

EVALUATION
of the
CAIRO UNIVERSITY/MASSACHUSETTS INSTITUTE OF TECHNOLOGY
TECHNOLOGICAL PLANNING PROGRAM
(AID CONTRACT NE-C-1291)

Submitted to the
Agency for International Development
by
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Executive Summary

This program rests on the hypothesis that if tri-partite teams composed of people from MIT, Cairo University and a development-oriented Ministry investigate or research a developmental problem, institutional changes will occur in Cairo U and the Ministry, improving their capabilities to do future research together for the solution of developmental problems.

This hypothesis is proving to be true, although the extent of institutional change varies from one research team to another.

The teams are producing research results which are being used by Ministries. Thus far, eight of the 13 projects have led to at least one action decision and sometimes to several decisions. Examples involve commodity targets in the five-year plan, training of construction workers, World Bank loans for electric power, highways, and petroleum. Decisions are pending on findings from four other projects. A policy on control of the Nile flow from Aswan proposed in the National Water Plan could permit \$40 million more of electricity annually without infringing on irrigation needs. Even if institution building (the program purpose) should not occur, the cost/benefit ratio for the program will be highly favorable because of such research outputs.

Leaving aside the research results, we find that attitudes are changed and skills improved in several faculties of Cairo University and in key Ministries. There is a general consensus, which we endorse, that MIT should continue about three years more to strengthen behavior patterns and enhance the skills of more people.

A Development Research and Technical Planning Center has recently been established at Cairo U to facilitate contacts between faculty members and Ministries, to assure proper research task selection and quality control and to provide logistic support to analytical teams with minimum red tape. The functioning of this Center is critical to future success and it needs strengthening during the next several years.

Part I of the contract (the activity to date) could be regarded as an experiment to see whether Egyptian academic expertise can help with developmental problems and whether Ministries will cooperate in research as well as use the results. Emphasis has been on the production of practical research results. Now that the experiment has demonstrated potential for success, emphasis in Part II of the contract can and should be gradually transferred to institution building.

A summary of recommendations is:

General

1. Continue the AID/MIT/Cairo U program with modifications to insure a transition to an independent Egyptian capability.
2. Clarify the purpose and the end-of-project status.

AID

1. Provide better backstopping for the program in the Near East Bureau of AID/W.
2. Establish regular liaison between the USAID and the DRTP Center to keep it informed about USAID activities.
3. Improve USAID efforts to keep AID/W well informed about project status.
4. Arrange for the DRTP Center to be linked to the National Technical Information Service.

MIT

1. In collaboration with Cairo U and USAID, develop a three year operational plan.
2. Set targets for numbers and types (disciplines) of Cairo U and Ministry personnel to attain capability in interdisciplinary and collaborative solving of development problems.
3. Add more formal training.
4. Adjust MIT project support to phase reached by each research project.
5. Gradually merge the functions of research management and logistic support performed by the Liaison Office and the DRTP Center (except Liaison Officer functions of financial accountability to MIT).
6. Coordinate total MIT program.

DRTP Center

1. Increase the representativeness of the Board of Directors.
2. Organize the Center with three divisions: Training, Research and Administration.
3. Adapt Liaison Office procedures with modifications to fit Egyptian needs.
4. Formalize criteria and procedures for project selection and quality control.
5. Use MIT personnel as consultants to the DRTP Center.
6. Sponsor training for Cairo U investigators in various aspects of research methodology.
7. Recruit faculty from other Universities when needed.
8. Establish a policy on patents for inventions resulting from Center work.
9. Investigate follow-on funding from UN sources for projects of strong interest to other nations.

Note on Terminology

Several words have caused confusion in connection with the Technological Planning Program.

Project - AID usually uses this term to designate an organized effort to cause a development change, with identifiable funding. Here, we have decided to depart from that usage and to refer to the whole complex of Cairo U/MIT activities as the "program," in order to distinguish this total set of activities from the 13 research "projects."

Research - To most academic people, research means seeking facts and relationships which have not been discovered. This may have occurred in a few instances in the early stages of Cairo U/MIT "research" projects. In most cases, however, the Cairo U/MIT projects deal with the development part of "R & D". That is, they use known facts and relationships (formulae) to solve a new problem or devise a new mechanism (engineering). In this report, we have used the words "research projects" because that is the practice for those involved in the program, even though most of the projects are not research in the pure academic sense.

Technology Transfer - This program is administered by MIT as part of its Technology Adaptation Program. In most cases, the technology being adapted consists of various aspects of research or investigative methodology rather than substantive knowledge. Many of the faculty members at Cairo U who serve as Principal Investigators on the tripartite teams and the officials in Ministries who are Project Supervisors on the teams have studied abroad and have kept well-versed in current technology. However, they have not had sufficient experience in organizing and using inter-disciplinary teams or in recent developments such as systems analysis with use of modeling and computers.

Approach to Evaluation

The Evaluation Team read program papers, progress reports, previous evaluation reports, and some of the research reports produced as part of the program. We also interviewed some 89 people in Washington, Cambridge and Cairo (see Appendix A). To acquire some direct sense of the context for a number of the research projects, we spent one day driving through the delta to Alexandria, returning via the desert and the new Sadat City.

The emphasis was on institution building. Our approach to getting evidence about changes in institutions was to examine the 13 research projects, asking what was happening in Cairo University and in various Ministries in connection with each one. We were also asked to assess the relevance and utilization but not the technical merit of the research projects.

Early during our stay in Cairo we met with all the faculty members from Cairo U who serve as Principal Investigators. We presented for their reaction a schematic model of the program as we visualized it (see p 4 of this report). Most of them agreed that the model generally represented the theory of the program. Use of the model had the advantage that it helped direct attention of the Principal Investigators away from the substance of their research projects to the question of institutionalization. It was also a sort of analytical device, in that we later explored with each Investigator which of three phases his particular project had reached.

The purpose of the evaluation was to look to the future. The first question was whether the program should continue. If the answer to this was positive, we were to explore whether any modifications of the program strategy would be desirable or if we could suggest techniques or changes which would enhance the probability of success in improving the capabilities of institutions -- Cairo U and development-oriented Ministries.

We were not auditing past actions or pointing the finger. Thus we did not probe deeply into the recent committee reorganization at MIT/Cambridge nor the reasons for poor coordination between the Liaison Office and Center in Cairo. Instead, we have tried to suggest how we think these organizations should work in the future to achieve the purpose of the program.

The scope of work asked us to assess the adequacy of program management by MIT, Cairo U, the Center, USAID and AID/Washington. We defined management broadly to include such elements as the philosophy behind the program, planning, and quality control as well as finance and personnel. Most of our impressions about management were acquired during the process of pursuing information about other topics. For example, we learned about USAID management from our own observations and reading of reports, from remarks of MIT and Egyptian people and from comments of various parts of USAID.

Chapter I - Program Objectives

Purpose

A number of statements of program purpose exist in various documents. The original project paper has slight variations between the narrative and the logical framework matrix. The Project Agreement between the USAID and Cairo University and the contract between AID and MIT also are not exactly the same. Nevertheless, the general theme and concept are sufficiently clear to provide a basis for this evaluation report. Reproduced below is the purpose statement from the project paper:

"Establish permanent institutional basis for utilizing Egyptian academic expertise to strengthen capabilities of Ministries to address and resolve development problems and to develop programs and projects directed toward development goals."

End-of-Project-Status

We did not find a precise and detailed description of the conditions which would be expected to exist if the above purpose were achieved. Therefore we attempted to formulate a statement of "End-of-Project-Status" as a yardstick to measure against. This recognizes three aspects of a "permanent institutional basis":

1. That a Center at Cairo U is capable of:
 - Facilitating contacts between faculty members and Ministry Officials.
 - Assuring proper selection of research tasks and quality control of the results.
 - Providing logistic support to researchers with minimum red tape.
2. That enough Cairo U investigators can plan and administer research to meet Ministry needs and can also train other investigators.
3. That enough key Ministry Officials can appreciate the value of research, request and participate in research and apply findings to meet national needs.

Program Strategy

The strategy for achieving the purpose and end-of-project status has been to find a broad problem critical to national development which is of mutual interest to a MIT faculty member, a Cairo U faculty member and a Ministry. Then a team of people from each of the three institutions investigates various aspects of the problem. The team is headed by two Principal Investigators, one from the MIT faculty and one from the Cairo U faculty, and by a Project Supervisor from the Ministry.

The team usually includes additional people from each institution. If there are sub-projects, they may be directed by senior people other than the project leaders. Staff members of the Ministry are involved in providing information from Ministry records or in conducting surveys. Students may also be used in surveys and data processing. Graduate students in Cairo

and in Cambridge (some of whom are Egyptian) pursue research assignments related to the project. All of the Egyptian team members receive hourly pay, with the rates related to their rank.

During the research, the Egyptian members of a team receive on-the-job training in research methodology and management. This training is supplemented by some short courses, workshops and seminars.

Program Outputs

The logical framework matrix of the project paper showed just two general outputs. We have subdivided these into four:

- Research reports with practical solutions.
- People in Cairo U and Ministries trained in research methodology.
- Center established in University.
- Awareness of senior Ministry officials about value of working with Cairo U.

Comments about Purpose and End-of-Project Statements

The purpose seems to call for two kinds of capability in Ministries - to resolve problems and to prepare development projects. The emphasis of the program thus far has been on problem solving, although the project paper and Annex A to the AID-MIT contract talked about project development. It seems realistic to confine the academic contributions of MIT and Cairo U to problem solving, leaving the project preparation to the Ministries. In two cases, for electric power and for highway maintenance, the World Bank has specified that the Ministries are to follow recommendations of the research reports in implementing development projects.

The Evaluation Team felt that existing end-of-project statements about the Center did not give sufficient attention to the aspect of quality control of the research and the reports. It seemed to us that unless the Center's future efforts meet the high standards of selection and monitoring established by the MIT/Cairo U/Ministry teams, the requests, funds, and enthusiasm of the Ministries might dry up. Then the efficiency of the Center in facilitating contacts and in logistic support would count for little.

We believe that successful institutionalization implies some critical mass of experienced and trained people in both the University and the Ministries. Generally, both institutions have able people who are well qualified in their specialities. What they have been learning under this program is the methodology of planning and managing investigations on a multi-disciplinary basis, using the latest analytical techniques. We found no targets for numbers of people. We tried to devise a description of what would constitute success but concluded that more consideration of the organizational structure of the University and selected Ministries would be needed to convert our descriptive terms into a range of numbers. This evaluation report gives some clue to the numbers already involved.

Finally, it may be that institutionalization in the Ministries should involve some organizational changes as well as a critical mass of trained people. We found some Ministries with functioning planning and/or research units which provided a convenient contact for the University, while in other cases, the University was almost compelled to deal with the Minister or Deputy Minister. Sometimes that officer coordinated staff assigned to work with a research team; sometimes the Cairo U Principal Investigator did the coordinating..

Understanding of Objectives

The preceding called attention to the slight variations in statement of purpose and to the question of whether the purpose should be confined to problem solving or should also include project planning. Also highlighted was the lack of a clear definition of program success - End-of-Project-Status - expressed as an effective, durable Center and a critical mass of trained people both in Cairo U and the Ministries.

Beyond these problems of clarification there is a question of emphasis. In Part I of the AID/MIT contract, it was necessary to prove that the experiment would work - that tri-partite teams could function and that they could produce results which would be used. One might expect emphasis to be on the program outputs, especially the research projects. Now Part II should concentrate on improving the capabilities of Cairo U researchers, of the Ministries, and of the Center. It appears that a number of the faculty of both MIT and Cairo U participating in the program have not been aware of the program purpose but have thought only about conduct of research.

