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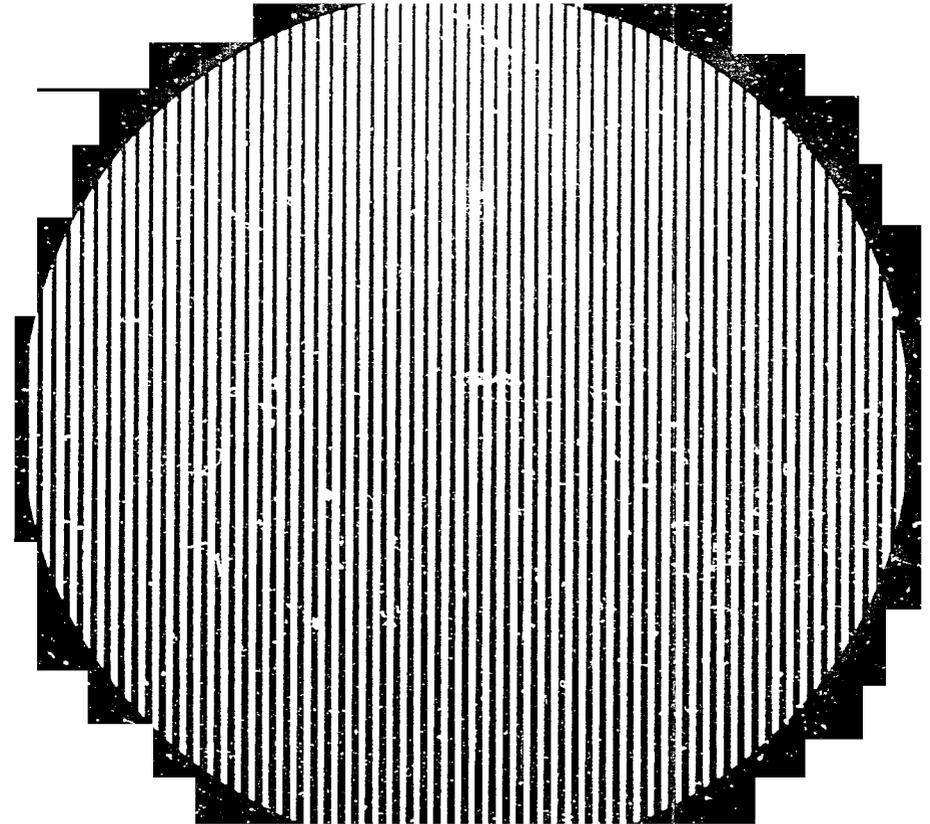
# Management of the Construction Industry in Egypt

Seminar Proceedings January 19-20, 1980 Cairo, Egypt

By  
The Joint Research Team  
on The Housing and Construction Industry  
Cairo University/Massachusetts Institute of Technology

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THE JOINT RESEARCH TEAM  
ON THE HOUSING AND CONSTRUCTION INDUSTRY  
CAIRO UNIVERSITY/MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Engineer Omar El Gamal, with the support of the MIT Liaison Office, was responsible for the effective coordination of the seminar and the workshop.

The Seminar was sponsored by the Cairo University/M.I.T. Technological Planning Program, Joint Research Team on Housing and the Construction Industry; Principal Investigators: Professor Ahmed EL-Erian and Professor N. John Habraken.

These proceedings are a part of a series of publications which describe various activities and studies undertaken in the Technology Adaptation Program at the Massachusetts Institute of Technology.

The seminar was sponsored by the Cairo University/M.I.T. Technological Planning Program, under the auspices of the M.I.T. Technology Adaptation Program, which is funded on an interim basis by the United States Agency for International Development (USAID), Cairo, Egypt. The views and opinions expressed in these proceedings, however, are those of the authors and do not necessarily reflect those of the sponsors.

In 1971, the United States Department of State, through the Agency for International Development, awarded the Massachusetts Institute of Technology a grant, the purpose of which was to provide support for the development at M.I.T., in conjunction with institutions in selected developing countries, of capabilities useful in the adaptation of technologies and problem-solving techniques to the needs of those countries. At M.I.T., the Technology Adaptation Program provides the means by which the long-term objective for which the A.I.D. grant was made, can be achieved.

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## Introduction

During the first two years of the Housing and Construction Industry Research Project, the subproject "Organization and Operation of the Construction Industry" investigated the various participants and their interactions and the role of the everchanging regulatory environment within which the construction industry operates. Findings from this research pointed out the need to increase the capacity and efficiency of the construction industry, especially the private sector, if long term development plans are to be achieved.

Increasing construction output requires: 1) an understanding of constraints limiting company growth and entrance of new firms, and 2) full appreciation of the applicability or non-applicability of modern project management techniques. From this additional base of information, it is possible to explore policy alternatives directed toward enhancing construction sector contributions to development. The initial review-related research has thus evolved into a policy analysis orientation; "Management of the Construction Industry in Egypt" subproject is the evolutionary product.

A combination seminar and workshop, inviting top construction industry managers to review, discuss and debate important industry issues and modern management tools was thought to be one of the more effective means of developing the required understanding of constraints and applicability of management techniques. This input from Egyptian construction executives, project managers and ministry officials focused and further ranked research alternatives.

The seminar held January 19-20, 1980, in Cairo attracted a broad spectrum of knowledgeable and talented people; their diversity reflected the various needs and roles of participants in the construction industry in Egypt.

Through discussions on construction financing, resource

constraints, tendering methods and management techniques these individuals significantly contributed to the ongoing research effort. These discussions are represented by the background papers and seminar proceedings contained in this volume.

### SEMINAR LOCATION AND DATES

Registration and meetings were held at the ARAB SOCIALIST UNION BUILDING, Cairo, Egypt; January 19-20, 1980.

### ADVISORY COMMITTEE

Professor Ahmed El-Erian  
Cairo University  
Professor N. John Habraken  
Massachusetts Institute of Technology

### COORDINATORS

Dr. David Ashley  
Massachusetts Institute of Technology  
Engr. Omar El Gamal  
Arab Contractors  
Mr. Tarek Selim  
Massachusetts Institute of Technology  
Mrs. Soraya Abdullah  
Cairo University

### SECRETARIAT

All correspondence should be directed to the following:

CU/MIT Technological Planning Program  
P.O. Box 39  
Giza, Egypt

### PROCEEDINGS

Dr. David B. Ashley, editor  
Mrs. Sally T. Brunner, editing  
Mr. Reinhard Goethert, design and production  
Mr. Nezar Al-Sayyad, assistance in preparation

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PROJECT FINANCING IN EGYPT

Mr. Fouad Sultan  
Chairman and Managing Director  
Misr Iran Development Bank

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## PROJECT FINANCING IN EGYPT

Introduction

The Egyptian economy has been suffering during the last 20 years from a multitude of problems: the continuous decline of domestic savings due to the increasing pressure of consumption in comparison to the growth in Gross National Product, the impact of successive wars and the burden of extensive military outlays, the large expenditures involved in reconstruction, the substantial rise in the internal price level brought about by imported inflation and the continuous reliance of the authorities in financing their deteriorating fiscal budget through the banking system. Therefore one can say that the above structural problems were aggravated by domestic financial and pricing policies.

The average rate of growth of real GDP in the period 1966 - 1974 was on the order of 3%, slightly above that of population growth. The Egyptian authorities in full knowledge of all of the above-mentioned problems, felt the urgent need to adopt the appropriate reforming measures, the basis of which were clearly spelled out in the paper drawn by the President known as the "October Working Paper". The paper adopts the open door policy as the approach to development through the encouragement of private sector initiative and the improvement of relations with the outside world to attract both technology and foreign capital.

Since then there has been a shift towards a more liberal exchange and trade system, decentralization of decision making in the public sector, and encouragement

to private sector initiative. The implementation of the open door policy was aided by the reopening of the Suez Canal and the return of the Sinai oil fields, the resurgence of tourist activity and the sharp rise of private remittances from Egyptian workers. This improvement in foreign exchange receipts assisted the reactivation of the idle capacity in industry, augmented the low level of domestic savings and accordingly substantially improved the rates of capital formation. Consequently, rates of growth in real terms since 1975 have been substantially higher, averaging about 9% p.a.

The 1980 Development Plan

The five year plan 1980 - 1984 development plan aims at a growth rate of real GDP and GNP of 10% annually. The relative high growth rate assumed in the plan was predicted on continued high rates of growth of investment to be financed by considerably higher rates of national savings and by decreased reliance on foreign resources. This scenario implied a substantial squeeze on domestic consumption to raise domestic savings from around 14% in 1977 to 26% of total resources in 1982. The 1978 and 1979 figures indicate that both investment and consumption expenditures have turned out to be higher than implied by the plan. For instance the rate of overall consumption to gross national product rose from 86% in 1977 and 1978 to nearly 92.5% in 1979. Consequently the ratio of Gross Domestic Savings/GDP deteriorated to nearly 7.3% in 1979, thus falling considerably below the plan target. However, the increasing reliance on the capital inflows to finance the rising investment expenditures resulted in a surplus on the overall balance of payments for 1977 and 1978.

On the average, during the past five years the overall fiscal deficit of the government has been running at

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19% of GNP. Such deficit was mainly financed through the banking system and foreign finance for 40% and 35% respectively. Such expansion in fiscal and monetary policies has resulted in general excess in demand pressures reflected in rapid increases in the prices of non-controlled goods and services and by a spread of black market transactions in areas subject to price control. The 1980 fiscal current and investment budget envisage an overall deficit of L.E. 3.7 billion, which represents again something around 28% of projected GNP for 1980. Domestic and foreign resources identified to finance the bulk of this deficit are L.E. 1.5 billion and L.E. 1.2 billion respectively. The balance vis L.E. 1 billion represents unidentified resources, and most probably will be covered through the recourse again to the domestic banking system.

In addition to the government investment program in 1980 amounting to L.E. 3.1 billion, it is anticipated that the private sector will also be investing around L.E. 500 million, i.e. total investments represent 277.1 projected 1980 GNP. If we assume that the debt/equity ratio applied for financing such private sector investments would be 60:40, then the overall domestic credit needed for financing the private sector requirements will be around L.E. 300 million, out of which one can assume 50% in local currency.

In order to discuss together the availability of such overall domestic credit as well as the ability of the capital market in Egypt to finance such investment requirements I shall try to analyze the structure of the present banking system as well as the monetary policy affecting domestic credit in general.

However, before discussing the financial aspects of the development plan, I would like to highlight the importance of the availability of the physical factors of

production and the need to strike a balance between such resources and the overall investment targets. Otherwise any excess in such investment expenditures can but add to the already accelerating inflation.

For example, according to the Booze Allen and Hamilton survey of 1977, 45.8% of investment expenditures is reflected in construction, and for every L.E. 1 million of net construction volume (in 1975 prices) there is a need of 8000 tons of cement. Such a formula translates itself into the need for 7.100 million tons approximately of cement, the implementation of the 1980 development program deflated by 1975 price level. With local cement production capacity of 3 million tons and a maximum ports capacity for importation of 2-3 million tons, can this investment program be implemented!

By the same token one should further investigate the availability of other physical means of production.

