibility studies detailing the available data base management systems (DBMS) for the selected VAX-11/780 Minicomputer (DEC), with COBOL, FORTRAN, BASIC, SEED, and PASCAL Compilers. In this capacity, met with vendors, designed system requirements/ Configurations, and developed product performance benchmarks and financial analysis and maintenance contracts. Was responsible for training systems analysts, programmers, and users in systems design and development, conversion, implementation, and test procedures. Was responsible for the development and maintenance of monetary-account track records to reflect the relationship between progress and foils to time and cost budgets. Specialized experience performing research in support of analytical and evaluation studies. Demonstrated experience in using investigative research tools for data collection including literature searches, questionnaires, structured telephone and personnel interviews, extracting and compiling data from information resources and preparing summary statistics and reports on research findings. Supervision of substantive ADP projects involving software development.

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0 The American University (1979-1981)  
Center For Technology And Administration  
Assistant Professorial Lecturer

Conducted professional training programs in computer-related areas, data processing, management information systems, and data base management systems. Designed and assisted in the planning, administration, and implementation of educational programs relating to the training of staff at the American University/Center for Technology and Administration; The "Dje" department of Defense; and the National Institutes of Health. Major areas of concentration included systems analysis and development methodologies of management information systems, data base management systems, and office automation.

0 The George Washington University (1976-1979)  
Computer Science and Electrical Engineering Department  
Assistant Professorial Lecturer

Designed and taught graduate-level courses in Structured Systems Analysis and Design Methodologies; Data Structures and Programming; Information Storage and Retrieval Systems; and Data Base Management Systems/Design and activities directed towards the Design/Development and implementation of Management Information Systems, Library, Text Processing, Banking, Hospital Systems and office Automation Systems and Data Communication Systems.

0 The American University (1974-1976)  
Department Of Statistics and Computer Sciences  
Senior Instructor

As assistant instructor in the Computer Lab., taught/directed various courses, assisted in the design and development of computer related projects in the areas of Information Systems, Data Base Design, DBMS, Computer Architecture, and Structured Analysis and Design.

0 Lebanon, Middle East (1970-1974)  
Ministry Of Education/Social Security Administration  
Technical Consultant/Program Development

Supervised, directed, and analyzed work performed by 100 staff members undergoing training for computer systems work. This involved evaluation and selection of hardware, software and human resources. Plans were underway to automate the major functions of both organizations.

**HARDWARE EXPERIENCE:**

DEC: PDP-11 Series and VAX-11/780 Minicomputers.  
IBM: IBM 34 and 38 Minicomputers; IBM 360, 370/135, 4300 and 3300 Mainframe; and IBM PC/XT/AT Microcomputers.  
CDC: CDC 6000 CYBER Mainframe.  
HP : HP PC/150/Vectra Microcomputer, and HP 3000 Minicomputer.  
FORTUNE Microcomputer.  
TANDON : PC/X10, X20 and PC/AT 20, 30, 40, 70

**SOFTWARE EXPERIENCE:**

Operating systems: CMS, OS/JCL, MVS/MVT, TSO, DOS, MS DOS, UNIX  
Applications: ACCOUNTING, PAYROLL, FINANCIAL, BUDGETING, INVENTORY, ECONOMIC ANALYSIS, LINEAR PROGRAMMING, ESTIMATION, HUMAN RESOURCES, PATIENT CARE SYSTEMS, REAL ESTATE SYSTEMS, SCIENTIFIC SYSTEMS, LOTUS 1, 2, 3; WORDSTAR, MEMOMAKER, PERSONAL CARD FILE.  
DBMS Systems: SYSTEM 2000, TOTAL, INQUIRE, IDMS/SEED, MODEL 204, ADABAS, SQL, INFORMIX, DBASE II, DBASE III PLUS.  
Programming : BASIC, FORTRAN, COBOL, PASCAL, C, PL/1, ASSEMBLER, DBASE II & III, RPGII, SNOBOL.