Schematic Model of Program

The evaluation team took as the objective of the program the transfer of knowledge and technological capability from MIT to Cairo U and to certain Ministries of the Arab Republic of Egypt responsible for development. This knowledge and capability we defined as the ability, using their own and other resources, to:

- (a) Identify and define high priority development problems.
- (b) Extract from these problems key issues for analysis.
- (c) Plan and manage sophisticated analytical research studies.
- (d) Interpret and apply the results of research to operational development programs.

This ability, for brevity, we call A.

To avoid long titles and to suggest the generality of the problem, we chose to call the U.S. university (in this case MIT) U, the Egyptian university (in this case Cairo) C, and the Ministry(ies) M. In the schematic rendering below, the size of the letter indicates the degree of leadership and responsibility.

We regarded the program and the individual research projects as proceeding through four phases, of which the first three would seem to be included in the AID/MIT contract. These phases may be designated as experimental, demonstration, institutionalization and replication.

Each phase has several steps. In the Experimental Phase, with U providing leadership, U, C, and M determine interest, select an illustrative

problem, lay out an investigative plan, determine a solution and assess the results. In this phase, some research projects can be expected to fail, because the problem can not be solved, the solution is not useful, or the Ministry's needs change. However, enough projects should succeed to prove that the system of technology transfer has possibilities.

Armed with these results, the parties progress to Phase II - Demonstration. Here the whole process is strengthened or repeated using new research projects or new aspects of existing research projects. However, in this phase, C and M should be the initiators, with the role of U shifting to that of a monitor and a contributor of advice.

In Phase III - Institutionalization - the system is made durable and autonomous. Here M is the principal, while C serves as called upon. U may be an occasional consultant and assessor or may not participate.

If the system works for U, C, and M, it should work for other foreign Universities, other Egyptian Universities and other Ministries or parts of Ministries. Alternatively, it could work for C taking the lead in other countries, in keeping with the tradition that Egypt trains most of the teachers, doctors, engineers, etc. of the Arab world. Then we would have reached Phase IV - Replication.

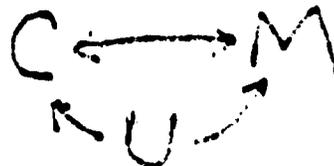
Phase I

Experimentation



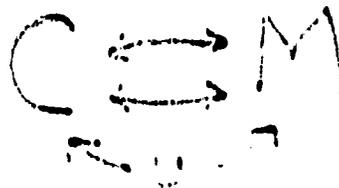
Phase II

Demonstration



Phase III

Institutionalization



(Size of letter indicates degree of leadership or responsibility.)

Chapter II - Relevance and Utilization of Research

Criteria for Selection

The scope of work asked the evaluation team to assess the adequacy of the criteria and the selection process for studies to be carried out through the DRTP Center. Since by April the Center had only five non-specific grants and four small research contracts, it has had little opportunity to do selection yet. We did not discover that there are formal criteria or procedures. The matter is discussed briefly in the section on the Center in Chapter IV on management and in more detail in recommendation #4 for the Center.

More pertinent to date has been the selection of Cairo U/MIT projects. MIT and Cairo U started with a list of around 70 broad topics which had been selected by Joint Working Groups set up when diplomatic relations were resumed. This list could be reduced by elimination of areas in which MIT lacked expertise. Then some topics were dropped because of lack of availability of some MIT people. In January 1977 a group of fourteen MIT faculty and six program staff visited Cairo. They found Cairo U faculty members with similar interests. Together they identified topic areas in which proposals could be developed and then discussed these topics with Ministries.

Among the criteria for research projects were that they should: relate to development and be of interest to a Ministry, involve tri-partite (Cairo U, MIT, Ministry) participation, show results within a year, demonstrate an organized planning methodology, and have potential for expansion in the next phase into a more general planning framework for the Ministry involved. Proposals were then reviewed by the MIT and Cairo U Executive Committees. Nine of these were funded initially and four more approved later.

One of the original projects, Government Incentives for Small Scale Industry, was dropped after the first year because of lack of common approaches by the MIT and Cairo U investigators.

Four other projects have encountered some difficulties. The project on rural communications started with a Ministry of Local Government which was abolished. The project then continued by working directly with seven governorates. It also had working relationships on some new devices with a technical research unit of the Telephone Department of the Ministry of Transport and Communications until the top three men of that research unit resigned. Now it appears that the project has the attention of the Deputy Minister of Transport and Communications who foresees a possible reduction in need for public transport if villages have more telephonic communications.

The Housing Project has been plagued by repeated reorganizations of Ministries and by inability to find decision makers with responsibilities comparable to the subjects being investigated. As a consequence, its Cairo U investigators concluded that it was still in the experimental phase.

The Labor Migration project has also been dealing with questions which go beyond the jurisdiction of a single ministry. Several have cooperated in providing data. The Education Ministry is interested in a newly-developed computerized data base about Egyptian teachers working in Arab countries but the team was not informed about any action decisions. A decision that the Army

should start training construction workers to help make up for emigration was taken only after Cairo U President Badran and Dr. El Salmi, Director of the Development Research and Technical Planning Center, arranged for a recommendation to get on the agenda of the Higher Economic Council. Now it appears that the Ministry of Planning may undertake a manpower planning project.

Finally, the project on Health Care Delivery Systems has developed good cooperation between the Ministry of Public Health and the Faculty of Medicine at Cairo U, but these two differed with the MIT principal investigator about the nature of the research. The project had started out looking at the effectiveness of rural health care by measuring infant nutrition. Now it is looking at medical education for rural health service.

Thus the major problem has involved instances where the tri-partite criterion was either modified in the beginning (Labor Migration and Housing) or has been modified later for various reasons. Even in these cases, research results have been applied to help solve development problems for the Housing and Labor projects and are being tested for the Rural Communications project.

In several instances, the Ministries were interested in the projects because of the prestige of MIT. Sometimes an informal conference was set up at which MIT people outlined possibilities and enlisted Ministry cooperation. This happened in Electric Power, for instance. In another case, the Ministry agreed to go along because of MIT but only gradually developed real enthusiasm. This happened for Water Planning. Thus the presence of MIT injected a useful element to help overcome skepticism by Ministries that academic personnel would produce practical results. The presence of MIT also added some additional screening to the selection process, on the one hand, and facilitated Ministry cooperation because MIT could provide AID funding, on the other hand.

For projects administered by the DRTP Center, these special aspects of selection because of MIT will be missing. If Ministries choose to pay for research, the Ministry interest and cooperation will be more certain. It is to be hoped that the attitudes created by the Cairo U/MIT projects will cause the Ministries to be willing to go ahead when MIT is gone. While the interest of a Ministry is an important criterion for selection, other criteria will also be necessary.

Utilization of Research - General

The real test of relevance is the use of results from research projects for decisions about development policies and projects. Of the 13 active research projects, actions have already been taken in eight projects and are pending in four more. The most dramatic pending decision on use of Nile waters indicates that up to \$40 million worth of additional electricity can be generated without infringing on irrigation needs. Decisions on use of single-phase electrical distribution have saved significant sums. Any one of several decisions has involved enough benefits to far outweigh the costs of the MIT program. Details on the use of research results are given following the next paragraph.

Another indicator of relevance has been the willingness of Ministries to finance work beyond the funds provided by the AID/MIT/Cairo U program. For each of the research projects, the Ministries have provided contributions in kind -- personnel, transportation, use of laboratories, etc. But beyond

that, the Ministries have also contributed cash for seven of the projects -- electric power, plastics, waxy asphalt, stochastic model of Nile inflows, urban transport, economic planning, and rural communications. In two cases, contributions have come even though results have not yet been used.

Use of Research Results - Specific

Electrical - Cost-benefit analysis is now a standard working tool. This was new to both the Engineering Faculty and the Ministry.

Decision was made to use single-phase instead of three-phase for rural distribution network.

Computer models have been used to evaluate the reliability of generating stations in Lower Egypt and of the 220KV transmission network.

The Ministry has prepared a guide on the most economical maintenance schedule for generating units.

Alternative methods for the urban subtransmission networks were evaluated for reliability.

Housing - Some policy decisions of the Ministry of Housing were affected by research findings of the Housing Economy Subgroup. These were establishment of a Housing Bank, use of a graduated mortgage system, abolition of the cement subsidy.

Some ideas on prefabrication will be used by consultant engineers in Sadat City, a new project.

Other recommendations, such as manufacture of two grades of cement instead of one and elimination of reinforcing bars in the concrete courses capping brick walls, have not been adopted because of lack of a Ministry with over-all responsibility.

Plastics - A device for reducing pollution by plastics factories was adopted by the industry.

Quality control procedures have been instituted.

Asphalt - A new distilling method for petroleum produces asphalt with less wax that is more suitable for highways.

Stochastic Model of Nile Inflows - The Ministry of Irrigation has incorporated the model into the Master Water Plan, which will serve as a basis for funding requests to the World Bank.

Water Resource Planning - A stochastic dynamic programming model for controlling operation of the High Aswan Dam has been developed and will be utilized for water planning. This indicates that up to \$40 million worth of additional electricity can be generated without infringing on irrigation needs.

Groundwater - While no major changes in policies or operations have resulted yet, the increased knowledge about the Nile Delta Aquifer (and to a lesser extent,

the Nubian Aquifer) has expanded and re-oriented the thinking of those responsible for national water planning, guiding the course of investigations into directions likely to have better cost/benefit ratios.

Intercity Transport Planning - The World Bank loaned \$30 million for road maintenance based on an analysis which used the Egyptian adaptation of a highway cost model. Two links have been built using this type of analysis.

The data base developed is being used by the Ministry of Transportation to evaluate other investment proposals.

At the request of the Ministry, the model is being expanded to include alternate modes of transport (rail and canal) and an additional 4500 kilometers are being surveyed for future highway construction.

Urban Transportation - Buses have been re-routed in Cairo, express service instituted, and numbers of buses allocated to routes changed.

The Ministry used the data base to test economics of elevated road construction and for negotiations on a World Bank loan for Cairo.

Economic Planning - General equilibrium models were used to help judge the effects of adjustments in subsidies or consumer taxes.

An input-output matrix of 32 x 32 sectors was used to help set production targets for various commodities.

Of a World Bank loan of \$10 million to the Petroleum Ministry, \$1 million will be for research on pricing and other economic factors. The Bank instructed the consulting firm to use models prepared by the Cairo U/MIT project.

A social matrix of income and consumption for three urban groups (top 10%, middle 30%, bottom 60%) and a similar three rural groups has been used by the Ministries of Transport and Electricity to estimate demand.

Rural Communications - Two inventions - an electronic PABX and a telex-telegraph - are about to be tested to see what differences they make in use of transportation, economic transactions, etc., for seven villages.

The International Telecommunications Union has contracted to pay \$10,000 for a report on a socio-economic model for assessing interrelations between economic status, telecommunication structure, and communications behavior.

Labor Migration - The Higher Council has decided that the Army should start training construction workers to help offset the outmigration of 60 percent of trained construction workers.

Health - No policy or development decisions have been taken yet. The research is being re-directed.

Small Business - Discontinued in 1978.

Chapter III - Effect on Institutions

CAIRO UNIVERSITY

Several kinds of changes have occurred within Cairo U as a result of cooperation with MIT over the past several years. These concern attitudes and behavior, substantive knowledge, and skills in research methodology.