#### The Banking Structure

Since the nationalization of the banks in the early 1960's and up to 1975, there were only four commercial banks operating in Egypt. They were fully owned by the state and they functioned mainly as instruments for carrying out government policy in their respective areas. Being commercial banks, their main function was to provide the public sector with its working capital requirements as well as the finance of international trade in general. There were also three other specialized banks--an agriculture credit bank and two mortgage banks--providing financing for agricultural cooperatives as well as housing and construction projects. Moreover, in 1976 the Industrial Development Bank was established to finance the fixed and working capital requirements of private and public sector industrial enterprises in Egypt. The deposit liabilities of those specialized

banks are relatively small and they are mainly dependent in funding their transactions on the Central Bank of Egypt and the commercial banks.

Under the foreign investment law enacted in 1974, foreign banks were allowed to enter Egypt. So far a total of 39 banks have been established under this law. Of these, 13 banks are authorized to engage in a full range of banking operations in both foreign and local currencies. These banks compete with the state-owned commercial banks, and their deposit liability as well as their net foreign assets and domestic credits are part of the liabilities and assets of the banking system in Egypt and thus affects both money supply and the overall domestic credit. Their foreign assets in 1976 came to exceed their liabilities under correspondent bank facilities for the first time since 1972 and by the end of June 1979 the net foreign assets of the commercial banks reached L.E. 1.2 billion or U.S. \$1.7 billion approximately.

The other 26 banks operate only in foreign currencies and very few of this group are engaged primarily in investment banking. Their deposit liability at the end of September 1979 amounted to U.S. \$676 million.

Moreover, the Arab African International Bank, established in the mid 1960's, and the Arab International Bank, established in 1971, are two offshore banks that operate under special administrative and judicial regimes. These banks finance foreign trade and investment projects in various Arab and African countries and are intended to deal exclusively with non-residents and in foreign currencies. However, with the relaxation of foreign exchange control in 1976 such limitation on their dealings only with non-residents does not any more apply. As depicted from their annual reports, their deposit liability at the end of 1978 amounted to U.S.

\$1.4 billion approximately.

#### The Monetary Policy

The monetary policy can be defined in a very preliminary manner as the intervention by the Central Bank in manipulating money supply with a view to assure the undisturbed functioning of the monetary system, as well as influencing the performance of the economy. It also deals with the organization of the monetary system with a view of establishing a proper banking system conducive to mobilization of resources to assist and facilitate the development process. During the last five years, 1975 - 1979, the growth rate of the broadly defined money supply (money and quasi-money) has averaged 27% p.a. whereas the rate of economic growth during that period averaged 9% only. Such excess in the liquidity is normally reflected in increased demand pressures and accordingly accelerated inflation and/or continuous depreciation of the currency.

The main factors affecting the substantial increase in money supply were the increase in domestic credit and the improvement in the net foreign exchange position of the banking system. This improvement in the net foreign exchange position of the banking system is mainly due to the substantial inflow of foreign exchange transfers from Egyptian workers which are kept in the form of currency deposits, and thus constitute part of the money supply but not of the balance of payments. By the end of June 1979 it is estimated that the foreign currency deposits with the banking system in Egypt exceeded \$4 billion. Given a continuation of this trend it can be expected that the needs of the private sector for foreign currency term finance can be adequately met by the existing financial institutions.

By contrast the situation concerning long term local currency resources has been characterized by increasing

shortages. This is due to the continuous reliance of the government and the public sector on the banking system for financing their current and investment deficits.

During the last 5 years 90% of the increase in domestic credit has been absorbed by the government and the public sector, leaving only 10% of the increase to the private sector. At the end of June 1979 net domestic credit amounted to L.E. 9.04 billion, out of which L.E. 7.92 billion represents the government and the public sector indebtedness. Money supply at that date amounted to L.E. 6.3 billion.

Assuming that there will be no changes in the net foreign assets of the banking system in 1980 in order to sterilize its effect on money supply, and assuming that under prudent monetary policy money supply will be allowed to grow by 15%, given the anticipated rate of economic growth at 10%, then net domestic credit can only grow by L.E. 1 billion approximately, which is almost equal to the net deficit of the 1980 Draft State Budget.

On the other hand, the banking system's claims towards the private sector have been growing during the last two years at a rate of 33% p.a. Assuming that the same percentage will apply in 1980, if not larger on account of the anticipated investment figure of L.E. 500 million, then the increment in the domestic credit needed to finance current and investment requirements of the private sector will be in the range of L.E. 250-300 million.

Moreover, the ability of the banking system to increase domestic credit to the private sector, given their increased overall liquidity in foreign exchange, is furthermore constrained by the quantitative ceilings imposed by the Central Bank of Egypt in conformity with the stabilization program agreed upon with the IMF for reducing the inflationary pressures on the economy.

One of the main deterrents to the proper evolution of the capital market in Egypt is the lack of specialized financial institutions in both term financing and the mobilization of long term local resources. The situation was further hampered in the past by the low level of interest rates and the lack of government interest in developing the capital market. The banking law enacted in 1975 removed the statutory ceilings on interest rates and empowered the Central Bank of Egypt to fix interest limits in the light of prevailing monetary and credit conditions. In 1977 the 40.5% withholding tax on interest payment was abolished and accordingly the return to holders of time and saving deposits increased by 66%. However the accelerating inflation in the last few years has caused real interest rates to remain largely negative. Therefore the relatively low level of domestic interest rates has made the banking system less effective in mobilizing private savings and for rationing the available investable resources among the competing uses.

The ratio of currency in circulation in Egypt to the total stock of money supply as at the end of June 1979 was 38% against 41% at the end of 1977. This rate is still considered very high and indicates the extent to which funds are available with the households and which can be easily tapped in a non-inflationary manner through the issuance by the private sector of bonds at attractive terms and conditions. This channel has been and is likely to remain ineffective as long as interest income from such bonds is still subject to the withholding tax at the rate of 40.5% plus the general income tax. Furthermore, the Egyptians are legally free to hold foreign exchange deposits, and as interest on such deposits is not regulated by the Central Bank but follows closely interest rates in the Euro currency markets, the present differentials against Egyptian pounds interest

rates provide disincentives for holders of foreign exchange balances to convert into local currency.

### Investment Banking

Up to 1975 investment banking has been neglected in Egypt. This is due to the fact that the state ownership was dominating the majority of all economic activity in Egypt. Investment decisions were made by the Central Authority, and funding was made out of the central budget. The banking system confined its role to financing the working capital requirement of the public sector, as well as financing Egypt's external trade. With the adoption of the open door policy as the approach to development, the international banking community was invited to establish offices in Egypt as well as to join with local financial institutions in forming investment banks. The main objective was to assist the local banking community in catching up with the technique of project appraisal which has substantially developed in the free world, as well as to contribute to the evolution of a capital market capable of funding development requirements. However, there is a loop-hole in the investment law which allows the foreign banking community to finance also international trade. Being newcomers and not fully aware of the economic environment in Egypt as well as the credit-worthiness of the clients, the bulk of the new banking community indulged in financing the increasing consumption demand for imported goods and commodities.

After the lapse of more than four years since the open door policy was implemented and with the increasing size of their deposit liability, the foreign banking community is becoming more and more interested in project finance. As mentioned before, the availability of such a relatively large pool of foreign exchange resources constitutes a good base for the evolution of a proper

capital market. However, the evolution of a capital market in local currency is constrained by statutory and institutional deficiencies as previously outlined.

### MIDB Policy and Strategy

Before closing down I would like to cite our experience in MIDB being the first investment bank incorporated in Egypt under the open door policy. From the outset the bank focused its activity on investment banking, i.e. project identification and finance.

MIDB only finances enterprises in the private sector. The object of the project should be responsive to the general objectives and set of priorities specified by the Egyptian government in the context of the National Development Plan. MIDB's financing is in the form of equity participation and/or medium and long term loans, depending on the project's ability to pay back such debt finance. Moreover, the bank provides full-fledged banking services to the projects, including working capital requirements.

The bank has succeeded over the past four years in promoting over 20 projects with a total investment cost exceeding \$300 million. The bank's participation in those projects, in the form of equity, medium and long term loans, as well as guarantees, amounted to around \$70 million. The difference between the two figures represents the bank's success in mobilizing resources from other local, Arab and international financial institutions.

The bank does not specialize in any specific sector, however, priority is being given at present to projects which address themselves to severe bottlenecks in the economy, such as construction, contracting and building material sectors and projects in the capital goods manufacturing sectors.

Investment decisions are only made on the basis of

sound investment criteria and will provide financial assistance only to projects which are financially and economically sound and technically feasible. To ensure this, MIDB applies the following major criteria in its appraisal of projects:

- (I) The project's internal financial rate of return should be higher than the interest rate applicable on long term loans.
- (II) The project satisfies the minimum requirements of sound financial practice relating to consideration of liquidity, profitability and loan safety.
- (III) The appraisal exercise should include the calculation of project's economic rate of return, which, as a minimum, must be higher than the opportunity cost of capital in the economy.
- (IV) Special consideration is also given to employment generation, training possibilities, the availability of raw materials and the level of value added.

Finally, the bank hopes to make a positive contribution toward the development of an active capital market in Egypt by emphasizing the following:

- (a) Mobilization of resources to cover its resource requirements.
- (b) Mobilization of financial resources for projects (in addition to MIDB financing) through public subscriptions and syndication of loans with other financial institutions.

- (c) Rotation of MIDB equity investments, promissory notes and bonds.
- (d) Insistence on the application of sound accounting and auditing practices by the projects in which MIDB participates.
- (e) Promotion and development of specialized financial institutions to develop the capital market in Egypt.

#### Summary and Recommendations

To sum up, one can say that project financing in Egypt is still in its infancy stage; the capital market is developing but its evolution is handicapped by a lot of deterrents. Among these deterrents are:

- The lack of specialized financial institutions in long term resources mobilization.
- The substantial budget deficit and the continuous reliance of the authorities on financing such deficits through the banking system.
- The monetary policy should also be qualitative and not only quantitative to allow for financing the ever increasing private sector investment activity.
- The structure of interest rates should be substantially higher to offset the accelerating inflation rates and to be more inducive to holders of foreign currency balances to convert into local currency.
- Interest rates on bond issues in local currency should also be exempted from withholding tax to enable the investment community in general to tap the ever increasing volume of local currency deposits in an uninflationary manner.

- More generous tax exemptions for productive investments to facilitate tapping the excess liquidity in the community through equity participation being the most acceptable form of capital formation in Islamic countries.
- And finally, the overall development plan should be accompanied by a material balance between the available physical factors of production and the overall investment targets.

Main References

- (1) IMF and the World Bank publications.
- (2) C.B.E. Annual Report, 1978.
- (3) C.B.E. Economic Report, June 1979.
- (4) The 1980 Draft State Budget and related Financial Statement.

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CONSTRUCTION PROJECT AND COMPANY FINANCING IN  
DEVELOPING COUNTRIES: A REVIEW

Dr. Donald Lessard  
Associate Professor of Management  
Sloan School of Management  
Massachusetts Institute of Technology

Daniel C. Vogel  
Student  
Department of Civil Engineering  
Massachusetts Institute of Technology

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## CONSTRUCTION PROJECT AND COMPANY FINANCING IN DEVELOPING COUNTRIES: A REVIEW

### I. INTRODUCTION

The overall objective of the Technological Planning Program is to assist Cairo University in augmenting Egyptian capabilities for formulating and implementing science and technology policies as required for the realization of Egypt's overall development goals. Within this broad mandate, the construction industry is of special interest, both because of its importance in Egypt's overall plans and because of perceived opportunities for improving its performance.