**PUBLICATIONS:**

"Automatic Search and Retrieval Systems" - Masters Thesis presented to the American University Department of Mathematics, Statistics and Computer Science.

"Differential Mathematics and Geometry" - Masters Thesis presented to the Lebanese University, Department of Applied Sciences.

"Modern Science and Technology As a Future" - Analysis and Recommendations.

"Alternative Interpretation of Leadership Data Base" Substantiation of Doctoral Dissertation presented to the American University School of Business Administration. Computer Analysis and Research was based on collected data bases from 100 existing organizations.

"Management Information System - Geographical Land Classification and Crop Suitability Analysis" - Ministry of Agriculture/USAID/Jamaica: Agricultural Planning Project.

"Project Planning and Control System" - Data Bank and Evaluation Division, Ministry of Agriculture/USAID/Jamaica.

"Monitoring and Evaluation Systems for Local and International Projects" - Data Bank and Evaluation Division, USAID/Jamaica.

"Programming and Documentation Procedures and Standards" - Data Processing Department, Ministry of Agriculture/USAID/Jamaica.

"Ministry of Agriculture Computer Needs and Requirements, Survey, Assessment and Analysis Study" - USAID/Jamaica.

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## MANAGERIAL AND TECHNICAL SKILLS SUMMARY:

### Managerial Skills and Services--

- o Feasibility Studies
- o MIS Definition, Conceptual Design, and Detailed Design
- o Program Analysis, Monitoring and Evaluation
- o Project Management, Productivity, Scheduling and Reporting
- o Organizational Resources Assessment Analysis  
<Manpower, Information, Technical Operations>
- o Budget and Financial Analysis
- o Economic and Cost-Benefit Analyses; ROR and ROI
- o Decision Support Systems
- o Management Science and Operations Research Studies  
<Tools, Techniques, Methodologies>
- o Statistical Surveys, Methods and Analysis
- o Organization Management and Communication Skills Development

### Technical Skills and Services--

- o Analysis of User Requirements and Needs
- o Development of Specifications, Evaluation Schemes and Criteria
- o Software Development Maintenance and JSupport
- o MIS Design, Development, and Implementation
- o Data Base Management Systems Applications Development
- o Systems Testing and Integration
- o Office Automation and Local Area Networks
- o Budget Monitoring and Evaluation Systems
- o Project Planning and Control Systems
- o Manpower Resources Inventory and Planning Systems
- o Research and "Development Projects
- o Customization, Operation, Support and Documentation

### Educational and Training Skills and Services--

- o Educational and Training Seminars and Workshops
- o Formal and Informal Classroom and On-The-Job Training
- o Skills Inventory/Needs Assessment/Job Analysis Criteria
- o Management and Communication Skills Training
- o Computer-Assisted Instruction Applications
- o Technical Skills Training
- o Curriculum Guides and Course Outlines Design and Development
- o Performance and Productivity Seminars
- o Management and Technical Related Conferences

### PERSONAL DATA:

- Born 8/28/1948; Married.
- Permanent Resident - USA.
- Speaks/Writes excellent English and Arabic, some French.

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## RESUME

**NAME:** Joy E. Hecht

**DATE OF BIRTH:** 1956

**CITIZENSHIP:** U.S.A.

**EDUCATION:** Ph.D., Urban and Regional Planning, Massachusetts Institute of Technology, 1988. Dissertation topic: "Use of Information Systems for Municipal Management in Tunisia." Awarded Fulbright Scholarship for dissertation research.

B.A., Economics, magna cum laude, Harvard University, 1980. Phi Beta Kappa.

**LANGUAGES:** French: fluent  
Spanish: fair  
Arabic: fair reading (literary Arabic)

**EXPERIENCE:**

1988 Applications Specialist, Education Development Center, Newton, Massachusetts.

- Developed strategy for applying corporate information systems planning techniques to public organizations in the Third World.
- Prepared training materials for overseas workshops on information technology strategy.

Senior Advisor, Ministry of Finance, Dakar, Senegal.