Interdisciplinary research teams - A most important change in attitude and behavior has concerned the use of inter-disciplinary research teams. Group activities in Egypt have tended to be bureaucratic with a hierarchical structure, rather than team play. The academic tradition had been for individual research and publication. (This is true generally, not only in Egypt. One of the reasons "think tanks" have proliferated in the United States is that they facilitate use of teams). A number of Cairo U investigators volunteered to the Evaluation Team members that this was their first experience with teams and in working with other disciplines and that, to their surprise, they are enjoying it. Teams have two obvious advantages - they permit larger problems to be tackled and solved more quickly and they pool different kinds of knowledge and skills.

Each of the thirteen research projects has been interdisciplinary, although in varying degrees. For the plastics project, chemical and mechanical engineers are working together. For the electrical and roads projects, engineers and economists are teamed. In some cases, American engineers might expect to do cost/benefit analyses themselves, but such questions had not been part of Egyptian engineering, either in the University or Ministries. For the economic planning project, economists are teamed with statisticians and computer experts. The housing project has had people from the Departments of Architecture, Construction Engineering, Civil Engineering, Political Science and Economics. The project with the widest scope of disciplines has been the rural communications. This includes people from seven faculties: Engineering (communications, electronics, systems) Mass Communications (radio), Political Science and Economics (both political scientists and economists), Arts (sociology), Agriculture, Public Health, Institute of Statistics. (The University has a total of 26 faculties or institutes.)

At least three of the projects have included people from other universities. For rural communications, there is a sociologist from Ain Shams and two agriculturists from El Azar. The urban transport project includes a professor from Alexandria University. Plastics has a graduate student at MIT from El Azar.

Team Selection - Another change in behavior pattern has been the selection of team members in accordance with their knowledge, ability, and available time rather than having senior people named by deans. This started because MIT professors sought out people they felt would be good partners. It caused some grumbling by deans but the President of the University and the Executive Committee stood firm. Now the pattern appears accepted and is persisting as the Center forms teams. Partly, it has become acceptable because deans are realizing that their faculties gain prestige as Ministries use research results and request more. Also, it is becoming evident that there is a possibility that most interested faculty members can be used. The teams have included senior and junior faculty members and graduate students.

Team Management - Most of the project teams meet regularly (several meet weekly). These sessions serve to exchange information and discuss plans for next steps. They foster real exchanges between disciplines and increase awareness of

various research techniques. In effect, all team members are learning details of project and team management. The team meetings are not confined to the academic personnel but also include Ministry personnel in many cases, thus fostering better working relations between academia and practical decision makers.

Peer Criticism - The Egyptian Executive Committee (discussed under the Cairo U section of Chapter IV on Management) has held biweekly meetings of all the Cairo U Principal Investigators. These have developed from information exchange into peer criticism sessions, a new phenomenon for Egypt. Undoubtedly, some of the same thing happens in team meetings. Thus another change in behavior is occurring. It appears that the same phenomenon is also occurring in meetings of the nine program coordinators of the Center.

Field Research - Some Egyptian faculty mentioned that the experience of field research was new for various junior faculty and graduate students. The willingness to engage in "hands on" research is another change in attitude and behavior.

Substantive Knowledge - The Evaluation Team did not pursue the substantive aspects of the research projects in sufficient detail to learn all the instances in which Cairo U people have acquired new substantive knowledge as a result of working with MIT people or as a result of field research, but various examples were encountered:

- A short course on reliability evaluation of electrical power systems was conducted at Cairo U for junior staff and for engineers of the Egyptian Electrical Authority. The course has been printed. Six engineers are now working on M. Sc. or Ph.D. theses in reliability evaluation or system planning.
- A five day course on polymer science and technology was given. Competence in plastics engineering technology has developed through involvement in industrial R & D, development of laboratory facilities and acquisition of a library.
- For highway engineering, concern about materials is relatively new at the university. Four junior faculty members are involved in the waxy asphalt project.
- A special two-week course was given on stochastic principles. Dealing with probabilities is new for both the university and the Ministry of Irrigation.
- The staff at Cairo U is now professionally current in technological areas relating to water resource systems. A four week course on analysis and planning for such systems was presented. University and Ministry people are both learning about the interface of sea water and fresh water in the Delta aquifer.
- As part of the rural communications project, much data about villages has been gathered which will affect courses in sociology and political science. Professor Oda (political science) says that papers can be produced as a byproduct of the project which will set out new facts, such as findings on changes in land ownership and social relationships. Changes are exceeding government perceptions, he says, citing a weekly market in a province which has a turnover of LE 1 million a week.

One indicator of confidence in substantive matters is the authorship of papers. As the program has gone on, Egyptians have produced more papers on their own. The following table attempts to show authorship for all papers. The count may not be precise because some working papers may have been counted inadvertently or a few titles may have been omitted when more than one was published under a single cover.

<u>Authorship</u>	<u>1971</u>	<u>1978</u>	<u>1979</u>	<u>3 mos. 1980</u>
MIT	2	12	27	5
MIT/Cairo U	1	10	9	3
Cairo U	1	7	16	3
Cairo U/Ministry	1	-	2	3
Entire Team	-	2	2	1
	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL	5	31	56	15

Research Methodology - The third kind of change which, along with the changes in attitude and behavior, is crucial for this project, is that of skill in research methodology. Each of the Cairo U participants in teams is learning about project scheduling and team management. MIT has emphasized the importance of research plans and of budgets, although some of the Principal Investigators said they would like some short courses on such subjects. Apparently they are discovering as they try their hands at preparing proposals on behalf of the Center for Ministries that they have not mastered all aspects as a result of working alongside MIT Principal Investigators. The first year, MIT budgeted both the dollars and pounds. The second year Egyptians took responsibility for pounds. The third year budgets were cooperative.

In addition to general principles of research administration, Cairo U people have learned various special research techniques. One of the most pervasive has been use of models and computers. This has occurred in most of the projects. Significant data banks have been compiled in various fields which can be useful for much future research. Other research or analytical techniques about which knowledge has been acquired have included:

- cost/benefit analyses
- systems analysis
- The Ras method of updating input-output matrices
- designing and administering questionnaires
- sampling. (Dr. Bendari, a consultant for the rural communications project suggested a "multi-stage" clustering which Prof. Ithiel Pool of MIT characterized as a new and useful approach for sampling villages.)

Number of People Trained - It is difficult to know exactly how many people at Cairo U have had enough exposure to bring about such a change in skill that research tasks could be conducted without MIT participation. The most exposure has probably come for Principal Investigators, but where all team members have regularly attended meetings, the effect is more general. Sometimes the diffusion effect is surprising for junior personnel who are receptive because of the prestige of the activity.

Estimates are that between 40 and 50 faculty members have had "continuous and substantial" involvement in each of the last three years. This is less than the total number which have been employed, which was 63 in 1979. If the annual turnover of participating faculty has been about 25 percent, the total number of faculty involved during the program would be in the mid-nineties.

Faculty members have two incentives for involvement. One is professional advancement and reputation. The other is money. The Executive Committee early in the program worked out a scale of supplemental pay by the hour, starting at LE 7 for full professors and going down to LE 1 for students. The rates were related to those paid by foreign firms in Cairo and to earnings of faculty members working as consultants. (The program funds came from FL 480 and are tax free. The Center, which does not have tax free funds, is paying LE 10 to give full professors about the same net pay). A faculty member might receive about 150 percent of his regular base pay for work on a research project.

The members of the evaluation team were skeptical at first about this policy of extra pay. We wondered whether it could be continued after AID withdrew support. We wondered whether it tended to distort the appearance of acceptance by Cairo U people of new ways of behavior. Eventually we concluded that such payments are part of the regular pattern in Egypt, that many faculty could have alternate source of supplemental income and that the pattern can continue with Ministry financing of research.

For graduate students, "continuous and substantial" involvement has included 32-36 people each year, reaching 40 this year. In addition, other students (some of them undergraduate) have worked at interviewing, coding, data processing, etc. Total employment of students in 1979 was 115. This employment varied between one and several months. Over the three years, probably twice that number have been involved.

(To give some perspective to these figures, the University has 130,000 students of which 20 percent are non-Egyptian. Of the total, 25,000 are graduate students. The faculty numbers about 3,000.)

In addition, between 15 and 20 graduate fellows have studied at Cambridge (as one Egyptian principal investigator said: "A man is different after an academic year there").

Finally, some university people received a few concentrated days of exposure in seminars and special training workshops. In addition to many of the faculty and students cited above, these may have reached another 150-175 university people.

Since the program had no target on exposure, the Evaluation Team had no criteria for judgment about quantities or quality. It seems likely that

exposure in the various departments of the Faculty of Engineering has been quite good, somewhat less in the Faculty of Political Science and Economics, strong in the Institute of Statistics (including the computer center) and spotty in the other four or five faculties involved. MIT does not have personnel for some faculties which the Center hopes to involve in its projects (although the Egyptian teams have been broader than MIT in several instances - MIT participation has been in the mid-twenties for faculty, between 3 and 12 research staff, and a growing number of graduate students, reaching the mid-forties this year).

Lack of Specialized Manpower - A major problem in increasing the contribution of Cairo U to better development planning in the Ministries is not a lack of desire, knowledge or cooperation but simply the lack of manpower. Departments in Cairo U are small by American standards and only some of the staff are qualified to do advanced technical investigation. Those who are good are as up-to-date as the average professor in American universities of comparable faculty size. They get the proceedings of American and European technical societies. Many are members of those societies. Often they joined when studying for U.S. graduate degrees.

The lack of manpower was encountered in several areas. In electrical power, the Ministry and University people know each other, meet often and are involved in several cooperative research projects. It is evident that other technical areas such as system stability, switching controls, telemetering could be investigated if Cairo U's electrical engineering department had expertise. In highway engineering, Cairo U had no capability 10 years ago. Now it has one full professor and a recently added associate professor. They have to teach 800 students and also lecture at two other universities. A similar problem exists in plastics.

MINISTRIES

Seven Ministries are participating actively in research projects. These are Planning, Transport and Communications, Electricity and Energy, Petroleum, Health (including the Family Planning Institute), Irrigation, and Land Reclamation. In addition, several other Ministries have been involved in supplying or receiving information but have not been full-fledged members of research teams. Thus the Housing Project has dealt with the Ministry of Housing, Ministry of Reconstruction, Ministry of Planning, Ministry of Local Government (now abolished) and the General Organization of Physical Planning. The Labor Migration Project has worked with the Ministry of Education on teachers, the Ministry of Health on doctors and nurses, the Ministry of Housing on construction workers, the Ministry of Labor, the Ministry of Planning and the Engineers Union.

Governorates - Several of the projects have also dealt with district governorates. The Rural Communications Project has worked closely with seven governorates where it will test the new telephonic devices and also did research in 149 villages chosen from the 22 rural governorates. The Health Project got information on nutrition in parts of 17 rural governorates. In both cases, the research and planning units of the governorates helped administer questionnaires. Other projects with some contact with governorates have included Urban Transport, Inter-city Transport, Electric Power, Waxy Asphalt and Water Resource Planning.

Examples of Ministry Participation - The pattern of participation by ministries has varied. The Ministry of Electricity and Energy had an organization chart which was spotted at all levels with Cairo U engineering graduates who are involved in cooperative research projects with the University. Some of them were also part-time members of the faculty. Sub-projects are chosen at a high level such as the Vice Minister or Chief Operating Officer. Each sub-project has a Cairo U and Ministry co-investigator.