The importance of the construction industry and the need to improve its performance are evident. The current five-year plan calls for approximately 1 1/2 billion dollars of new construction, but current industry capacity falls far short of that target. In addition, it appears that the Plan's forecasts for construction are conservative and the likely demand may be 10-12% greater than that projected.

While improvements in "hard" technology undoubtedly can help reduce the gap between projected construction demand and industry capacity, an equal opportunity exists in the area of "soft" technology, the management of construction at both the national and project levels. Financing is a key part of this "soft" technology. The financial capacity of construction firms appears to be a major constraint on their growth and uncertainties

regarding the availability of financing appear to be a major source of risks to these firms.

The purpose of this note is to suggest various avenues for improving financial technology in the construction industry. This refers both to the design and operation of the overall system for financing construction and to the understanding and use of this system by individual firms. It should be recognized, of course, that this improved financial technology will not relax constraints on the overall availability of resources for investment, whether in construction or industry. Hard choices will still have to be made at a national level to balance desired expenditures with available resources. However, improved financial technology within the construction industry can increase its efficiency, especially if it removes dysfunctional constraints from firms and provides clearer incentives for superior management of construction itself, as opposed to successful passage through a financial labyrinth.

In order to discuss improvements in financial technology, a basic understanding of financing at the level of individual project as well as that of the firm is required. The main body of this paper provides this background. Part II gives an overview of financing, defining its functions, distinguishing the three different classes of finance and outlining its role in project development. Part III provides a more detailed look at financial evaluation and the structuring of financing for specific projects, with a special emphasis on alternative mechanisms for relaxing financing constraints. Part IV focuses on financing's role in project implementation, with an emphasis on issues arising at the level of the construction firm. Part V presents a summary of the issues and financing's role in project development.

Given this basic framework for financing's role in

project development, in Part VI we briefly describe some topics for further analysis that have a significant impact on financing's role in development in Egypt.

## II. OVERVIEW OF FINANCING

In order to develop an understanding of the financing process, it is important to first consider the two functions that finance performs: (1) the allocation of financial claims over time to take advantage of productive possibilities and allow for differences in preferred time patterns of consumption, and (2) the allocation of risks among different sectors, firms, or individuals to minimize the impact of these risks on overall welfare.

Additionally, it is necessary to distinguish between three types of finance: (1) credit, where the return on investment is limited to contractual terms, (2) risk capital, where the financing entity faces risks of a commercial or political nature but anticipates that its share in the returns of the venture will compensate for the risk, (3) subsidy capital, where the expected financial returns do not compensate for the risk exposure undertaken.

Credit involves a transfer of purchasing power over time and, in general, is not a useful mechanism for allocating risk. The expected return earned by the lender is the interest rate, which reflects the time value of money, the expected rate of inflation, and any necessary administration costs. The actual return may be lower due to the possibility of default and the real returns may vary due to inflation. However, since the normal return is never greater than the contractual interest rate, the lenders' primary concern is to limit the possibility of loss through default. Credit comes very close to being a pure time transfer of money.

Risk capital embodies both time transfers and risk

allocations. By providing a mechanism for distributing claims on risky ventures throughout society it provides the advantage of allowing diversification, the reduction of risks by averaging them across ventures whose outcomes are not perfectly linked. The return on risk capital is normally a share in the profits of the venture, so it can entail either a profit or loss depending on the outcome of the venture.

The risk allocation role is critical when investors, as assumed in modern capital market theory, are risk averse. This implies that in order to invest in a risky venture the expected rates of return will include an additional "risk premium" above the market rate of interest. To the extent that the outcomes of ventures are not perfectly correlated, risk averse investors will seek to diversify their holdings and limit their exposure to risk. To the extent that capital markets enable this diversification to take place, the "risk premium" demanded will only reflect that proportion of risk which is undiversifiable within the economy. Thus the impact of risks on a society are minimized when the claims on risky ventures are held by well-diversified investors. A counteracting influence is the incentive for proper management of risky ventures, which favors strong control of risky ventures by individuals with large stakes in them. As a result, policies for allocating risk depend both on diversification and incentive effects.

Subsidy capital covers the broad range of financial contracts that embody some form of grants or subsidies in addition to the basic functions of finance. Often financial subsidies are not readily apparent, since they take the form of concessional interest rates or below market expected rates of return. When these rates do not reflect those in the open market with regard to compensation for time and risk tradeoffs, a subsidy is being granted. It is important to be aware of

these equivalent subsidies during all stages of the financial process.

#### The Role of Financing in Project Development

The financing process is an issue here because of the critical role that it plays in the choice and development of projects to be undertaken in the five year plan. In order to clarify this role in this section, we outline briefly the overall process of project development. This process is divided into five stages. These stages are:

1. Project Design
2. Economic Evaluation
3. Financial Evaluation/Structuring of Financing
4. Implementation
5. Monitoring and Supervision

The relationships among these stages are flowcharted in Figure 1.

The first stage, project design, begins with the identification of investment opportunities based on technological improvements and the desire to expand the existing infrastructure. This identification is followed by a specification of the technically feasible alternatives for exploiting the opportunity and a selection of the economically efficient alternatives. Thus the first stage involves a substantial element of economic as well as technical evaluation.

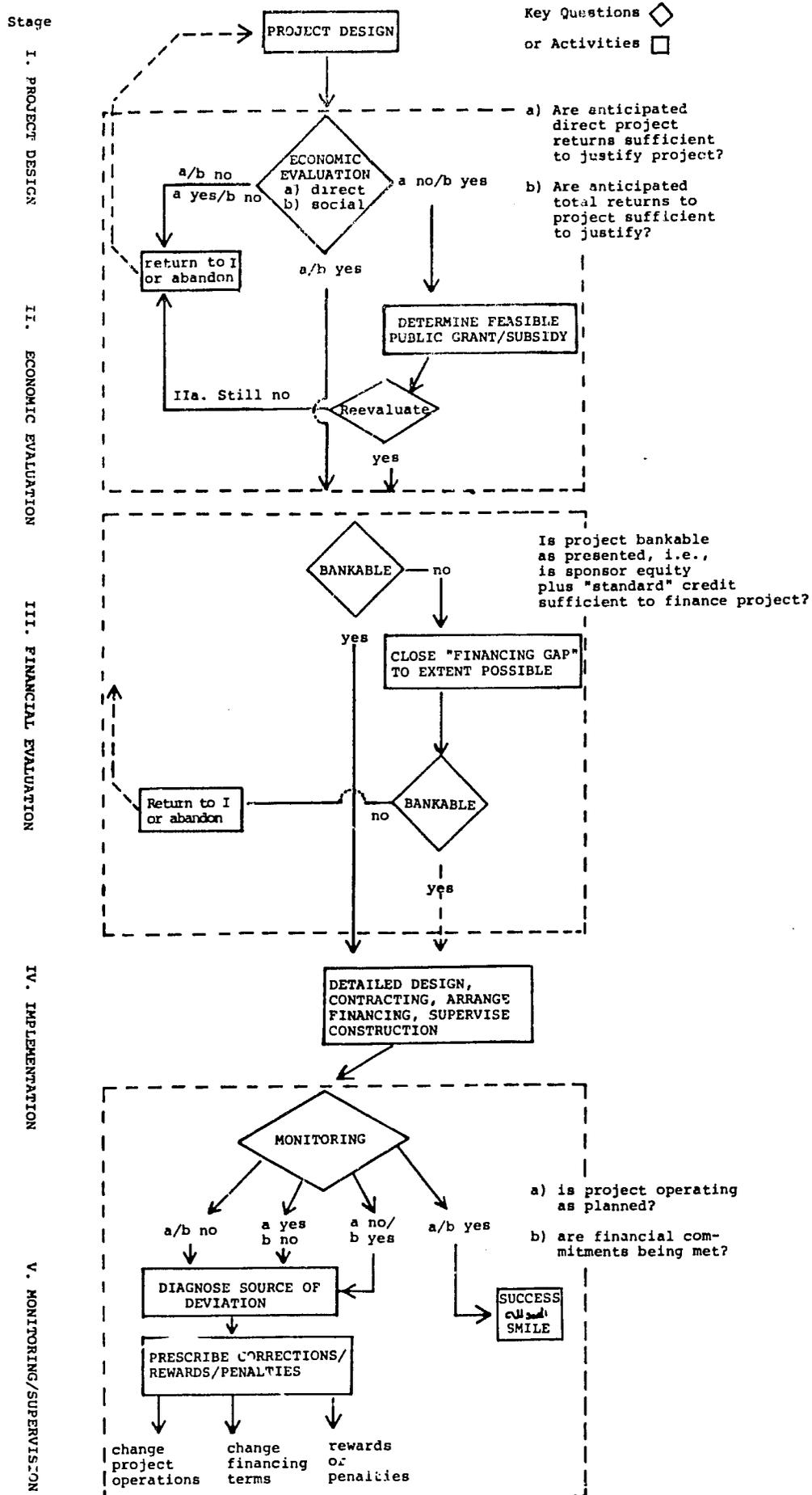
The second stage, the formal economic evaluation, involves a careful analysis of project costs and benefits, adjusting for differences in timing and risk of the various inflows and outflows. At this point, careful selection of discounting rates is essential in order to correctly capture the time value of money and the varying levels of risk exposure. This economic justification should be done for both direct project costs and benefits--the costs and benefits that would accrue to a

private owner of the project--and total costs and benefits--those that would accrue to society as a whole. If the project is profitable only in direct terms, but not from a social perspective, the project should be rejected for the purposes of public financing and relegated to the private sector. If the project is profitable from social perspective but not from a private viewpoint, it can either be redesigned or be supported by grants or subsidies sufficient to make it attractive. Clearly Stages 1 and 2 should be viewed as interactive with extensive redesign or revision of projects taking place if the economic evaluation suggests this is worthwhile.

Stage 3, the financial evaluation, is of primary importance for the selected projects to be able to advance to the implementation stage. This process will be examined in detail in Part Three of this paper. The evaluation process involves two types of activities. One is credit evaluation. This involves determination of whether the project is bankable--whether the project's cash flows are sufficient to support the credit needed given the equity investment the project sponsor is prepared to make. The other involves a series of steps for closing the "financial gap"--the difference between a project's financing requirements and its credit capacity. These two activities are interactive with the second, continuing until the project becomes bankable or is discarded. This process enables project financing to be structured in the most efficient manner available. It should be remembered that while this process is used to directly determine financial structure on the project level, it also defines financing at the company level, since the firm is the sum of its component projects.

Stage 4, implementation, involves the final design, contracting, disbursement of funds, and the monitoring

Figure 1: FRAMEWORK FOR PROJECT FINANCE



activities which the financing entity must perform during each of these activities. It is this stage of the project development that has the greatest impact on the financial needs at the company level. The issues in company financing as required for project implementation are examined in Part IV.

Stage 5, monitoring and supervision of the project once it is underway, is a critical stage which is often overlooked in the project evaluation process. It provides information which can be used to "correct" project operations to insure that it is economically beneficial after the fact and to insure that the project sponsor is able to meet the terms of the financing and is motivated to do so.

### III. FINANCIAL EVALUATION AND FINANCING OF PROJECTS

The purpose of the financial analysis is to determine what structure of financial claims a project will support and, hence, whether and how a project can be financed. The basic process is very similar to the economic evaluation, focusing on the expected future cash flows and their associated risks.