- Designed and implemented a microcomputer-based system to manage quarterly industrial surveys, produce price and production indices, and analyze impacts of tariff reform on industrial activity.
- Trained Ministry employees in information systems use and management.

1987 Research Fellow, Aga Khan Unit on Housing and Urbanization, Harvard Graduate School of Design and Lincoln Institute of Land Policy, Cambridge, Massachusetts. In Tunisia:

- Carried out case studies on use of information technology for property tax management in six cities.

Mr. Joy E. Hecht  
Page Two

- Collected and analyzed data on municipal finance and impacts of automation on tax recovery.
- Wrote training materials on introduction of computers in local government in the Third world.
- Analyzed tax design and administration for project on international property taxation.

1984 - 1987

Instructor and Consultant, Computer Resource Laboratory, Massachusetts Institute of Technology.

- Research and teaching on use of computer systems in Tunisia and elsewhere in the Third World.
- Set up and maintained Ingres data base system to manage spatial data files. Used C interface to Ingres to retrieve information and modify the data base.
- Managed software and hardware for a laboratory of 30 networked micro computers. Trained and supervised user support and software maintenance staff.
- Worked on development of research agenda and strategic plan for the laboratory.

1985

Research Assistant, Project on Public Infrastructure and Regional Growth, Multiregional Planning Staff, MIT Department of Urban Studies and Planning. Researched state capital budgeting procedures, conducting telephone interviews of public officials nationwide. Wrote report published by the Multiregional Planning Staff.

1984

Research Fellow, Aga Khan Program for Islamic Architecture, MIT (work in North Yemen).

- Researched impacts of economic change and international labor migration on urban growth.
- Interviewed builders, architects, and public officials about impacts of urban labor market changes.

Resume - Joy E. Hecht  
Page Three

- Presented research results at Conferences at MIT and elsewhere in the United States.

1981 - 1982

Consultant, Organization for Economic Cooperation and Development Environment Directorate, Paris.

- Developed statistical data base on pollution control expenditures by OECD member countries.
- Interviewed public officials and industry representatives to identify and evaluate data sources.
- Travelled to eleven countries to gather data (France, England, Ireland, Netherlands, Belgium, Germany, Denmark, Switzerland, Italy, Greece, and Turkey).
- Developed methodology for estimating costs when exact data were not available.

1980 - 1981

Research Assistant, Resources for the Future, Washington, D.C.

- Research and wrote a directory of federal data bases on the natural environment.
- Co-authored a paper on the impacts of U.S. environmental policy on industrial innovation.

1979

Research Assistant, The Urban Institute, Washington, D.C.

- Conducted case studies on the impact of local housing regulation on home prices in the United States. Worked with town planners in Texas and Illinois to develop data.

PAPERS:

"Introducing Information Technology in the Third World: Objectives and Policy," paper to be presented at National Academy of Sciences Conference on Microcomputers in Development, 1988.

"Use of Computers in Local Government in the Third World: The Tunisian Experience," paper presented to the Urban and Regional Information Systems Association, 1987.

"Annotated Bibliography on Management of Information Systems, with Particular Emphasis on the Public Sector and the Developing World," MIT School of Architecture and Planning, Computer Resource Laboratory, 1987.

"Capital Budgeting in the States: The State of the Art," MIT Department of Urban Studies and Planning, Multiregional Planning Staff Report 42. 1985.

"Urban Migration is Changing Architecture of the Capital," International Herald Tribune special report on North Yeman, September 1985.

"Land Banking and Urban Development: A Preliminary Analysis," Harvard Graduate School of Design, 1985.

"Public Policy to Influence the Use of Earnings from Overseas Employment," Harvard University Department of Economics, 1985.

"The Yemen Arab Republic: Economic Development and Architectural Change." Coauthor. In Development and Urban Metamorphosis: Volume II Yemen Background Papers. (Singapore: Concept Media (PTE) Ltd. for the Aga Khan Award for Architecture, 1984).