The Ministry of Transport and Communications is now active on three projects. For each, the Vice Minister is the active leader. About 19 employees work on the Urban Transportation Project with three spending eight or more months. They took the lead in surveying traffic patterns and public transport passenger movements. For the Intercity Transportation Project, six economists and engineers participate actively and 46 employees have helped provide basic data for a multi-modal model (rail, highway, and canal) for freight and passenger traffic. For the Rural Communications Project, the Economics Department is taking the lead on studying the current pattern of traffic for seven experimental villages in order to see what changes occur when new telephonic communications devices are used. The Vice-Minister says that the Ministry is planning to establish a large research institute to continue the type of advanced studies these projects have initiated. He anticipates that the Academy of Scientific Research and Technology will be involved and that Cairo U staff will provide most of the personnel. Previously, the Ministry had been unable to find private consulting firms which could deal with similar types of questions. The Ministry has its own computer and so can do much of the work involved in models on such topics as car ownership, traffic assignment, parking, highway cost, etc.

In the Ministry of Planning, direct supervision came from the Minister (now promoted to be one of six Deputy Prime Ministers) who requested various models, received the results and made staff available. About 15 middle level professional people have organized the provision of data and received some supplemental payments. It appears that the day-to-day work of coordinating these Ministry people, who head sections on various commodities and sectors, has fallen to the Cairo U Principal Investigator. In fact, requests come from the Minister (or now from the Vice-Minister) to the Principal Investigator who then goes to the staff with whom he has developed good working relations. To some extent, one of the section chiefs coordinates the others because of force of personality rather than official status. The Institute of National Planning, which is affiliated with the Ministry, has dealt with such topics as monetary policies, balance of payments, etc. While it can use the models developed by the Cairo U/MIT project, it was not the part of the Ministry from which the data would come.

Ministry Organization - According to the Cairo U Executive Committee for Cairo U/MIT project, they wanted a core in each Ministry. Most Ministries have some sort of research and development organization. These units sometimes lacked access to decision makers. In other cases, they lacked enough able staff because the better scientists preferred the status of being with the University. Consequently, the units were often able to deal only with small specific problems. Personnel from these units have often been the ones assigned to serve with the Cairo U/MIT research projects. This has given the units more status and funds. It is not certain that a continuing pattern has evolved for when Ministries will use their captive staffs and when they will turn to the Center and Cairo U for faculty assistance.

Changes in Skills - The effects on the Ministries often parallel those described earlier for Cairo U - changes in attitudes and behavior, increases in substantive knowledge, and acquisition of skills in research methodology. As members of the teams, Ministry personnel have participated in the weekly meetings, have attended the special training sections, have supervised the collection (and often the processing) of data. Thus the various examples cited in the preceding section are also pertinent here.

However, one would not expect the influence of the program to be the same for the Ministries as for the University. Their role is different. Ministries are the users of research findings as well as co-producers. (The University may also use findings for new courses or to enrich existing courses, but this is a byproduct). As users, the Ministries need to educate and involve decision makers as well as researchers. This difference is recognized in the title used for the chief member of a tri-partite team. While the Cairo U and MIT people are called Principal Investigators, the Ministry people are called Supervisors. In the future, the Ministries will also be expected to request studies or to respond to proposals. Thus the Ministries must be able to define problems but may not necessarily have to plan the research methodology.

Although some of the Ministry personnel in research and development or planning units may be as able scientists as the faculty members, other Ministry researchers will often have more specialized and narrow responsibilities, such as commodity specialists.

Despite these differences between the knowledge and skill needs of the University and the Ministries, it appeared to the team that the research projects which were progressing most satisfactorily were those in which the partnership was nearly equal. Ministry personnel, with their intimate knowledge of practical operations, could make important contributions in adapting models to the Egyptian situation, in interpreting information, etc. Moreover, the Ministries often have laboratories which are better than those of the University. This is true for highway engineering, petroleum refining, chemicals (at the National Research Center of the Academy of Scientific Research and Technology) and plastics.

Changes in Attitude - Apparently a number of the Ministries started with an attitude of skepticism about the Cairo U/MIT program. This consisted of two elements -- that academics could produce practical results and that some of the esoteric, sophisticated concepts proposed by MIT people would really be pertinent to Egypt. Generally, this skepticism has disappeared. The new attitude is shown in various ways. The first was in assignment of more personnel and in more active participation by senior officials. The Evaluation Team, in what was admittedly a somewhat subjective judgment, rated the type of participation excellent for nine or ten of the thirteen projects. Some of these had good cooperation and interest but needed better internal coordination. Economic Planning was an example. Participation was not considered as good for three projects. The Health project has good Ministry-Cairo U rapport but has failed to get non-medical counterparts from Cairo U for the MIT investigators. Labor Migration and Housing have both been broader research projects than any one Ministry. Perhaps these latter three projects have not progressed as well in enlisting Ministry enthusiasm because they appear to have lacked some unifying concepts or models.

Another indicator that Ministries are accepting the use of academic research is their willingness to supplement AID financing for existing projects or their willingness to finance new projects. This has happened for nine of the projects (including labor and housing, for spin-off activities) and for six Ministries. Also, the assistance of governorates accounts for the fact that 35 percent of budgeted pounds for the rural communications project remain unused.

Numbers Affected - Counting the number of Ministry people who have received training through this program is more difficult than for the University because not all of them have been on the program's payroll. In 1979, there were 219 consultants for all the projects. Most of these came from Ministries. If the annual turnover rate for these people was as much as 30 percent, as many as 350 people would have received some experience and training by working on Cairo U./MIT research projects.

In addition, other personnel attended conferences, seminars, and workshops. Estimated attendance at these is shown in the following table:

At Conferences

Housing (Jan. '78)	200
Transportation (June '78)	200
Program Conference (Jan. '80)	30
Health and Nutrition (July '78)	100

At Short Courses and Workshops

Plastics (Jan. '78)	50
Water Resources (June '78)	70
Electric Power (Jan. '79)	50
Housing (Jan. '80)	70

At Seminars

Small Scale Industries (June '78)	30
Water Resources (Mar. '78)	30
Water Resources (Jan. '78) (2)	60
Housing (Jan. '79)	100
	<u>1240</u>

Of the total shown above, perhaps 250-300 people were from Cairo U and an equal number were already part of research teams from Ministries. That leaves 600-750 other attendees, who came primarily from Ministries and industries but partly from other Universities.

As with the University, there are no targets against which to judge the numbers of people in Ministries who have acquired new skills in research methodology. It seems likely that the critical factor concerns people who will request and use research, rather than who will help perform it. Moreover, the effectiveness of these people will probably depend not only on their numbers but also on the nature of the coordinating organization within each Ministry (or each major department in Ministries with major subdivisions).

Chapter IV - Management

USAID

The USAID economist, James Norris, has been the project officer for the entire period. This continuity has been useful. Norris has been interested in the project, finding many of the reports useful in his own work. For example, he cited the value of some of the housing reports to him, even though these reports have not led to many action decisions by the Government of Egypt. Norris has kept informed about what was happening and has met frequently with key people, sometimes offering suggestions.

MIT testified that USAID responded rapidly and positively to requests and someone in the USAID commented that Norris seemed to provide more support for his program than was the pattern for the USAID. On the other hand, the USAID has consciously followed the policy that the project would succeed in its purpose of institutionalization only if MIT and Cairo U were left to solve their own problems. In view of the degree of detail in the Project Agreement about organization of the Liaison Office and Center, it might have been wise for the USAID to have helped analyze possible changes from the Project Agreement as the organization took place.

The USAID has not served as an intermediary with Ministries. In contrast, the World Bank has specified with both the Ministry of Electricity and Energy and the Ministry of Transportation and Communication that they are to follow criteria set forth in reports from the Cairo U/MIT program.

In the future, USAID might do better in passing on information. AID/Washington people commented that they were relatively ignorant and hence skeptical about the program. They had received long progress reports and evaluations and long research reports. Apparently there was little in the way of brief reports about significant events.

The other area for information exchange would be with the Center. If it knew more about AID programs, it could be of service from time to time in providing information from data banks or arranging contact with knowledgeable faculty. Similarly, AID should be aware of projects undertaken by the Center outside of AID/MIT funding.

AID/W Management

AID/W backstopping of this program has suffered because of frequent turnover in the designated project officer. This has sometimes meant that neither the USAID nor the contractor (MIT) had anyone in the Near East Bureau to whom they could turn for prompt answers or for effective support. Rather more than usual, AID/W's role appears to have been to ask questions. This general attitude of skepticism may have influenced the project officer when there was one so that he gave the activity little attention. It is unfortunate that after nearly three years, AID/W has not adjusted to the reality of having a success story. A new Project Officer has recently been named. Because of his recent appointment, he will need support. The Evaluation team suggests that both the NE Tech Office and the desk can be helpful in the contract negotiations which will be required to arrange for the continuation of the project.

MIT Management

The program was a follow-on of a grant from AID which enabled MIT to enhance its capability in technology transfer. The Director of this early Technology Adaptation Program, Professor Fred Moavenzadeh, has also served as director of the program with Cairo U. Assisting him have been an Executive Committee and an Advisory Committee.

MIT Committees - Recently, MIT has reorganized this committee structure. The Executive Committee is replaced by a Policy Committee with somewhat different membership. The change of name and personnel apparently indicates that the Committee is not expected to be involved with particulars of administration, leaving that to Director Moavenzadeh. The Advisory Committee is also somewhat re-cast, comprising a few more people serving in an ex-officio capacity and fewer appointed because of personal interest. The Evaluation Team did not go into detail on the background for these changes. However, it is to be hoped that the reconstituted Committees can serve to encourage more overall planning for the project and that the character of the Advisory Committee can strengthen the hand of the Director in coordinating the individual Principal Investigators.

Director - The Director has devoted almost full time to this program, serving also as a Principal Investigator for the research project on Inter-City Transport Planning. He keeps close track of time and budget reports of the Principal Investigators and travels frequently to Cairo to monitor the activity there.

Administrative Support - Administrative support has been excellent. The Director's staff has included a Technical Officer who serves as a general assistant and arranges publications, an Administrative Officer, and a Liaison Officer in Cairo. In addition, the Controller's Office of MIT keeps the final accounts and visits Cairo for instruction and audits. The Provost of MIT, who signed the original agreement with Cairo U, visited Cairo in January and interviewed each Principal Investigator, providing a basis for his decision that MIT should seek to continue with Part II of this contract. The Director of Personnel for MIT helped set up a manual for personnel administration and went to Cairo twice last fall, partly to work on job descriptions for the new Center. Altogether 31 trips from Cambridge to Cairo were made for administrative purposes in FY 1979. This categorization of "administrative purposes" covers all trips not related to specific research projects. Thus it includes general technical assistance.

Faculty Participation - The degree of participation by senior faculty of MIT as individuals in the various research projects has been excellent. Good liaison is maintained with Cairo U by frequent trips (some 67 trips in 1979 from Cambridge to Cairo, while Cairo U personnel made 45 trips to Cambridge), telex, telephone, and mail. MIT personnel have written some 46 papers on their own and collaborated on another 23. However, the MIT Principal Investigators have met as a group only once in Cambridge and once in Cairo during the life of the program. It appears that the Investigators are not fully aware of the institutional purpose of the program. Some of them say they are interested only in research and yet it is evident that some who speak this way have become interested in the Ministry and Faculty with which they work and offer advice when asked about topics outside their research projects. It would appear that these MIT people might have even more impact if they were more aware of the institutional targets of trained people and improved procedures.