#### Process of Financial Analysis and Structure

The process is an iterative one that begins with the determination of a project's debt capacity and whether or not this capacity, combined with the intended equity investment, is sufficient to finance the project. If so, the project proceeds to the implementation stage. If not, a series of steps should be taken, each one concluding with a new test of the project's bankability. These steps include extending the project's credit capacity, providing risk capital financing, or, as a last resort, providing guarantees or subsidies. The outline of this process is shown in Figure 2. It is important to remember

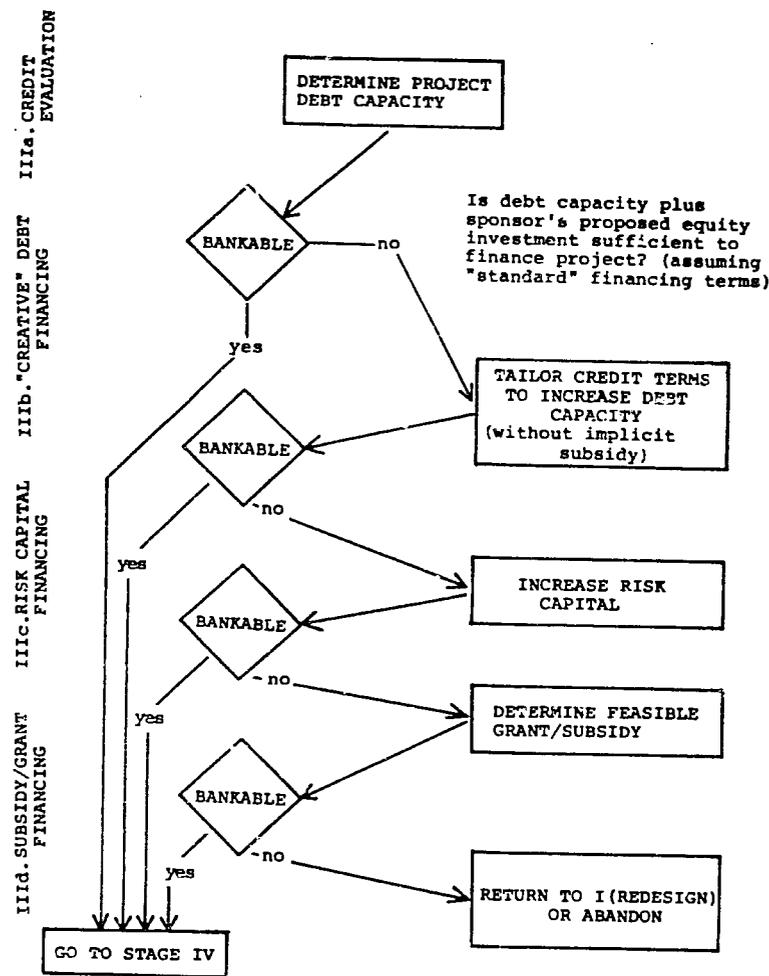


Figure 2: DETAIL OF FINANCIAL EVALUATION PHASE

that this process may be repeated iteratively and that the entire process may feed back into the earlier stages of project design and evaluation.

If this process is carried out aggressively, it should be possible to finance most projects that are economically attractive from both direct and social perspectives. Through vigorous application of the first two phases--extending the project's debt capacity and risk capital financing--subsidies can be avoided in many cases, saving scarce public financial resources for cases where the project's social benefits clearly outweigh the direct financial costs.

#### Credit Capacity

Credit financing involves a contract to repay a determined amount regardless of the profitability of the project. Since the lenders' income can never be greater than the stipulated return or interest, the lenders' primary concern is to limit the possibility of loss due to default. Since the lender does not get a share of project earnings, it must take a relatively narrow approach in project analysis, an approach concentrating primarily on the risk of loss.

#### Determining Debt Capacity

There are many approaches used to determine debt capacity. However, most of them involve variations of two basic approaches. The traditional approach centers around the question: What protection do we (the lender) have if the borrower defaults? This translates into the question of whether there exists a sufficient personal or corporate guarantee. The second approach involves the question: How much debt can the project (borrower) incur without a serious risk of default? This question would suggest an analysis concentrating on net cash

flows expected from the project and the extent to which these cover debt service (plus scheduled repayment) under very pessimistic conditions. The first approach focuses on the lender's capacity to recover funds in case of failure while the second emphasizes the project's capacity to cover fixed charges as a going concern.

The traditional approach has a number of unfortunate consequences. First, since the credit agency focuses primarily on borrower collateral, they avoid, to a large extent, taking any responsibility for the viability of the project from a technical and economic perspective. In contrast, the going concern approach requires a thorough economic analysis of the project, since it focuses on the project's capability to cover fixed charges. This is a particularly important consideration for a public agency, whose objective is to promote economic development. Such a lender must take responsibility for the efficient use of all resources, and not merely concern itself with the profitable recovery of its own funds. Second, many projects involving development of capital poor resources may not be able to pass the collateral test even though they are clearly economically viable. The reliance on guarantees may not even reduce the losses from default. This approach assumes that in the case of default the lending agency will be able, and willing, to seize the assets and liquidate them.

We are not trying to imply that borrower guarantees are unimportant. They play an important role in providing incentives for complying with credit terms and can be particularly useful in dealing with defaults resulting from fraud and mismanagement. They should not, however, be viewed as the prime source for security for the loan. The principal question should be that of how much credit the project can support.

The critical question of the going concern approach

is what amount of debt a project can service under pessimistic conditions. In general terms this is determined by identifying various factors which may have a negative effect on the project, estimating the cash flows which the project will generate under various pessimistic assumptions regarding these factors, and determining what level of debt these minimum flows would service. Thus the focus is on flows or coverage of fixed charges, rather than on balance sheet relationships.

This approach should be used for public as well as private projects. When a public sector project is financed through debt beyond its own capacity, its "excess" debt represents a claim on the country's overall debt capacity and will offset borrowing elsewhere in the system. Thus, it represents a hidden subsidy which may distort the evaluation of the project's attractiveness.

Clearly, a lender should look beyond the project's cash flows to other assets and liabilities of the borrower. Although the project and its cash flows represent the primary source of funds for servicing the debt, other resources should be taken into account. When the other resources are negative, the firm may be overcommitted relative to its operating base. In such cases, the maximum loan should be the debt capacity of the new project less the excess debt position of the borrower.

The above discussion has focused on the ability of a project to service a debt, a necessary but not sufficient condition for granting credit. A willingness to meet the contractual terms is also necessary. This willingness may be inferred from past experience, where a particular borrower has met all obligations faithfully. However, in cases where there is no previous experience or where it has been inadequate, personal guarantees and other types of collateral claims become important. A guarantee which provides a claim against a borrower's

personal property represents a mechanism for enforcing the contractual credit terms, since it provides the lender with a way to impose penalties when the borrower fails to act in good faith. As such, guarantees may be particularly important in the case of closely held firms where the allocations of revenues and expenses among affiliated projects may be arbitrary. In such cases it may be difficult to adequately define and enforce claims on the project itself. In most cases, however, the returns the project sponsor hopes to earn will serve as a guarantee since default will result in a loss of these benefits.

#### Effect of Credit Terms

As previously noted, a project's debt capacity should be determined primarily by the cash flows it can generate to service debt under pessimistic conditions. However, the total amount of debt which can be serviced by these cash flows is a function of the credit terms. Credit terms include interest rate, maturity, grace period, amortization schedule, and degree of flexibility of the payments. Often, with standard credit terms which require payment of interest plus an equal amortization of principal in each year or equal total payments in all years, the project's debt capacity is constrained by the pessimistic cash flow in those one or two critical years where its expected cash flows are lowest in relation to required debt service. A change in the terms of credit which provides a closer match between anticipated cash flows and debt service may serve to relax this constraint.

#### The Interest Rate

Discussions of credit terms often focus on the interest rate; the interest rate charged has two critical impacts: (1) it determines the total cost of the loan,

and (2) together with the maturity of the loan and the amortization schedule it determines the time pattern of payments. However, by changing the maturity or the amortization schedule, the pattern of payments can be altered without changing the interest rate applied. This is important because the interest rate should not be viewed as a policy variable that can be changed to accommodate a particular project. In the case of a true credit, one not involving a hidden subsidy, the interest rate charged should reflect the cost of borrowed funds to the institution, the opportunity cost of the use of the funds, the institution's normal operating cost, and a risk premium to cover the chance of default. This interest rate should be similar to that which can be obtained on loans of similar risk elsewhere in the economy. If this is not the case, credit will be misallocated and may worsen rather than improve total economic welfare. An interest rate below this level implies a hidden subsidy and as will later be shown, this is often an inefficient and inequitable subsidy.

#### Loan Maturity and Flexibility

The traditional approach for determining loan maturity is to match the length of the loan to the life of the asset being financed. This criterion, however, ignores the fact that what is being financed is not the acquisition of a specific asset but the firm as a going concern. An alternative to this somewhat dubious approach is to match the maturity and repayment schedule to the net pattern of expected cash flows from the project. This approach shifts the focus from the particular assets to the project as a going concern.

The implications of this going concern cash flow focus are readily apparent in the case of working capital financing. Although the components of a firm's working

capital are relatively short-lived, the recovery of cash from the project as a whole reflects the fact that there is a permanent investment in these short-lived assets. The project as a whole will have a cash deficit in early years and in later years a stream of positive cash flows which can be used to retire debt and provide a return to the equity holders.

The contribution of credit in promoting development can often be extended by incorporating some flexibility into the repayment schedule. If properly designed and administered, this flexibility need not imply a greater risk of default or implicit subsidies of any type. Project cash flows will certainly fluctuate from expected levels; the magnitude of these fluctuations are the prime factors in determining project debt capacity. To the extent that scheduled repayments can be shifted in response to these fluctuations the chances of insolvency are decreased and thus debt capacity is increased. However, a loan with totally flexible payments would not be a true credit since the repayment of the loan would depend on the project's profitability. Additionally, it would have the undesirable effect of removing incentives for the borrower to repay the loan promptly, since there is not a contractual payment schedule which must be met. As a result, there would be less assurance that the debt would be repaid. On the other hand, totally fixed payments, with no provisions for flexibility, may unnecessarily increase the risk of insolvency, thus reducing borrowing capacity and increasing lender risk.

#### Sources of Credit

There are three primary sources of credit which we will briefly discuss below: (1) private banks lending capital at market terms, (2) official lenders, and (3) development banks.

Borrowing at market terms from private banks has the advantage of obtaining funds with less outside intervention and control. The negotiation takes place on a purely commercial basis. There is a fair amount of flexibility available ranging from straight loans to lines of credit. However, due to the limited input of the banks in the other stages of the development process, there is less flexibility in the credit terms than may be desirable for developing the project's debt capacity to its maximum potential.

Both official lenders, typified by the import-export banks, and development institutions, such as the World Bank, offer more flexible credit terms. Additionally, these institutions participate in the earlier evaluation and design sections of the project development process. While this may put certain restrictions on the development process, it can be particularly valuable in providing an element of expertise in this complicated process. The use of import-export bank financing may also impose further restrictions by requiring the project developers to use the services and products of the bank's nation. Finally, in the case of both development banks and import-export banks, the credit terms often involve concessionary interest rates. Whenever this is the case it is necessary to determine the grant equivalent in the loan; the grant equivalent is the face value of the total loan minus the discounted present value of all future repayments computed using the appropriate discount rate as previously discussed under interest rates. By explicitly acknowledging the amount of subsidy present through the use of this technique, distortions in evaluation because of hidden subsidies can be eliminated.