Programming - The combination of able investigators, a conscientious Project Director and the committees in both institutions has resulted in good programming for research projects. This can be judged by Ministry participation, financial support, and use of research findings. However, looking for evidence that the program was achieving its overall objectives, we did not find specific targets, operating plans, or indicators. A particular weakness seemed to be the lack of definitive plans for transition from MIT leadership to Cairo U leadership, and eventually Ministry initiative. On research projects, there seems to be a gradual evolution, with Cairo U people taking more initiative, planning follow-on activities, and writing more papers. Nevertheless, the uniform budget reductions first proposed for each active research project do not reflect the various phases of the projects - experimental, demonstration, or institutional - nor do they encourage a shift toward Egyptian autonomy.

Institutionalization - The Evaluation of the Technological Planning Program (undated) prepared by program personnel speaks of the institutional aspect of the program as if it concerned only the Center, although in conversation MIT people have sometimes volunteered comments about changes in attitudes and procedures at the University and the Ministries. The Evaluation report section on each research project stresses substantive results rather than the institutional changes.

The aforementioned Report says that the Liaison Office, in addition to providing the means through which MIT can meet its contractual obligations to AID, represents an organizational model for the Center, with many policies and procedures which can be transferable. Yet when the Center was established, the whole Liaison Office operation was apparently regarded as necessary for operation of the MIT contract. The problem may be traced back to Annex 1 of the Project Agreement which says that the Liaison Office will be maintained within the Institute in order to carry out the participating US institution's administrative and contractual obligations to AID.

Until the Center was organized, there was no Director in Cairo who was fully comparable to the MIT Director. The Vice President for Research at Cairo U had many other interests. Hence, the Executive Committee in Cairo exercised considerable responsibility. Apparently, when the Center was organized, management analysis on the relationship of the two Directors and the role of the Executive Committee was not done. Up to now, there are two parallel operations in the Center and Liaison Office, with cooperation at some points and friction at some.

The Liaison Office in Cairo is headed by a Liaison Officer and an Administrative Officer. The Liaison Officer, Mr. James McCarthy, is the fourth incumbent and a recent arrival. The Administrative Officer is Gen. A. Mamdouh Hassan, a retired Police Officer with foreign experience. The staff consists of three accountants and seven other employees, responsible for travel and transportation, translation and secretarial work, conference and seminar arrangements, library, etc. The Liaison Office provides good administrative support for the 13 research projects, serving both the Cairo U and MIT Principal Investigators, but not helping other activities of the Center.

Management at Cairo University

The President of Cairo University, Dr. Badran, takes a keen interest in the program. He has frequent contact with members of the Executive Committee

and with the Director of the Development Research and Technical Planning Center. Usually Dr. Badran sees MIT Program Director Moavenzadeh when he visits Cairo. Dr. Badran also chairs the Board of Directors of the Center.

Considerable effort by the President was required to get the Center established. A decree was obtained from President Sadat and the charter was approved by the Faculty. Arrangements were made for the Center to be given working capital equivalent to the amount of the overhead paid by MIT to Cairo University. Good offices and conference rooms for both the Center and Liaison Office were provided in one part of a new University building.

The original arrangements between MIT and Cairo U called for each university to set up an Executive Committee. Both Committees must approve new research projects and are involved in other decisions on the budget and program. The Cairo Committee is composed of three senior and dedicated members. The Chairman, Dr. Shafei, is an economist who was formerly a Dean and a Minister. The other members are Dr. Shahbender, Dean of the Cancer Institute, and Dr. Kabil, Dean of Engineering. Like other participants in the program, they receive stipends. This Committee has provided strong guidance and continuity through changes in University administration.

The Committee has set up bi-weekly meetings of all the Principal Investigators. At each meeting, one investigator reports on what is happening in his project. These meetings have evolved from information sessions to a forum for peer criticism. They are thus serving as a mechanism for quality control of research results.

Since the first research projects began with MIT professors finding compatible Cairo professors to work with, the selection process differed from the traditional one of deans choosing senior people. The new pattern of choosing people for teams on the basis of competence and interest has been supported by the President and Executive Committee.

Several of the Cairo Principal Investigators volunteered that, as a result of working with a Principal Investigator from MIT as well as through trial and error, they were learning how to manage research projects effectively. Despite their growing confidence and effectiveness, some of the Investigators suggested that they would like some formal short courses on research budgeting and management.

Management of the Development Research and Technical Planning Center

The Center was formed in 1979. It is difficult to set an exact date. Following a decree by President Sadat, a Director was appointed in the spring. Gradually a charter was approved by the University, by-laws were established and a Board appointed. Formal inauguration occurred in January 1980. One of the events at that time was a Program Conference attended by all the Principal Investigators from both Cairo U and MIT.

By-laws and sources of funds - The by-laws set a three-fold objective: to develop and support research studies, to conduct training programs and to provide consultation to help achieve the development goals of Egypt. In due time, it may evolve to an institute which can offer degrees, according to the by-laws. This possibility was also mentioned by Dr. Badran. The by-laws

state that financial resources are made up of: (a) sums paid by Ministries, other government agencies and foreign organizations; (b) consulting and training services provided by the Center for fees and (c) sums granted by USAID. Apparently, the gift from the University of overhead received from MIT was interpreted to be acceptable under this last provision. Thus far, the Center has been very cautious in using this working capital.

The last article of the by-laws states that the CU/MIT Project is "considered one of the main programs of the Center and the project agreement between Cairo U and USAID of August 17, 1978 will remain on terms of reference." This adds a complication since that agreement refers to a new Joint Advisory Committee with a membership like that of the Board of Directors to replace a previous Advisory Committee. No mention is made of an Executive Committee in the by-laws.

Board of Directors - The Center has a Board of Directors of nine people, six of whom are from the University (counting the Center Director) and three of whom are technically from Ministries. One of the members with Ministerial status is Dr. Hassan Ismail, who is now President of the Academy of Scientific Research and Technology. He is a former President of Cairo U and former Minister of Education. Since the Academy is charged with coordination of all research in Egypt, Dr. Ismail provides an important link to Egyptian scientific policy. Another Ministerial member is an adviser to the Prime Minister. Thus only one client Ministry, Planning, is now represented on the Board. There is no representative from industry, although some current research projects are industrial and others are sure to emerge. Some funds have come from industry. One of the faculty members of the Board is Dr. Shafei of the Cairo U/MIT Executive Committee and the other two members of this Committee have been invited to the Board meetings.

The by-laws state that the Board is supposed to meet monthly but it has not done so. It has recently decided to set up an Executive Committee for decisions between Board meetings.

Director - The Director of the Center is Dr. Aly El Salmi. He has a Ph.D. in Business Administration from Indiana University and had taught in the Faculty of Commerce where he is now a Professor, served as an assistant to Dr. Badran when the latter was Vice-President of the University, and been a Minister for Follow-up and Control (a kind of Cabinet executive secretary).

Some of the overhead support of the Center consists of regular payments from the MIT program. However, MIT has kept this allocation under control of the Liaison Office, which treats the Center as if it were another research project and requires that the Center provide the same documentation for each expenditure as do the Principal Investigators.

Program Coordinators - Dr. El Salmi has appointed nine senior faculty members on a part-time basis to serve as program coordinators for the subject matter areas selected by the Center as matters of interest. These are technological planning, economics, energy, health, Sinai and physical development, local government and regional planning, population, educational technology, and management development. As can be seen, the Center anticipates work in several areas not touched by the Cairo U/MIT program. Dr. El Salmi stated that arrangements will be made for inter-disciplinary teams even though some of the program areas are generally treated as a single discipline.

Three of the coordinators are also Principal Investigators in the Cairo U/MIT program and a fourth coordinator has been a consultant to several Cairo U/MIT research projects. Apparently they have carried over the concept of peer criticism from the bi-weekly meetings of the Executive Committee with Cairo U Principal Investigators but the two groups do not meet together. In an informal way, then, Program Coordinators are providing some elements of a mechanism for project selection and quality control. The informal transference of procedures by the three Principal Investigators should be strengthened by organizational and procedural changes deliberately designed to ensure quality control.

Center Activities - The Director and Center have been active. More than 30 projects are being discussed. New funds actually received by the Center as of April totalled L 232,335. This total included LE 110,000 for non-specified grants from five agencies - Ministry of Higher Education, Academy of Scientific Research and Technology, Family Planning and Population Agency, Ministry of Planning and Secretariat of Local Government. The remainder, LE 122,335, was for contracts with the General Organization for Physical Planning, Egyptian Cement Office, Ministry of Agriculture, and Petroleum Ministry (waxy asphalt). Since the pound funds administered by the Liaison Office are from P.L. 480 sources and are tax free according to a decision of the Ministry of Finance, any additional pound funds received for CU/MIT projects cannot be co-mingled with funds administered by the Liaison Office. Instead they go to the Center. This has happened for several projects and was due to happen with a \$10,000 International Telecommunications Union contract for a report on a special aspect of the CU/MIT Rural Communications Project.

The Center has held several seminars and management training workshops.

Some senior Egyptian officials expressed concern that the Center may spread itself too thin, so that its effectiveness in obtaining and managing research may suffer.

Center Employees - In May 1980, the Center had eleven full-time employees besides the janitorial and maintenance crew. These included typist-secretaries, accountants, librarian, public relations, procurement, and administrative officers. Three of these are paid by the Cairo U/MIT program. In addition, there are eight part-time employees, including three working on developing an information data system, four on industrial research and one research assistant. Two of the data systems people are paid by Cairo U/MIT.

Some of the functions performed by the Center's present staff for new research activities duplicate those performed by the Liaison Office for the Cairo U/MIT projects. Dr. El Salmi says he would be glad to have the offices gradually merge and would pay the former Liaison Office employees the same net salaries they now receive.

For the Cairo U/MIT program, hourly pay rates have been established to supplement base pay received by faculty members or Ministry personnel. The Center is paying comparable rates, which are about 30 percent higher because the Center's funds are not tax free.

Chapter V - Summary of Findings

1. Research projects - Findings and recommendations have been adopted by development Ministries in a substantial number of instances. In some cases these findings have reduced costs of development or maintenance. In other cases, they have formed the basis of development programs financed by the World Bank. For some research projects, more work is needed before conclusions can be reached. For one project, the problem is to find an action Ministry. One project has been discontinued and another has been revised.
2. Cairo U - Significant institutional changes have occurred in terms of attitudes and skills. Individuals from seven faculties are involved in inter-disciplinary team research of practical interest to Ministries. They are working cooperatively with Ministry officials. Researchers are being selected by ability rather than seniority. Peer criticism of methods and results is occurring. Several hundred faculty members and students have had exposure to innovations in research methodology and management. Of this number, perhaps 200 have had enough exposure to have mastered new skills.
3. Ministries - Parallel changes are occurring in development-oriented Ministries, although the situation varies among Ministries. Seven Ministries can be classified as sponsors or active participants in research; some others have provided information. Five Ministries and two other organizations have provided funds for research, in addition to such in-kind support as staff, transport, or laboratories. Six sponsoring Ministries have taken action based on research findings or recommendations (two other agencies have also used findings). These indicate changes in attitude about the usefulness of working with academic personnel on development-related research. In some cases, Ministries have planning or research units which can coordinate Ministry work and provide liaison with the University. In other cases, the effective contact must be at the Ministerial or deputy Minister-level. We did not hear of any instance where Ministries have yet made any organization changes in order to work more easily with the Cairo U research program. The skill changes at Ministries are more difficult to characterize than for the University. For a few projects, Ministry people have been full-fledged members of research teams and thus exposed to all methodological aspects of the task. In other cases, Ministry employees have learned particular supporting skills such as sampling, interviewing, coding questionnaires, etc. In some instances, the Ministry personnel have been occupied in providing information, with no particular change in skills. A number of key Ministry officials have been sent to MIT for post graduate work or short courses.
4. DRPT Center - Recently established, the Center has only begun to accept new projects. It seems to have a good start. There is some danger that it may be trying to do too much at once, with a possibility that it could put so much attention on management training that it would neglect the establishment of quality control for research. A lack of cooperation between the Liaison Office and the Center hurts the effectiveness of both.

5. MIT - A general consensus among Ministry and University officials exists that the Cairo U/MIT program should continue about three years more to broaden exposure to innovative research methods, strengthen behavioral patterns, enhance skills and expand the conversion of Ministry decision makers by demonstrating more successes. There is a need for more formal training, for consultation by MIT as well as research partnership and for more graduate fellowships.

Chapter VI - Comments

An Effective Approach to Technical Assistance

Most of the MIT professors in the program would probably characterize their activity as research rather than technical assistance. Nevertheless, they are engaged in a form of technology transfer in relation to both the problem being researched and the methodology and management of research. As demonstrated by the results, the MIT approach to technical assistance has been highly effective. This is probably attributable to several characteristics.

First is undoubtedly the nature of the people involved. The MIT faculty who chose to take part in this program are able and enthusiastic people who have won the respect and cooperation of their Egyptian colleagues.

Second, the relationship has been more one of partnership than of teacher-student. The research teams have worked together to define the problem, to devise possible solutions, to plan the collection of data, and to analyze the findings. Each party had something to offer the other. In such an ambience, people do not have to be defensive and to resist new ideas in order to keep self-respect.

Finally, experience in other countries has demonstrated that advisers who come and go may often be more effective than those who are resident in the developing country. When the adviser comes for a brief stay, he and his colleagues are apt to plan the course of action for the next period. Sometimes resident advisers fall into the habit of dealing with daily problems as they arise and do not select activities in accordance with a plan. After the adviser departs, the local partner is forced to take responsibility for decisions. If the adviser were resident, the local person might be tempted to play safe by shifting responsibility. The scheduled return of the adviser creates an artificial deadline by which the local team tries to complete certain tasks. In contrast, when the adviser is resident, there is less compulsion to meet a schedule.

For these various reasons, the MIT methods should be continued during the second part of the contract. The desirable change will be to shift the planning focus from a series of independent research projects to a coordinated effort to reach certain mutually agreed institutional targets. This will also mean that the research approach to technical assistance should be reinforced by some more formal training activities. These will build on the acceptance gained in the research projects and will still have the advantages of able, intermittent advisers.

On the Nature of the Program

The primary aim of this AID program is to build an autonomous, institutionalized capability in the host country. As noted elsewhere, we see this as including:

- a. an experimentation phase - testing whether the techniques and processes will work;
- b. demonstration in which the necessary attitudes and skills are transferred;
- c. an institution building phase wherein steps are taken to insure that the resources and organizations necessary to meet the national needs are present and viable.

The experimental/demonstration phase consisted primarily of tri-partite, multidisciplinary problem solving. It was a form of learning-by-doing, based largely upon the tried and proven techniques of graduate education through research. However, the individual projects were a means to an end - not the end in itself. It was, of course, essential that most of the projects produce useful results but, in a sense, these results can be considered serendipitous. The real goal remains the transfer and institutionalizing of attitudes and skills.

Taken alone, such problem-solving activity has a tendency to perpetuate itself. Especially when it includes research, the process often reveals as many new problems as it solves, each fascinating the participants and thus reinforcing the normal pressures on university professors to continually acquire follow-on, sponsored research. Hence there is a strong tendency for the principals involved in AID projects to look upon the obtaining of continuing technical results as the measure of success and to optimize the chances for such results instead of focussing on establishment of an autonomous capability in the host country institutions.

MIT chose to use the powerful technique of joint research (problem solving) to demonstrate the potential of university-government cooperation, and to teach principles to a limited number of Egyptians. To a large degree they were successful in achieving this preliminary goal. Nevertheless, the evaluation team feels that the program as a whole will fail to reach its goal on time unless:

- a. the learning-by-doing method is supplemented by some specific training aimed toward filling gaps in skills and numbers;
- b. the transfer of technical leadership is accelerated;
- c. definite milestones are established now to measure the degree of transition achieved in the future;
- d. progress toward those milestones is periodically assessed.

In short, the emphasis must now change from technical results to the more difficult and socially-oriented task of institution building. This will require a gradual but planned transition of responsibilities and decision-making from MIT to the Egyptian counterparts - even if the result is a deceleration of the output of the research projects. We found no evidence of adequate planning for such a transition by either AID or MIT.

One aspect of the transition deserves additional comment: the transfer of administrative and program management skills from the Liaison Office to the DRTPC. We feel that the establishment of such a center was a wise step and that its quality and reputation are vital to success of the program. It is a keystone in the institution building process. Although it was originally intended that the Liaison Office be a prototype or even a nucleus of the DRTPC, progress toward this end now seems to be stymied. No doubt there are a number of reasons, yet we feel that the objective is still valid and a way to reach it, consistent with the Egyptian environment, must be found. In our opinion, elements of the Liaison Office should gradually be merged with the Center. If feasible, the present personnel of the Liaison Office should be transferred with the functions so that the Center may benefit quickly from their experience. Some procedures may need to be modified to fit with those of the University of Cairo, but this should be done without sacrificing the principles of good administration. With personnel from

Cairo U and MIT using the same organization, the evolution in the Center of such essentials as financial control, quality control and responsive logistic support should be accelerated. This merging can occur even under a continuing direct contract between MIT and AID.

Finally, we believe that to bring this promising program to a successful conclusion, careful, joint planning and teamwork by AID and MIT are needed.

Phasing

The schematic model we conceived for this program has four phases: experimental, pilot demonstration, institutionalization, and replication. In the judgment of the Cairo U Principal Investigators about their research projects and from the facts related to the Evaluation Team, it is evident that the various research projects are in different phases.

For example, the housing people think their activity is still in the experimental stage because they have not yet enlisted the active participation of a Ministry, although they are well-advanced in some aspects of research and have an excellent reporting system. By contrast, the electric power people think they have reached the replication stage. That is, their proposals are being implemented with the full cooperation of the Ministry and they are confident they could help a University and Ministry in a neighboring country. Moreover, the Ministry and University are proceeding to tackle new problems on their own. Such variations in the phasing of research projects can be expected.

Recognizing the conflict between AID's objective to make Egyptian counterparts autonomous and the inherent characteristic of research continuously to open new avenues for inquiry as well as the understandable motivations of University researchers to keep research going, MIT now needs to exert stronger central direction if the program is to be brought to a successful conclusion.

During the second part of the contract, the pattern of MIT assistance and participation should consider the institutional phases as well as the state of the research. During the first part of the contract, the research plan affected the number of trips by Principal Investigators, the number of graduate students involved in Cairo and Cambridge, the amount and type of short-term training, etc. In the future, budgets might conclude that, for example, more students should be involved because some departments at Cairo U need reinforcement. This kind of assistance might be advisable even for a research project in an advanced phase of institutionalization where little MIT input is needed for on-going research activities. Possible candidates are plastics, electric power and waxy asphalt.

In some cases, MIT consultation as called for by Cairo U or a Ministry is all that is needed. However, MIT may also need to consider the halo effect. In some instances, Ministry people formed an alliance with Cairo U because of MIT prestige. Gradual withdrawal by MIT is necessary for institutionalization but MIT may need to continue some affiliation with a research project to avoid any implication of disowning the work. Such adjustments for reasons of emphasis

on institution building will take careful planning and may be complicated by the requirement for MIT professors to commit fifty percent of their time to research.

At this stage of the program, one needs to place more emphasis on costs and benefits or cost effectiveness. For example, one might need to weigh costs of trips between Cambridge and Cairo against support of a graduate student and assess which seems more likely to benefit the long-run institutional capability of Cairo University.

Relationship to Governorates

A change is occurring in the Arab Republic of Egypt government structure, with more authority and responsibility being assigned to governorates. Ministries have overall planning responsibilities, yet governorates are themselves encouraged to solve local problems and undertake some planning. Researchers for two projects - rural communications and health services delivery - have worked extensively with governorates in gathering information and others have had some contact. The DRTP Center has held a conference on local government and appointed a program coordinator for this subject.

One proposal is that governorates would assume responsibility for Universities located in their areas. A corresponding suggestion by Hassan Ismail, President of the Academy of Scientific Research and Technology, is that the Cairo U/MIT pattern be replicated so that the various Universities can better serve their own areas. In that case, Cairo U might serve the Governorates of of Cairo, Gizeh and Fayeum.

One of the problems on which governorates may want some research and consultation concerns organization and procedures. MIT has tended to avoid research topics with political overtones but the Center has not shown such hesitancy.

If the Cairo U/MIT program is able to reduce U support for some research projects which now are well established with client Ministries, some resources might be made available to start a new project with a governorate as the chief client. Alternatively, one of the existing projects might undertake an activity directed primarily at a governorate decision.

Lack of Academic Manpower

The lack of specialized manpower at Cairo U (discussed in Chapter IV on Institutions) has several implications for the program. First, as Cairo U can increase its budget and number of approved positions, it needs to do so. Pending that, other actions may be helpful. An obvious one is for the DRTP Center to recruit faculty from other universities as part of the teams it organizes to respond to Ministry problems. This has already occurred in a few Cairo U/MIT projects because the team was aware of the potential contribution of a particular individual.

A second, longer run approach would be for Cairo U to add faculty members with the idea that part of their support will come from the Center. This support can consist of overhead paid by the Center to the University and of compensation paid by the Center for time spent on research.

Such expansion of staff by the University can be done safely only if the Center is well enough established that a continuing volume of research contracts are assured. It should not involve the Center hiring its own employees -- a mistake made by various other Egyptian research institutes.

Another way to deal with shortages of academic investigators is to use them for special problems of high priority and of intellectual sophistication. Thus, in the plastics area, Egypt is now at the stage where it imports raw PVC and extrudes it into various products. It is moving toward establishment of an integrated industry, making raw materials from its own petroleum and manufacturing for large potential markets in both capital goods such as irrigation pipe and in consumer goods. Many of the necessary feasibility studies can be conducted by consulting firms, either foreign or local. The special contribution of the University may be to help establish standards for quality and for sizes and to educate fabricators. In the water planning fields, the Cairo U/MIT projects dealt with such issues as the policy for control of the Nile and of underground aquifers. These are different in kind from engineering for reclamation of a few more hectares of more desert.

Finally, the Center will probably continue to bring in foreign researchers as part of special research teams. Even after institutionalization has occurred, special expertise will still be needed for particular problems. In many cases, this might come from MIT. But in other cases, such as agriculture or public finance, MIT may not have the specialists.

This lack of manpower has implications for the suggested End-of-Project Status suggested at the beginning of this report of "enough Cairo U investigators to meet Ministry needs." Perhaps another numerical criterion for institutional success needs to be devised. It might be expressed in terms of a trained nucleus in each faculty.

Potential for Replication

Dr. Hassan Ismail, the President of the Academy of Scientific Research and Technology, commented that the program has great potential for replication. He believes other Egyptian Universities can also serve government needs effectively.