#### Summary: Credit Terms and the Financing Gap

Clearly there are many ways in which credit terms

can be changed to favor a project without incorporating implicit subsidies. Thus it may be possible to provide benefits at very little cost to the lending agency and society as a whole. For this reason the development finance function should focus on a creative use of financing terms, aggressively pursuing all the available options, including some built-in flexibility of credit contracts, as the first step in closing a project's financing gap.

#### Risk Capital

All projects involve risk, and thus the cash flows they will generate are not known with certainty. Credit financing, however, involves at best only limited flexibility in payments. As a result, only a fraction of the net expected cash flows from a project can be promised to creditors and the amount of credit financing that can be obtained will generally be less than the total necessary investment for most projects. The remainder must be financed with risk capital, capital which is subordinate to credit commitments but participates in project returns once credit commitments are met.

Risk capital may be of several types. It may be common equity in a going concern, a pro-rata share of all returns above and beyond debt service either in the form of dividends or reinvested profits. Other forms of risk capital involve limited participation in the risks and returns of the enterprise.

If the project is not bankable even after credit terms are tailored as closely as possible to the project's characteristics, the remaining financial alternative is to increase the risk capital investment in the project. Given the limited availability of external equity capital, it is likely to be a binding constraint on the financial viability of many projects. There are

three basic ways to relax this constraint on risk capital: increase the commitment of public risk capital, create private domestic markets for sharing in risks and returns of projects, and create and improve channels for attracting foreign risk capital.

When performing the financial analysis it is extremely important to realize the impact of debt service requirements on the risk distribution and therefore the required rate of return to equity capital at different stages of the project. As credit, which involves relatively fixed streams of payments, increases the variability in remaining income attributable to equity investment also increases. Clearly, financial leverage raises the expected profitability of the equity-financed portion of the investment, but it also increases the variability, and hence the riskiness, of the net income stream. In fact, the effect on risk is such that the risk premium in the required return will increase as much as the expected return. This result can be traced to the fact that the absolute risk of the equity remains constant as the equity base is replaced with debt. In other words, from a social perspective leverage will not make a good project better or a bad project worse, it will simply reallocate the risk and return among different financial claims. However, this increased risk of equity with leverage is often overlooked and cash flows net of financing are evaluated at a standard discount rate. As a result, projects whose expected returns do not compensate for the risks involved may be accepted. To the extent that public participation in equity investment through guarantees and cash disbursements is implicit in the total risk of the project to society, may be disguised. Additionally, when a government extends credit beyond the project's debt capacity a hidden equity investment takes place. Failure to recognize this

results in errors in project evaluation and a potential inefficient allocation of resources.

#### Sources of Risk Capital

Three sources of supplying risk capital were mentioned above: (1) private domestic markets, (2) publicly financed mechanisms, (3) foreign risk capital.

While private domestic markets are clearly an attractive source of risk capital, there are limitations on their applicability. Without well developed formal markets and appropriate legal and tax structures for protection and encouraged reinvestment, this source of risk capital is not going to be able to meet the current needs. However, careful structuring of government policy can encourage expansion in this area.

One of the primary sources of risk capital is the publicly financed institutions. They can participate in equity investment, not only through common equity ownership but also in a more limited role; e.g. guarantees to purchase initial production from a facility upon completion at a predetermined price. When using public equity investments, it is of primary importance to evaluate the investment considering the level of risk undertaken. As mentioned above, this is necessary to eliminate any hidden forms of subsidy.

In cases where domestic sources of equity capital are hard to come by, the option of direct foreign investment remains. Project guarantees are available from the export-import banks when firms of their respective countries are involved in the project development process. Also, many large multi-national corporations actively participate in joint ventures with local firms, providing capital and technical resources. However, it has been argued that in the long run the expense of repatriated profits and loss of domestic control is

great. Therefore this approach should be used with caution, being sure to carefully examine all the implications.

As a final consideration, the Islamic banks that have recently developed should be considered as a source of equity capital. Rather than providing interest-bearing loans, these banks lend money for a pre-determined share of the profits or losses. As these banks continue to develop, a unique opportunity for obtaining equity investment funds is being created.

#### Subsidies

Although subsidies and grants are mechanisms for financing projects, to discuss them fully requires delving into the difficult and complex issue of social cost/benefit analysis, which is beyond the scope of this report. Several points about the relationship of subsidies and grants to other elements in the financing process, however, are in order.

As noted earlier, subsidies and grants should be viewed as financing measures of last resort. If there are commercially attractive financing options that will make a particular project bankable, then these should be employed. Creative use of credit and risk capital, where returns are commensurate with the risks involved, can be expected to reduce substantially the need for subsidies, reserving these public funds for projects with the greatest public benefits, which would not be viable without subsidies.

Under no circumstances should credit or risk capital financing be provided on terms which cannot be met under reasonable assumptions about the future. This implies disguising a subsidy as credit or risk capital. Such subsidies typically are not granted on a rational basis and even if they are, they damage the image of the

financing institution and encourage irresponsible behavior by borrowers.

#### Concessionary Interest Rates as Subsidies

If subsidies are to be granted, they should be granted through mechanisms other than concessionary interest rates. Any interest rate which does not cover the lending institution's cost of funds, reflecting its borrowing rate as well as the opportunity cost of its own capital funds, and a premium to cover expected default, is a subsidy. A "spread" for administrative costs may or may not be included in this definition, since in many cases these costs represent costs of promotional activities which are not directly associated with the loan in question.

The reasons for avoiding concessionary interest rates are several. First, they are another form of hidden or implicit subsidy, often granted with little or no explicit analysis of public benefits. Second, they subsidize the credit rather than the project--thus those projects with the greatest borrowing capacity gain most. These typically would be projects with the greatest investment in imported equipment, especially if credits are tied. Further, if lending is based on borrower guarantees rather than on project cash flows, the bulk of the loans will go to the largest, most powerful, and most influential firms with the financially strongest sponsoring firm. There is no basis for presuming that these factors have any relationship to the project's social desirability. Finally, and perhaps most seriously, the low interest rate discourages early repayment and in fact encourages delay and rescheduling. Thus it makes the credit supervision task much more difficult than necessary and provides the maximum benefits to those who do not meet their obligations.

Government Guarantees and Risk Sharing as Subsidies

Any time the government takes on project risks by guaranteeing loans or agreeing to share in the risk of the project without charging a sufficient risk premium, it is granting a subsidy. Implicit subsidies of this type can be particularly dangerous since they are seldom noted beforehand. No outlay is required for a government guarantee and therefore it is easy to overlook the fact that a resource transfer has taken place. The correct pricing of contracts which shift risks to government is critical, since project sponsors will make decisions based on these contracts.

Sources of Subsidies

Subsidies are available through direct government participation and concessional credit from national or multinational development banks. In evaluating the social benefits of a project to determine if a subsidy is justified, it is important to exclude the subsidy from the analysis.

During the evaluation process all soft loans and guarantees should be restructured with rates of return that reflect the true level of risk premium required. Then by using the concept of grant equivalent presented earlier the level of grant or subsidy present in the financial instruments being considered can be determined explicitly. Once the real value of subsidy present has been determined it can be weighed against the social benefits the project under consideration can produce. This process will encourage rational evaluation and responsible behavior by borrowers.

## IV. PROJECT IMPLEMENTATION AND COMPANY LEVEL FINANCING

As projects move into the implementation stage the issues of finance become important considerations for the construction firms involved. The following discussion is

centered around the three different classes of finance previously outlined and their appropriate uses.

Credit

Credit is necessary for construction firms to operate due to the difference in the timing of the flows of costs and payments. Uncertainty regarding this timing, due either to project uncertainties or delays in payments, however, limit the contracting firm's debt capacity and call for risk capital in some form.

There are three primary sources of credit available to construction firms: (1) commercial banks, (2) supplier credit, and (3) client cash advances.

Commercial banks typically supply construction firms with lines of credit which are altered depending on the requirements of the firm's ongoing projects. Additionally, short-term loans are made to accommodate specific cash requirements on different projects.

Supplier credit is provided by the payment terms for material purchases used in the construction process. These terms typically allow for payment within 30 to 90 days of receipt of the materials. Supplier credit provides an additional mechanism for offsetting the difference in the timing of cash flows.

Client cash advances are typically used as a means of supplying credit to public enterprise firms. If this credit is granted less than the market rate of interest for projects of comparable risk, it represents a hidden subsidy and may lead the contractor to make socially incorrect decisions regarding scale, capital intensity, or timing.

The availability of credit is extremely important for efficient operation of the construction industry. In instances where credit markets are insufficiently developed, or heavily restricted by government intervention, the contractor may be forced to operate as a financial

institution, tying up scarce capital that could be used to take on further construction risks. To the extent that contractors are primarily organized to construct rather than operate as financial intermediaries, this situation represents an inefficient allocation of resources.

### Risk Capital

The role of risk or equity capital in the construction industry is intimately related to the desire to create incentives for efficiency through decentralization. Construction firms typically commit themselves to deliver projects for a fixed price, or a price that is only partially indexed to take account of change in costs or other relevant external events. The amount and timing of their costs and the timing of their revenues are uncertain and the potential variation of costs and revenues often is large relative to their anticipated profits. Much of this uncertainty is properly imposed on contractors since it gives them the incentive to control costs and complete the project on a timely basis. It does, however, imply that contractors require risk capital sufficient to weather unfavorable outcomes without hindering their operations.

Since the primary source of risk capital is a firm's retained earnings, this requirement acts as a constraint on the industry's growth. It can be relaxed in two ways: (1) reduce the risks imposed on construction firms and (2) increase their risk capital by injecting additional public funds, or encouraging the entry of private domestic or foreign capital. To the extent that some of the risks facing contractors are outside of their control and are unrelated to their technical ability to design or manage projects, no social purpose is served by imposing the risk on them and the first course is best. To the extent that the risks can be minimized through good management, however, they

should be imposed on contractors to insure efficiency and the second course is superior. This suggests the need for a two-part attack: (1) removing or reducing those risks to contractors where there are few beneficial incentive effects and (2) increasing the risk capital base of the industry.

Examples of risks that should be eliminated or reduced include uncertainties regarding overall rates of inflation over the project term, uncertainties regarding the availability or cost of credit, and uncertainties regarding the timing of reimbursements for work completed. While not easy, there are ways to deal with each of these issues.

Sources of additional risk capital at the company level include public and private equity ownership and joint ventures. Equity ownership is self-explanatory. Joint ventures allow firms to participate in projects that would normally be beyond their capabilities due to technical or risk requirements; in effect, joint ventures allow a firm to reduce its requirements for risk capital financing on large projects.

### Subsidy Capital

Subsidy financing is an alternative that should be avoided at the firm level. In order to limit the economic distortions present in subsidies one should apply the specificity rule: it is more efficient to apply policy tools (subsidy) closest to the locus of the distortions separating private and social benefits or costs. The use of this rule shows that it is more efficient to use subsidy at the project level, which is closer to the social benefits inherent in subsidized project development. Clearly, there may be cases where firm subsidy may be necessary due to economic distortions but in general subsidy at the firm level should be used only as a last

resort.

#### V. SUMMARY

This paper has presented an overview of financing in the project development process while focusing on the major issues present.

There are two functions of finance: (1) to allocate financial claims over time to take advantage of productive possibilities, (2) to allocate risk among different groups to minimize the impact. These functions are performed to varying degrees by three classes of finance: credit, where the maximum return to the financing entity is limited to the fixed contractual terms; risk capital, where the financing entity faces risks of a commercial or political nature but anticipates that its share in the returns of the venture will compensate it for the risks, and subsidy capital, where the expected financial returns do not compensate for the risks involved.

Financing has a significant role in two parts of the project development process: (1) financial evaluation and structuring or project level financing, and (2) project implementation, where company level financing of the participating construction firms becomes an issue. Financing's role in both of these areas was examined in terms of the three classes of finance (credit, risk capital, and subsidy) and the issues associated with the proper use of them.

While the paper has presented a basic framework for the role of financing in project and construction development it has only briefly touched on a few issues that are significant in financing development in Egypt. In Part VI, some topics for further analysis are briefly described that have a significant impact on financing's role in development in Egypt.

#### VI. TOPICS FOR FURTHER ANALYSIS

##### Issues Particular to Public Enterprise Projects

Since 1961 most of the construction in Egypt has been done by publicly owned enterprises. Public enterprise finance is particularly susceptible to hidden subsidies; it is of particular interest to determine how public enterprise finance can be structured to insure that public resources are used with the greatest possible efficiency.

##### Social Cost Benefit Analysis

Whenever subsidies are used to finance projects with non-monetary social benefits, the problem arises of comparing and ranking alternatives. It is important to develop a system that captures all social costs and benefits, and compares them in a consistent fashion.

##### Risk Assessment

At the project level, risk assessment should focus on the tradeoff between anticipated net benefits and risks to ensure that scarce social resources are used appropriately and on the type of financing consistent with the projects' risks to ensure that the project can be implemented. At the level of the construction contract, care should be taken to see that the risks imposed on the contractor correspond to factors over which the contractor can exercise some control and that the contractors' financial structure be consistent with the risks it must take.

##### Credit Policy

As part of the current development plan, Egypt desires to strengthen the public sector construction firms while also encouraging private investment in the

industry. The availability of credit and the types of controls placed on it will have a significant impact on the realization of these goals.

#### Development of New Financial Instruments

Both credit and risk capital are scarce economic resources. In order to utilize them most efficiently there is some merit in attempting to develop new financial instruments within the framework outlined in this paper.

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Management of the  
Construction Industry in Egypt

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Seminar Proceedings    January 19-20, 1980    Cairo, Egypt

CORPORATE FINANCE OF THE  
CONSTRUCTION INDUSTRY IN EGYPT

Mr. Nabil Azmi  
General Manager of Finance and Supply  
The Arab Contractors  
Osman Ahmed Osman & Co.

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## CORPORATE FINANCE OF THE CONSTRUCTION INDUSTRY IN EGYPT

Corporate finance in general means the ability of securing sufficient funds needed for undertaking the Company's objects which can be performed through the assets and working capital generating its productivity.

We are here to discuss the Company level finance within the construction industry in Egypt, therefore we have to talk about the following points:

- a) Source of Company financing
- b) Constraints on Company financing in Egypt.

We will now start talking about the first of these points:

### FIRST. SOURCES OF COMPANY FINANCING

Sources of Company financing are either cheap finance, or bearing interest finance. As a general rule we have to make use of the cheap finance first, and then seek the bearing interest finance sources in order to soften the cost of finance of the Company.

#### 1. Source of Cheap Finance

Cheap finance are those sources securing funds to the Company either through nonbearing interest, or low bearing interest. Such sources are:

##### a) Paid-up capital and reserves

The paid-up capital and reserves as a source of Company finance in the construction industry are employed for financing fixed assets, particularly land, buildings, furniture and basic machinery required for the start of the Company's activities.

The reason of such applications is due to the existence of these assets along with the Company duration, therefore it should be financed from a nonbearing interest source.

##### b) Client payments

Client payments are either advance payments funded upon signing the contracts, or progressive payments, depending upon the performance of the work progress.

Basically the advance payments are allocated to secure the application of equipment, machinery, and mobilization costs of contracts, while progressive payments or monthly statement payments finance the working capital and running costs of the contracts.

##### c) Long term and soft loans

In principal, the Company prefers loans as soft as possible, this means over 10 years loans, with grace period and bearing low interest rates. These sorts of loans are secured through government loans or World Bank development programs.

Such sources are applied to finance fixed assets and applications depreciated over long periods.

#### 2. Bearing Interest Source of Finance

Bearing interest sources of finance are normally structured on commercial bases, and are applicable for financing the Company's working capital.

Such sources in the Company level are:

##### a) Commercial banks

The commercial banks are always offering short-term loans in the form of overdraft or facility limits. This source of finance is employed in financing the working capital cash flow deficit throughout a period of time.

The above-mentioned sources of finance are always bearing compound interest at commercial rates and these are considered to be quite high.

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b) Suppliers credit

Suppliers credit means the purchasing of either materials or equipment for the Company's use and at terms of payment granted by the suppliers. The supplier, on the other hand, should take into consideration that the finance of such terms should include simple interest slightly lower than the commercial rates.

Such sources are used in financing working capital requirements to be imported.

c) Buyers credit facility

This facility is applicable to finance imports from certain countries who offer terms of payments to buyers (the importing Companies) at an interest rate lower than the commercial rates and against certain guarantees, examples of these facilities are:

- COFAC buyers credit program for imports from France
- EXIM Bank program for imports from U.S.A.
- ECGD program for imports from U.K.
- HERMIS program for imports from Germany

SECOND. CONSTRAINTS ON CONSTRUCTION COMPANY FINANCE IN EGYPT

After the settlement of the peace treaty, Egypt is preparing a vast 5 years construction budget scheme, therefore we are expecting a construction boom in the area in the near future. And due to this, finance shall represent a top priority during the coming period.

We think it is high time to discuss the constraints on the construction Company finance. These constraints are due to factors beyond our control. These factors are:

1. Shortness of Credit

The state program in order to cut inflation, is imposing pressure on banks to keep its credit facilities

at a certain limit, therefore banks are not financing funds necessary for construction Companies. This of course does affect financing.

2. Lack of Suppliers Credit

In this respect we wish to point out that suppliers of materials and equipment of the construction field are either:

- a) public sector producers
- b) private sector suppliers or producers
- c) foreign suppliers, either from Europe or the U.S.

The trend of the public sector suppliers is based on securing their finance through advances from the clients (in our case the construction Companies), therefore we are requested to finance suppliers, not to have their support for our finance.

The same case applies, to a certain extent, in dealing with suppliers of the private sector.

On the other hand, suppliers are granting very limited short credit which could not be considered as a source of finance to construction, and so can be ignored.

3. Contracts and Guarantees Required

All contracts with clients are applying for guarantees which does represent a burden on the finance because the guarantee issuing banks are always asking of keeping cash collateral margins on a percentage basis of the guarantee sum.

4. Client Payments and Receivables Delay

The government budget represents in Egypt 80% of the total construction work in Egypt, therefore we consider the government payment system as the factor to be considered in our present discussion.

Our practice allows us to say that government payments on contracts are usually delayed for considerable periods of time. This delay may be due to the lack of

budget figures or lack of cash. Then the construction Companies are financing the government on such contracts instead of being financed from contract payments from the government.

As a summary, we could say that finance in construction Companies in Egypt is facing greater difficulties than in any other place, so we would like to suggest that the government should take this problem into consideration and provide more support to finance.

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Management of the  
Construction Industry in Egypt

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Seminar Proceedings    January 19-20, 1980    Cairo, Egypt

RESOURCES AND CONTRACTORS IN EGYPT: A REVIEW

Mr. Tarek Selim  
Research Assistant  
Massachusetts Institute of Technology

Dr. David B. Ashley  
Assistant Professor of Civil Engineering  
Massachusetts Institute of Technology

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## RESOURCES AND CONTRACTORS IN EGYPT: A REVIEW

### I. Introduction

The construction industry in Egypt and its major actor, the contractor, are faced with the necessity of making adjustments in response to a changed situation. The availability and prices of the resources used in construction are changing. Shortages in skilled labor and certain building materials are impacting construction production. New construction techniques are being introduced in the major cities, thus increasing and changing equipment use. In addition the environment of construction is itself changing. The private sector's role is increasing. The application of foreign investment laws to contracting is one example; the return to competitive bidding between public and private contractors is another.

These changes are taking place when the demand for construction output in the economy is surging, due to the need to reconstruct the nation's infrastructure and to provide shelter for its increasing population. It is not astonishing then, that they have been accompanied by increases in construction costs and delays in project delivery. Such problems however, pose a threat to the attainment of Egypt's development goals. Changes in the legislative and organizational environment play a very important role in encouraging the increased output of the private sector; but the price and availability of resources--especially the ability of the contractors to secure them--threaten such efforts. Firms suffer from shortages and inflated prices. The persistence of such

conditions can limit the growth of the construction output of these firms and encourages them to diversify into other activities.

Most efforts in dealing with resource problems have so far concentrated on the supply of individual resources: materials, land, and labor. These efforts have not traced the effects of such problems on the resource assembler, namely the contractor. In an effort to do just that, to trace the effects of resource constraints on contractors' operations, this paper reviews the major constraints that characterize the delivery of various resources in Egypt.

This paper will cover the following resources: building materials, construction labor, equipment and management personnel. For the sake of brevity and due to constraints in data availability, the paper will concentrate on three primary building materials, namely cement, rebars and bricks. It will then identify the major issues that characterize the supply of construction labor, equipment and management personnel. It will use published materials to identify bottlenecks in the delivery of resources to the contractors and will use the results of interviews with Egyptian contractors to point to the effect of these bottlenecks on project execution. Finally, it will advance recommendations, for both the government and the contractors, to alleviate the impacts of these constraints on the firms and on the industry.

### II. Contractor Demand for Construction Resources

Studying the overall output of construction in the economy can indicate the development of demand for construction resources, considering that construction is their main consumer. Table 1 shows that fixed capital investment in 1960 prices in Egypt has almost tripled between 1960 and 1976, with the largest increase occurring

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between 1973 and 1976. The table also shows that construction output has met the increased demand and has also increased by about the same amount. Finally, the table shows that the increased output of construction and hence the increased demand for resources has largely been dominated by new construction and new projects, with maintenance averaging only about 10 percent of total output.

The figures in the table, however, do not show the problems associated with such increases. The overall increase has not been monotonic, but rather characterized by fluctuations. Such fluctuations were mainly due to changes in government priorities and goals which occurred during the implementation of the government-controlled development plans. Such changes were partly imposed by external circumstances, such as wars, and partly due to unrealistic estimates of the resources available in Egypt [17]. It is expected that such sporadic changes in the demand for construction resources have posed some problems with regard to the price and availability of these resources —Problems that have affected the resource suppliers as well as contractors.

Such increase in overall output thus shows the extent of the firm's increasing demand for resources over the years. Most of that demand is still concentrated within the public sector of the economy, but the private sector's role is expected to increase in the next few years. Despite the lack of complete historical information on the development of all contractors, consideration of some characteristics of these firms should give indications to the problems they face in fulfilling their demand for resources.