The Evaluation Team agrees that the program is indeed replicable, not only in Egypt but elsewhere. We think that if it were tried, the presence of an outside University such as MIT working in a partnership mode can be extremely useful.

Chapter VII - Recommendations

A. General

1. The AID/MIT/Cairo U program should continue, with modifications to insure a transition to an independent Egyptian capability.

The program has been succeeding, at both the output level of useful research results and at the purpose level of enhanced institutional capabilities. Just to evoke a reaction, we suggested in Cairo that since progress was good, perhaps MIT was no longer needed. The reaction was strong that MIT can make an important contribution to consolidate the good foundation built thus far.

In view of its successful procedures, one should move with caution to make modifications. Our general recommendation is that more planning emphasis go to the institutional characteristics of success. This will probably mean that research projects should be selected or directed to help parts of the University or Ministries which need more experience with research. It will also mean that the training which occurs as part of the conduct of research projects should be supplemented in some particulars.

2. Clarify the purpose and the end-of-project status.

For the second part of the contract, it would be useful for the various parties involved - Cairo U, including the several interests represented in the Center's Board of Directors, the USAID and MIT to agree on what they now consider a realistic statement of purpose. For instance, does it include project development as well as problem solving? Then the statement should be generally known, so that all people working on sub-projects address themselves to its achievement. For instance, Ministries should be aware that they ought to be concerned about training people as well as about helping plan and produce research results.

Probably more important than the wording of the purpose is the description of the conditions which should exist with success - "the end-of-project status." Chapter I of this report suggested characteristics of success for the Center, the University, and the Ministries. Each of these needs to be considered by the interested parties.

For instance, if one of the three capabilities of the Center is agreed to be to facilitate contacts between faculty members and Ministry officials, the nature of this facilitation may need to be considered in more detail. If a Ministry comes with a problem, how should the Center proceed to mobilize a team to prepare a proposal? If a faculty member initiates a proposal, how should the Center help in getting support from a Ministry sponsor?

The second capability suggested for the Center is to assure proper selection of research tasks and proper quality for results. The Evaluation Team considers this so important that it has made a separate recommendation on this topic. (Recommendation 4 for Center).

The third characteristic of success deals with logistic support for researchers. Here, there is a recommendation (#3) that the Center adapt procedures of the Liaison Officer to fit Egyptian needs.

It may be that other capabilities are also desirable for the Center.

The essence of the characteristics of success suggested for both the University and the Ministries is a critical mass of trained people. The Evaluation Team did not attempt to determine the desirable numbers or to describe the skills. For the University, the approach may be to have a trained nucleus in each department which can contribute to development problems. For Ministries, the target might be expressed in terms of a functioning unit to plan and coordinate research in each major department.

B. Recommendations for AID

The USAID, of course, will be responsible for deciding which of these recommendations it wishes to include in the project implementation order requesting a new contract and for overseeing the program during the next three years. Beyond that, the following recommendations are addressed specifically to AID:

1. Provide better backstopping for the program in the Near East Bureau of AID/W.

The most important period will be the next few months when the contract is being renegotiated. But some support will undoubtedly be needed during the life of the program. For example, assistance of AID/W will be needed to arrange for a connection between the Center and the National Technical Information Service of the Department of Commerce. There will be questions to answer for Congress and others.

2. Establish regular liaison between the USAID and the DRTF Center to keep it informed about USAID activities.

Dr. El Salmi, the Center Director, requested such liaison. It should be of mutual benefit and not require much effort. For some USAID activities, Center data will be helpful. In other cases, USAID consultants will produce development data which should go into the Center's library.

3. Improve the USAID efforts to keep AID/W well informed about project status.

Field-headquarters communications are a continuing problem for most programs. The field project officer lacks time to do much reporting. Also, the tendency is often to guard against unwarranted second-guessing from headquarters. Nevertheless, the advantages of an informed headquarters justify extra effort. Perhaps the USAID can suggest to MIT ways to make the regular progress reports more useful. Or perhaps the USAID can use the occasion of the project reports to make a few brief comments of its own.

4. Arrange for the DRTP Center to be linked to the National Technical Information Service.

The NTIS is a program sponsored by AID/W for service to developing countries. The Center is interested in helping faculty members stay up to date and in providing data of use to researchers. When the Center receives NTIS accession lists, it will need to make some arrangements to inform its program coordinators and principal investigators so that they can select pertinent documents which the Center will request from NTIS.

C. Recommendations for MIT

1. In collaboration with Cairo U and USAID, develop a three-year operational plan.

Annex A for the Project Agreement and the AID-MIT contract set some targets in terms of the number of research projects, the establishment of a Center and the general phasing of the budget. This was adequate for Part I of the contract. For Part II, however, the achievement of desirable elements of successful institutionalization is much more likely if there is an overall plan with interim targets. This should be developed in collaboration with Cairo U and the USAID. Such collaboration will take some time but will add to the realism of the plan and increase the chances of success.

This operational plan should start with the end-of-project status described in the second general recommendation above. It should then delineate current status for each indicator of success. It should then lay out a strategy and tactics for progressing from current status to desired end-of-project status. Interim targets and budget can then be set.

MIT has devised a number of proposals for new activities, such as short-term (3 month) research projects, support and supervision for Cairo U theses, graduate fellowships. It has worked out unit costs, proposed volume, and total cost for each of these proposals. However, none of them have been related to specific program objectives in more than a general way. Nor have these supplemental activities been integrated with the training expected from continuation of current research projects. A good operational plan consists of more than a set of independent activities.

The next four recommendations deal with particular aspects of a total operational plan.

2. Set targets for numbers and types (disciplines) of Cairo U and Ministry personnel to attain capability in interdisciplinary and collaborative solving of development problems.

One of the most important aspects of end-of-project status will be faculty members of Cairo U who are well trained in planning and managing research projects. In addition to these general skills, MIT and Cairo U planners may decide that some people will need some special

skills in such subjects as sampling, questionnaire design, computer programming, etc.

When the targets are determined, MIT and Cairo U should then plan how they will be achieved -- some will learn from on-the-job experience in the conduct of research projects with MIT colleagues or with more experienced Cairo U colleagues; some will learn from graduate work at MIT; others will have supervised theses at Cairo U; special short courses will supplement such experience, etc.

It will also be desirable to develop similar targets for particular Ministries and then make plans for achieving them.

3. Add more formal training.

In the first part of the contract, four workshops were held. Each of these dealt with particular substantive topics - polymers, water resource systems, reliability of electric power systems, and housing materials. Also there have been short courses on such special subjects as stochastic principles, computer programming, weighing and measuring babies, and administering village questionnaires.

Some of the Principal Investigators suggested that more general short courses would be useful. They specifically mentioned a course on proposal writing and on budgeting for research projects. Perhaps such courses could be developed in a way comparable to that used for the training on stochastic principles, which was given jointly by MIT and Cairo professors. When such courses are developed, they should be given several times, for faculty not yet engaged in research projects and for faculty of other universities (see also recommendation #6 for the DRIP Center).

4. Adjust MIT project support to the phase reached by each research project.

This was discussed in Chapter VI on comments. The phasing out of support as research projects gain maturity in an institutional sense, including the possibility of support from Ministries, is an important characteristic of an institution-building project. The criteria for support are not identical to those of projects for which research is the only purpose.

5. Gradually merge the functions of research management and logistic support performed by the Liaison Office and the DRTP Center (except the Liaison Officer functions of financial accountability for MIT).

This topic was touched upon in Chapter IV on management (the section on MIT) and in the comment in Chapter V which is entitled "On the nature of the program." The desirable situation will be a single organization providing contact with Ministries, assuring good quality of research, and serving research teams. For the duration of the MIT contract, a partnership should function, with researchers informally exchanging ideas regardless of the source of funding for

their activities. When MIT faculty members come to Cairo, they should drop in on the Center director and also talk with the pertinent program coordinator. In an informal way, they can be useful for commenting on project proposals and research methods. The bi-weekly meeting for Principal Investigators should include investigators for both Center and MIT projects.

The merging of individual functions need not happen at the same time for each function but can proceed as seems most convenient and practical.

It is recognized that for reasons for financial accountability, MIT will need to continue to have a Liaison Officer who signs checks. Whether this also necessitates a separate accounting unit is not certain. It is possible for a single accounting unit to maintain two or more sets of accounts, one for each kind of fund.

6. Coordinate total MIT program.

All the separate activities under the MIT program should contribute to achievement of the overall purpose of institutional capability. Thus each research project should be monitored from the point of view of what it is doing to enhance improved research planning and management and to train people as well as what research results it is achieving. When a training activity is prepared for one project, consideration should be given as to whether it should be opened to others. Just as Cairo U investigators meet regularly, MIT investigators should meet from time to time in order to consider progress toward the overall purpose and to exchange information on actions employed to enhance institutional capability.

D. Recommendations for the DRTF Center.

1. Increase the representativeness of the Board of Directors.

Over the long run, the Board of Directors should become more representative of the organizations to be served by the Center. Although the Center is properly a part of the University, it exists to facilitate cooperation with Ministries. It must obtain money from Ministries to support research and training activities. Then it must assure a high quality of performance so that continuing funds will be forthcoming. With such an orientation, the Center will be well served to have the viewpoint of its clients well represented on its Board. At present, its only client Minister, Dr. Abdel Razzak Abdel Meguid, has broader responsibilities as a Deputy Prime Minister.

Another important type of representation to consider is industry. Already various industries are contributing financial support to research and are participating in research teams. The evaluation team is not sure of the best source for an industry representative. Perhaps it should be from the General Organization for Industrialization.

2. Organize Center with three divisions: Training, Research and Administration.

If the Center evolves as now appears likely, with an ambitious management training program, there is some danger that research would

receive inadequate attention as more of the time of the Director and of the administrative staff was devoted to arranging and conducting training sessions. To help assure effectiveness in each of the functions, it would be desirable to organize three main divisions within the Center. Training activities could be headed by a training specialist, research activities by a scientist, and administrative activities by a manager.

3. Adapt Liaison Office procedures with modifications to fit Egyptian needs.

As the functions of the Liaison Office and Center are gradually merged (see recommendation #5 for MIT) careful analysis will be needed about the rationale and effects of various procedures. Sometimes they exist to assure accountability. Sometimes they are a means to obtain professional judgment and thus enhance quality control. An example may be some of the clearances by the Executive Committee. Careful attention to budgeting may often be regarded as a way of encouraging systematic planning and management of research projects.

However, some of the current forms and procedures may be necessitated by rules of MIT or AID. These may need to be modified to fit Egyptian rules.

The point for an organization like the Center which serves research projects is to devise the proper balance. On the one hand, procedures should be simple and rapid. On the other hand, procedures should encourage careful planning, sound management, and high quality. In the long run, the reputation and success of the Center will depend upon research results which are useful to Ministries.

4. Formalize criteria and procedures for project selection and quality control.

The Center probably should not accept every contract which is proposed or offered. Possible reasons for refusal might include irrelevance for development, lack of a researchable hypothesis to solve a problem, inadequate budget or time to produce a satisfactory research result, lack of qualified faculty researchers for the problem (even if faculty are recruited from other universities), or lack of a Ministry liaison office with sufficient authority. Other reasons for refusal may also occur to the Board of Directors. Refusal will be easier if criteria are written and known in advance. Then it will be easier to resist political pressures or to negotiate for a more adequate budget.

An important aspect of project selection is to assure that the problem has been clearly identified and that the client Ministry and the faculty researchers are agreed about its nature and the method of attack. Also, before a contract has been agreed upon, professional review of a proposal is needed to consider not only the methodology but the realism of the estimated man-days and costs.