Public contractors, owned and controlled by the government, are responsible for a little over 75 percent of the total construction contracted in Egypt. There are about 50 of these firms in Egypt. More than half are

Table 1: OUTPUT OF CONSTRUCTION IN EGYPT  
(VALUES IN L.E. MILLION) (1)  
(Source: Ref. 22)

Year	Fixed Capital investment in 1960/61 L.E.	Total* Output in 1960/61 L.E.	Output of new construction in 1960/61 L.E.	Maintenance and repair in 1960/61 L.E.
1960/61	225.6	111.0	94.8	16.1
1961/62	248.4	141.1	124.3	16.8
1962/63	299.1	170.0	154.0	15.9
1963/64	368.0	202.7	187.9	14.7
1964/65	314.2	167.5	152.4	15.1
1965/66	323.4	168.7	154.4	14.3
1966/67	285.0	148.6	134.9	13.8
1967/68	227.0	144.1	107.7	13.2
1968/69	254.7	173.3	121.3	13.6
1969/70	262.0	182.3	130.8	14.5
1970/71	255.4	175.6	116.3	17.9
1971/72	265.3	185.2	114.3	17.5
1972	288.1	223.6	152.5	18.1
1973	307.0	183.4	133.5	16.8
1974	372.6	169.9	180.9	16.0
1975	662.3	291.0	271.8	19.2
1976	704.9	357.3	315.8	24.2

\* Includes output of the armed forces which is not distributed between new construction and maintenance and repair.

(1) Deflated using the official gross domestic product deflator used by the Ministry of Planning.

supervised by the Ministry of Housing and Reconstruction. The remaining firms are the more specialized ones and are supervised by other government ministries. Most of these firms are medium-sized firms. The 3 largest are responsible for more than 30 percent of the output of all of the firms. About half of the remaining firms specialize in building construction, while the other half specialize in non-building work. Only 3 public sector firms are active in specialty type of construction, in sanitary and foundation work [15].

These public firms are generally much bigger than the private ones. Except for the new private firms joint venturing with foreign contractors, most private firms in Egypt are small partnerships and proprietorships. 1979 estimates of the number of private firms range from as low as 12,000 to 20,000. [23] More than one third of these firms work as specialty contractors, and most general contractors are in the building field. These firms are only responsible for about 25 percent of the construction in Egypt. Their low share is mainly due to the ceiling previously imposed on the contracts they could sign with government and public sector clients. This practice has now been abolished; thus private firms are expected to increase their share of the market. Also the smaller private sector contractors work a great deal in the informal urban construction market, where buildings are erected without permits, a market which some sources claim may be as large as 50 percent of all housing activity in Egypt between the late 1960's and mid-1970's [11]. Nevertheless, it is expected that private sector contractor's demand for resources is in general smaller than that of the public sector ones.

The available figures on aggregate demand or consumption of the various resources by these contractors are based on consumption of individual projects. There

are reasons to question the accuracy and adequacy of such figures. First, the information is old; the latest official series concerning contractors' output covers fiscal year 1971/72, and there is even doubt concerning its coverage of private contractors' output. Second, the information is at best incomplete. The technical coefficients, which relate the consumption of resources to the type and size of projects, are not available for all project types, but mostly for building construction. The coefficients may also be distorted by problems in choosing appropriate designs to represent the consumption pattern of groups of projects, as well as problems in converting contractor's costs to quantities, due to the existence of official and black market prices for some resources. In short, the ability to update and adequately forecast resource usage in Egypt has been limited.

A general indication on the distribution of the aggregate demand between the main construction resources can nevertheless be gained by considering the breakdown of the costs of the contractors published in the official data. Table 2 shows the distribution of costs between the three major categories of inputs - materials, labor and equipment plus overhead - for different types of building as well as non-building projects. The very small share of equipment in the cost is an indication of the low mechanization of the construction in Egypt. Sector value-added figures which represent wage and equipment share in output support this fact. The share of wages in value added in the construction and industry sector was 58 and 33 percent respectively in the mid-seventies [5]. When considering the fact that the average wage in both sectors at the time was almost similar, the very high construction wage share can only reflect the sector's labor intensity.

Table 2: DISTRIBUTION OF COSTS BY PUBLIC VERSUS PRIVATE CONTRACTORS FOR VARIOUS FACILITIES  
(Source: Ref. 1,2)

		Residential	Industrial	Other Building	Non-Building
Percent Material Costs	Public	72	65	68	57
	Private	68	63	65	53
Percent Labor Costs	Public	23	27	24	24
	Private	23	27	25	35
Percent Depreciation and rents	Public	5	8	9	13
	Private	9	10	10	12
TOTAL	Public	100	100	100	100
	Private	100	100	100	100

Table 3: TYPE OF WORKERS REQUIRED TO BUILD 1,000,000 LE OF DIFFERING FACILITY TYPES (Source: Ref. 21)

Type of worker level of skill	Residential		Industrial		Other Building		Non-building*		
		Number		Number		Number		Number	
Masonry	.140	73	.066	24	.114	56	.240	43	
High		15		5		11		9	
Medium		22		7		17		13	
Low		36		12		28		21	
Steel Fixing	.061	32	.071	26	.065	32	.118	21	
High		14		12		14		9	
Medium & Low		18		14		18		12	
Carpentry	.111	58	.137	50	.022	60	.202	36	
High		26		23		27		16	
Medium & Low		32		27		33		20	
Concrete Pouring	.198	104	.145	53	.225	110	.438	78	
High		26		13		28		20	
Medium & Low		78		40		32		58	
Sanitary Works	.140	72	.096	35	.059	29	-	-	
High		22		11		9		-	
Medium & Low		51		24		20		-	
Plastering	.182	95	.181	66	.155	76	-	-	
High		33		23		27		-	
Medium & Low		62		43		49		-	
Painting	.027	14	.077	28	.088	43	-	-	
High		5		10		15		-	
Medium & Low		9		18		28		-	
Joinery	.126	66	.123	45	.129	63	-	-	
High		30		20		28		-	
Medium & Low		36		25		35		-	
Electrical Works	.015	8	.104	38	.045	21	-	-	
High		2		11		6		-	
Medium & Low		6		27		15		-	
Subtotal		523		365		490		178	
TOTAL		1.000	680	1.000	485	1.000	652	1.000	396

\*Earth work is excluded. If included it would require 3,500 man/year to do the job or 200 man/year if earth-moving equipment were used.

The figures in the Table furthermore show that in building construction, the materials share in costs is larger than for non-building projects, which include roads and civil construction. It averaged 70% for the former and 55% for the latter. This reflects, in part, the use of larger numbers of workers on non-building projects; especially when taking into account that non-building projects require more unskilled, cheaper labor than building projects. This higher materials share also reflects the larger use on building projects of expensive building materials such as cement and steel.

These facts are apparent in both Tables 3 and 4. From Table 3, to construct L.E. 1,000,000 of non-building projects clearly requires less skilled workers than those required to build the same value in building projects. The Table excludes earthwork, which if included, whether executed manually or by equipment, would reinforce the fact that non-building projects require more workers than building projects. Table 4 shows the available detailed information on the requirements of main building material of the various projects. It confirms the fact that building projects require more quantities of the expensive materials, and that non-building projects require the largest quantities of the less expensive materials. In general, steel and cement consumption is much larger on building projects, especially industrial building where there are large quantities of reinforced concrete work, while sand and gravel have their largest consumption on non-building projects, especially roads with embankments and sidewalk tiling works.

Figures in Table 4 reveal more than just this distribution of requirements between projects; they also give indications on the requirements of both the public and private sector firms. First they confirm the difference in size between the requirements of the two groups, where public contractors demand is shown to be much larger

than private ones. Second they show that the distribution of that demand is different in the two sectors. Judging by the number of projects, public sector output seems to be almost equally distributed between building and non-building projects, while private sector contractors' output is much more concentrated in building construction.

These characteristics of demand impact all firms in the industry. The larger consumption of the public firms exposes them to problems of quantitative unavailability of some of these resources. The smallness of the quantities demanded by private firms does not seem to save them from such problems. As will be discussed later, it is in the categories of resources where the private demand is concentrated, basic materials and skilled labor, that most of the shortages occurred in the past. The fact that these private firms are competing for resources with the public firms further complicates the situation. The public firms owned by the government and working on government projects had priority of access to some resources, especially those produced, subsidized or controlled by the government. Such practices have recently been discouraged by the government. Through government reduction of some resource subsidies, market forces now have more freedom to allocate resources.

It is expected over the next few years that the demand for the various resources will continue to increase. This can be seen from the figures in Table 5 on the planned fixed capital investment for Egypt between 1978 and 1982. Knowing that capital investment in 1976 was L.E. 1400 million, one can see that this plan calls for the doubling of the investment, and thus the construction output, by 1982. This means, on the aggregate, that the high demand pressures of the mid-seventies for all resources are expected and planned to continue, for the next few years.

Table 4: AVERAGE MAIN BUILDING MATERIALS REQUIREMENTS BY PROJECT TYPES  
IN THE PUBLIC AND PRIVATE SECTOR (Source: Ref. 1,2)

Project Category	Fiscal Year	Number of Projects		Reinforcing Bars (Tons)		Cement (Tons)		Bricks (1000)		Sand and Gravel cubic meters	
		Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Residential	70/71	151	4,563	59.6	1.2	377	8.6	141	3.5	1,345	33.2
	71/72	170	4,937	92.7	1.1	937	9.2	214	6.6	2,657	34.0
Industrial	70/71	272	4,534	162	1.2	843	8.3	381	2.6	4,026	34.2
	71/72	268	3,924	228	0.6	1,455	6.5	375	3.0	7,151	31.5
Other Building	70/71	388	10,400	55	1.2	270	9.9	138	4.3	1,393	40.7
	71/72	453	10,248	54	1.1	337	9.5	95	5.5	1,434	44.9
Roads	70/71	151	200	18	.25	198	47.0	44	2.7	13,613	632.0
	71/72	137	200	59	.10	424	41.8	22	--	11,115	367.0
Other Non-Building	70/71	486	7,659	40	.6	309	6.7	84	2.3	1,522	25.3
	71/72	513	8,693	73	.6	233	7.4	59	1.6	1,063	29.8

Table 5: FIVE YEAR PLAN SECTORAL DISTRIBUTION OF FIXED CAPITAL INVESTMENT IN 1977 L.E. MILLION (Source: Ref. 17)

Economic Sectors	Year					Construction's Share (%)
	1978	1979	1980	1981	1982	
Housing (a)	140.1	168.5	198.8	243.2	291.7	93.63
Construction	32.0	42.5	44.6	46.3	48.4	10.84
Trade & Commerce	30.7	40.9	48.1	45.6	50.5	43.12
Services	158.7	179.5	201.6	216.6	221.8	63.08
Agriculture & Irrigation (b)	159.8	175.7	188.5	202.9	215.5	57.89
Transport, Communication, & Suez Canal (c)	502.4	572.8	646.7	544.8	597.2	30.97
Industry & Mining (d)	504.7	554.5	696.8	872.7	1055.4	35.98
Electricity	122.6	172.2	223.8	211.7	193.7	28.11
Public Utilities	94.6	124.4	133.5	135.5	136.0	63.14
Unclassified Private Investment	14.5	16.0	20.7	54.3	41.5	NA
Grand Total	1760.1	2047.0	2403.1	2573.6	2850.7	
Total Public Sector	1584.1	1865.0	2153.1	2283.6	2350.7	NA
Total Private Sector	176.0	182.0	250.0	350.0	500.0	NA

- (a) Includes 31.3 percent of private sector investment per year  
 (b) Includes 44.0 percent of private sector investment per year  
 (c) Includes 7.3 percent of private sector investment per year  
 (d) Includes 48.6 percent of private sector investment per year

The distribution of the planned investments over the sectors gives an indication of the expected changes in the structure of that demand. It can be expected that the demand for the primary building materials, as well as that for construction labor and equipment, will probably be stronger than in the mid-seventies. The distribution of the planned investments not only shows the same emphasis as before on industry, as well as housing; having allocated about 30 percent and 8 percent of the total investment to each respectively, it also shows some added concentration in public utilities. This means that materials demand has to be at least comparable to the period of the mid-seventies, with labor required for the non-building utilities projects pushing demand for labor and equipment a little higher than before. Furthermore, the plan shows emphasis on the private sector. Its share increased from 8 percent to 20 percent of the fixed capital investment. Since it is not expected that the Government will relinquish its control over non-building and utility projects, this increase means more building projects are expected during that plan period, and demand for primary materials is expected to increase.