For Cairo U/MIT projects, at least at the beginning, total funding came from AID. Budgets by the Principal Investigators were necessary, but the Ministries were concerned more with the relevance of the research than with its cost. Now as the Ministries agree to pay for contracts, a new element has been added. Previous experience of Ministries with consulting contracts may be analogous but is not exactly the same.

A common practice for research organizations is to set up one or more review committees composed of knowledgeable professional personnel who are not themselves personally involved in the proposal being reviewed. Such a review serves several purposes. It protects the researcher against starting a project without thinking about some key aspect. It protects the head of the research organization from a project which may incur a deficit or fail to fulfill its promises. It protects the client agency against wasting research funds on activities with slight chance of success.

Thus, the Center would be well advised to set up special committees and formal procedures for review of proposals, for checking on research progress, and for approving final reports. Having the review committee separate from the Program Coordinators would have some advantages. The coordinators will be busy promoting and negotiating - they may not have time for review. Also the coordinators will be personally involved with some proposals.

With formal criteria and formal procedures, the Center will build a reputation for quality which will create demand for its services and facilitate a sound financial operation for itself and, through its payments of overhead costs, a financial assistance for the University in general.

5. Use MIT personnel as consultant to the DRTP Center.

Dr. El Salmi and some of the Program Coordinators have both suggested that they would appreciate being able to receive advice from MIT professors about various problems such as proposals for new projects, devising or modifying a research approach, reviewing research results, etc. Such involvement by MIT people would be consistent with the philosophy of transition in the type of technical assistance. That is, as institutional capability of Cairo U and the Center progresses, MIT's role should evolve from full participation in research teams to that of monitor and consultant.

Some of the consultation can occur on an informal basis as MIT Principal Investigators are in Cairo for their own projects. In addition, there probably should be some provision for consulting time in the program plans and budget. MIT professors will want such time to count as part of their required fifty-percent of their time for research. This can probably be arranged, with the work to help the Center being considered an outgrowth of one of the Cairo U/MIT research projects or being considered as research supervision.

It is assumed that MIT personnel are experienced enough in this kind of consultation that they will not let the Center personnel use the consultation as a way of avoiding responsibility for decisions.

6. Sponsor training for Cairo U investigators in various aspects of research methodology.

Recommendation 3 for MIT called for more formal training. All such short courses should be given under the sponsorship and administrative control of the Center. Courses which may be developed jointly

by MIT and Cairo U personnel and given jointly in the beginning will eventually become all-Egyptian. As such, they may continue to be given under Center sponsorship or elements of some courses may become part of the curriculum of various faculties. An aspect of institutionalization will be regular, continuing training of graduate students at Cairo U in various up-to-date aspects of research methodology. Then the Center may wish to concentrate its efforts on elements of most importance for its own operations, such as proposal writing, budgeting or management of research teams.

7. Recruit faculty from other Universities when needed.

The comment in Chapter V on lack of academic manpower suggested several ways to cope with the problem. The easiest in the short run will be for the Center to recruit faculty from other universities as part of the teams it organizes to respond to Ministry needs. Such inclusion of faculty members from outside Cairo U will have another advantage -- it will help, in a small way, to spread the influence of the Cairo U/MIT project and be a first step toward replication of the procedure of mixed academic-government teams to solve development problems.

8. Establish a policy on patents for inventions resulting from the Center projects.

One of the Cairo U/MIT research projects, rural communications, has resulted in two inventions. Thus far no effort has been made to obtain a patent on the new devices. The Principal Investigator, Professor Kamal, is also a director of Benha Electronics, which is manufacturing the prototypes. He believes that he has an informal agreement that Benha will pay royalties to the DRTP Center if manufacture is undertaken after the experiment.

In other parts of the world, policy on patents has been a major problem for research organizations. Policies followed vary greatly. Some release the inventions to the public. Some allow an individual researcher to obtain a patent and receive royalties. Some reserve the right to patents and royalties for the research organization, with the theory that the work was usually done by groups which could not have functioned without support of the organization.

The Board of Directors may wish to establish a policy to be followed for inventions resulting from Center projects.

9. Investigate follow-on funding from UN sources for projects of strong interest to other nations.

Various aspects of current or future research projects may be of interest to non-Egyptian sources of funding, as has been illustrated by the ITU contract for a report from the Rural Communications project. Two aspects of the work on water resources would appear to be of possible interest to UN sources since they involve international resources. These are the Nubian Aquifer and the Upper Nile.

Appendix A - People Interviewed

AID/Washington

Alfred D. White, Acting Assistant Administrator of AID for Near East
Bradshaw Langmaid, Director of Development Planning, NE
Joan Silver, Evaluation Officer, NE
Gerald Kamens, Director Egypt-Israeli Office
Bert Stone, Egypt Desk
Edward Krowitz, Egypt Desk
Edward Tolle, Project Officer, NE Tech

Washington on related projects

National Academy of Sciences

Dr. Halmuth H. Weldes, Dr. Adviser to President of National
Research Center in Cairo
Dr. Gus Nasmith
Dr. Jay Davenport

Evaluators for Science and Technology Policy

Princeton Lyman, Special Assistant to Director, International
Development Cooperation Agency
Courtney Nelson, Consultant to Office of Science and Technology Policy,
Executive Offices of the President
Herman Pollock, Professor of International Affairs, George Washington
University

Evaluators for Applied Science and Technology Project

Clinton Stone, Georgia Institute of Technology
Nicholas Luykx, Agency for International Development

Massachusetts Institute of Technology

Dr. Walter A. Rosenblith, Provost
Dr. William F. Pounds, Dean of Sloan School of Management
Dr. Richard S. Eckhaus, Professor of Economics, Principal Investigator,
Economic Planning
Dr. Nazli Choucri, Professor of Political Science, Principal In-
vestigator, Labor Migration, Chairman Policy Committee
Dr. Fred Moavenzadeh, Program Director, Professor of Civil Engineering,
Principal Investigator, Inter-City Transportation Planning
Mr. Kevin O'Toole, Technical Officer
Mr. James J. Culliton, Assistant to the Vice President, Administration
and Personnel
Dr. John O. Field, Research Associate, Center for International
Studies, Investigator on Health Care

Dr. Ithiel de Sola Pool, Professor of Political Science, Principal Investigator, Communications for Rural Development
Dr. Martin Weitzman, Professor of Electrical Engineering, Principal Investigator, Long-term Investment Planning for Electric Power System
Dr. Frederick McGarry, Professor of Mechanical Engineering, Principal Investigator, Engineering Applications for Plastics Industry
Dr. Peter Eagleson, Professor of Civil Engineering, Principal Investigator, Stochastic Model of Nile Inflows to Lake Nasser.
Prof. David Marks, Professor of Civil Engineering, Principal Investigator, Water Resource Planning Models for Nile River Basin
Prof. J. Kirtley, Professor of Electrical Engineering, Principal Investigator for Egyptian Electric Power System
Prof. Skolnikoff, Professor of Science and Public Policy

USAID - Cairo

Mr. Donald Brown, Director
Mr. James Norris, Chief Economic Section, Former Project Officer for MIT Project
Mr. John Elackton, Chief, Sectoral Analysis
Ms. Janice Weber, Science and Technology Division
Mr. James Riley, Science and Technology Division
Mr. Al Bissette, Chief Education and Manpower Division, Project Officer for MIT Project

Liaison Office

Mr. James McCarthy, Administrative Officer
Ms. Jeanne DePass, Administrative Officer
Gen. Ahmed Mamdouh Hassan, Administrative Officer

Government of Arab Republic of Egypt

Dr. Aziz Bindary, Chairman, Family Planning and Population Agency, Program Coordinator of Population Studies, Consultant for Rural Communications, Health Care, Macro-Economic Planning and Labor Migration Projects
Dr. Atef Dabbor, Head, Industrial Sector, Ministry of Planning
Mahmoud Ibrahim Saleh, Chief, Commodity Balances, Ministry of Planning
Maurice Farid Abdullah, Head, Input-Output Unit, Ministry of Planning
Adli Mansour Abdel Salam, Food Section, Commodity Balances, Ministry of Planning
Dr. Rukaiya Suleiman, Statistician on Manpower Planning, Ministry of Planning
Ali Suleiman, Foreign Trade Department, Ministry of Planning
Ahmed Amin Abdel Hafez, Head, Oil Products, Ministry of Planning
Dr. Sayed Hanafi, Deputy Minister of Planning
Dr. Hassan Ismail, President, Academy of Scientific Research and Technology
Dr. Fahmy Ramadan, Director, National Research Center
Engr. Ibrahim Sharkas, Deputy Chairman, General Organization for Industrialization
Engr. Shakei El Nahas, Director for Foreign Agreements, General Organization for Industrialization
Engr. Abdel Aal El Salamwy, Deputy Minister of Transport and Communications

Dr. Abdel Mobarek, Deputy Minister of Health
Dr. Maher Abaza, First Undersecretary of State, Ministry of Electricity
Dr. Hamed Amer, Petrochemicals Project, Ministry of Petroleum
Dr. Ahmed Shawhey, Chairman of Authority for Roads and Bridges
Ministry of Transport and Communications
Dr. Ahmed Handy, Vice Chairman of Authority for Roads and Bridges,
Ministry of Transport and Communications
Dr. Ahmed Talaat, Ex-Minister for Housing
Mr. Samir Allam, Vice Chairman, El Nasr Constructing Co.
Engr. Sarwat Fahmy, Co-Manager of Water Master Plan
Engr. Bayumi, Ministry of Irrigation

Cairo University

Dr. I. Badran, President, Cairo University, Chairman of Board of
Directors, DRTP Center
Dr. Ali El Salmi, Professor of Management, Director, DRTP Center
Dr. M. Zaki Shafai, Professor of Economics, Chairman of Executive
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Dr. Salah Shabender, Professor of Surgery, Dean of Cancer Institute,
Principal Investigator of Health Care Delivery Systems, Member
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Dr. Yehia Kabil, Dean, Faculty of Engineering, Principal Investigator
of Engineering Application for the Plastics Industry, Member of
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of Labor Migration and Macro Economic Planning, Program Coordinator
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Dr. A. El Erian, Chairman, Department of Structural Engineering, Principal
Investigator of Housing and Construction Industry
Dr. Mohamed El Hawary, Professor of Civil Engineering, Principal In-
vestigator of Intercity Transportation Planning and Urban Trans-
portation, Program Coordinator for Technological Planning
Dr. Mohamed G. El Maghrabi, former Dean, Faculty of Engineering
Dr. Sakia Shafai, Professor of Architecture, Investigator, Housing and
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Dr. Abdel Amer, Professor of Civil Engineering, Principal Investigator
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Dr. Mohamed Abou-Hussein, Chairman, Department of Electrical Engineering
Principal Investigator of Long-term Investment Planning for
Electrical Power System
Dr. Ismail Mobarek, Professor of Civil Engineering, Principal Investigator
Stochastic Model of Nile Inflows to Lake Nasser
Dr. Mohamed Osman, Professor of Civil Engineering, Principal Investigator,
Waxy Asphalts
Dr. Ismail El Assiouti, Professor of Civil Engineering, Principal Inves-
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Dr. Salah Bayoumi, Professor of Chemical Engineering, Principal Investi-
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Dr. Abdel Malik Oda, Professor of Political Science, Investigator for
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Dr. A. Aziz Kamal, Vice Dean, Faculty of Electrical Engineering; Principal
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