To sum up, without having to investigate the detailed consumption of each individual resource, the above discussion showed the extent of the overall increases of such demand both in the public and private sectors. It revealed that on the aggregate the consumption of all resources has at least doubled between 1960 and 1978, and indications point to continuation of these increases. Investigating supply and prices of the various resources and the accessibility of the firms to their markets will allow consideration of their impacts on contractors' performance.

### III. Supply of Resources to Contractors

In response to this increasing demand for construction resources in Egypt, there has been, in general, as expected,

an increase in their supply through local production, as well as importation. This increase however has not been without problems. There have been, and continue to be, sporadic shortages in some of these resources. Such shortages interrupt the supply of these resources to the contractors and help push up their prices. This situation has come about for different reasons: for example, labor shortages are mostly due to migration; cement and steel problems are due to production and regulations; and brick shortages are a result of the Nile silt problems. This section will highlight the major problems that interfere with the contractors' acquisition of building materials, labor, equipment and management in Egypt.

### III. A. Building Materials

With the exception of timber, Egypt produces, in various quantities, the whole spectrum of building materials. This production is supplemented by imports from abroad to satisfy the requirements of the market. Materials in Egypt are classified into two categories, either main or secondary materials, according to their use in the various structures. Main materials are used in the structural and partitions components of the facility, while secondary materials have other uses. Main materials in their turn can further be broken down into natural and manufactured materials. Natural materials include sand, gravel, and stones, for example, while manufactured materials would include cement, steel and bricks. The secondary group includes the remaining materials, such as paints, sanitary fittings, and pipes. For reasons of brevity and data availability, discussion here is limited to three main manufactured materials, specifically, cement, steel and bricks.

#### III. A.1. Cement

Cement in Egypt is entirely produced by 4 public sector companies. The development of the production is very well

summarized in Table 6, compiled by a MIT/Cairo University team [11]. Production has shown an upward trend, with short periods of stagnation, from the mid-1950's until the early 70's, when there was a downward turn. This recent downturn has been mainly the result of equipment obsolescence and lack of spare parts. The 1973 War and the shortage at the time of paper sacks also added to this slowdown. As would be expected, with this downturn in production and continued increase in demand, cement imports have increased to more than 1 million tons per year while cement exports have decreased to almost nil. Egypt became a net importer of cement after many years of being a net exporter. Exports of cement had always been encouraged by the government in order to earn foreign exchange. This situation is expected to persist for a few years until the factories already producing cement renew their equipment and the new factories currently under planning and construction come on line.

Egypt's cement problems, however, go beyond the lack of existing capacity of production of the materials. Since 1961, both the production and distribution of locally produced as well as imported cement have been controlled by the government. In addition to the production by the four public sector companies, distribution, import and export had been handled solely by the Egyptian Cement Office, which is also state owned. This control, while intended to enable the government to increase the availability of cement in Egypt for the development plan, seems, however, to have caused some side effects.

Government production has not been able to prevent the recent declines in the efficiency of production of cement despite no apparent problems in the quantity or quality of its raw materials. Such declines point to managerial and technical problems. Shortages of funds, in part due to governmental emphasis on military efforts, have resulted in a lack of spare parts and new equipment. This lack,

Table 6: FIGURES ON PRODUCTION, TRADE, AND CONSUMPTION OF CEMENT, FELT TO BE REPRESENTATIVE OF THE EGYPTIAN SITUATION, BEING DERIVED FROM A VARIETY OF SOURCES (UNITS ARE 10<sup>3</sup> METRIC TONS)

Year	Averaged Pro- duction	Averaged Imports	Aver- aged Exports	Calculated Con- sumption	Averaged Con- sumption
1951	1075	—	—	—	—
1952	950	12.00	19.0	943	—
1953	1080	—	—	—	—
1954	1224	7.143	167.8	1063	1027
1955	1370	—	—	—	—
1956	1345	—	—	—	—
1957	1415	21.30	218.7	1218	1246
1958	1511	9.527	217.9	1303	1286
1959	1716	6.692	415.8	1307	1278
1960	2052	7.000	352.9	1706	1525
1961	2218	.984	605.9	1613	1453
1962	2321	1.613	419.5	1903	1744
1963	2499	13.49	218.0	2294	2229
1964	2510	100.0	178.3	2432	2360
1965	2433	246.2	290.0	2389	2355
1966	2627	162.2	339.2	2450	2383
1967	2769	180.5	419.7	2530	2337
1968	3163	1.192	774.5	2390	2468
1969	3570	2.889	759.3	2814	2755
1970	3689	.717	625.4	3064	2915
1971	3878	.067	998.1	2880	3006
1972	3831	1.830	856.7	2976	3081
1973	3605	1.667	542.5	3064	3038
1974	3262	1.110	190.1	3073	3088
1975	3673	906.7	123.5	4456	3915
	3673	193	123.5	3743	3668
1976	3364	1255	29	4590	4520
	3364	791	29	4126	4140

Note: For each column labeled "averaged", the data from the appropriate sources was adjusted to a calendar-year basis if necessary (by averaging the surrounding fiscal years, e.g., data for 1969/70 and 1970/71 was averaged to obtain data for 1970), and then all data was averaged to obtain the representative set of calendar-year figures given in the table. Some wide differences occurred in the 1975 and 1976 import and consumption data. In each case, the data was thus handled as two distinct sets, a high and a low set, each being presented in the table. According to the Ref. the higher set of figures, that are given first in the table, is more likely correct.

The column labeled "calculated consumption" is simply averaged production plus averaged imports minus averaged exports, under the assumption that change in inventories has been negligible.

Source: Ref. (11) Original Sources listed below:

- For (1) Central Agency for Public Mobilization and Statistics, Egyptian Cement Office, Federation of Egyptian Industries, General Organization of Industrialization, Institute of National Planning, Ministry of Planning.
- For (2) Same as For (1), and the Ministry of Housing and Reconstruction.
- For (3) Central Agency for Public Mobilization and Statistics, Egyptian Cement Office, Institute of National Planning, Ministry of Planning.

combined with the low priority attributed to maintenance and quality control, also leads to lower productivity. Furthermore, product planning does not seem to be coordinated with construction needs. The production of mixed cements (karnak and slag) has been increased to represent some 40 percent of the total production, when most of the use in the field is still concentrated around portland cement [11].

Contractors' problems with the availability of cement are especially complicated by the distribution and delivery of the material. Each building permit is allocated a quantity of cement according to criteria set by the government, at the official price of cement, to be delivered by the government later. Due to the dispersion and small size of the various sites, the main mode of delivery of cement in Egypt is by trucks. Lack of the required infrastructure, such as a central storage area, and the lack of a ready-mixed concrete industry, means that 97 percent of the cement is distributed in 50 kg paper bags. This leads to increases in the costs of transportation as well as increased losses of cement due to breakage.

Government regulation of cement, by artificially keeping locally produced price low compared with the imported price, has stimulated the propagation of a black market. In 1976 locally produced cement was selling for L.E. 18 per ton when imported cement cost L.E. 35. Contractors and owners, especially in the private sector, who could not wait for six to eight months to receive their quota at the official price, had to revert to this market. There they could get their requirements but at a much more expensive price. Furthermore, there has been evidence that the government allocation criteria do not really meet the actual needs of the projects, being based on inadequate cost data and inefficient designs [11].

Cement importation in recent years has not made it possible, in all instances, to supplement the local short-

ages without interruptions—partly due to currency regulations that made foreign currency very scarce in Egypt, and partly due to restrictions on cement imports. These restrictions were sometimes imposed on the quantities imported, and other times on the agencies responsible for the importation. Regulations on cement imports have been in a constant state of flux. Until 1977 imports were restricted only to government companies, and even as recently as the summer of 1979, a controversial decision temporarily barred all cement imports to Egypt. Finally, duties levied on cement made the price differential between locally produced and imported cement noticeable. Under those circumstances the price of both official and black market cement rose sharply in the mid-seventies. Official prices went from L.E. 8.0 per ton in 1970 to more than L.E. 28.00 in 1979, while black market prices in the same period went from L.E. 10 per ton to L.E. 80 [11].

Now the government equates the official and import prices of cement and is on its way to deregulating its trade. Such actions are expected to alleviate the situation. Until capacity of the cement production in Egypt has increased and import regulation has stabilized, sporadic shortages can still be expected to interrupt supply to the contractors and increase its price.

### III. A.2 Reinforcing Steel

The steel produced and used in Egyptian construction projects covers reinforcing steel (rebars), steel sections, and steel sheets. Rebars, however, continue to be the main steel component in most of the structures in Egypt. Rebar production in Egypt, like all the heavy industries, is dominated by the public sector. Estimates from 1973 show that 92 percent of domestic output came from four large public sector companies while about 17 small private firms account for the remaining eight percent [18]. Egypt, however, has never been able to satisfy its demand for rebars

Table 7: FIGURES ON PRODUCTION, TRADE AND CONSUMPTION OF REINFORCING STEEL BARS FELT TO BE REPRESENTATIVE OF THE EGYPTIAN SITUATION AND DERIVED FROM A VARIETY OF SOURCES (UNITS ARE 10<sup>3</sup> METRIC TONS)

Year	Aver- (1) aged produc- tion	Aver-(1) aged imports	Aver- (2) aged exports	Calcu- lated consump- tion	Aver- (3) aged consump- tion
1960	160	58	2	216	N.A.
1961	176	44	18	202	N.A.
1962	189	60	6	243	N.A.
1963	197	98	<1	295	N.A.
1964	187	84	<1	271	N.A.
1965	162	73	1	234	197
1966	176	86	1	261	213
1967	176	74	<1	250	254
1968	207	39	—	246	255
1969	214	30	—	244	267
1970	177	73	—	250	285
1971	204	78	—	282	314
1972	225	131	1	355	348
1973	222	70	—	292	319
1974	237	135	—	372	354
1975	199	269	—	468	410
	199	462	—	661	410
1976	217	266	—	483	454
	217	195	—	412	454
1977	225		—		

Note:

For each column labeled "averaged" the data from the appropriate sources was adjusted to a calendar-year basis if necessary (by averaging the surrounding fiscal years, e.g., data for 1969/70 and 1970/71 was averaged to obtain the representative set of calendar-year figures given in the table). Some wide differences occurred in 1975 and 1976 in the import data. In this case data was handled as two distinct sets, a high and a low set, each being presented in the table.

In the column of exports the word "averaged" was used for consistency since exports figures are based on a single set of data.

The column labeled "calculated consumption" is simply averaged production plus averaged imports minus averaged exports, under the assumption that change in inventories has been negligible.

Source: Ref. (18) Original Sources given below

For (1) Central Agency for Public Mobilization & Statistics, Delta Steel Company, General Organization for Industrialization, Federation of Egyptian Industries, Ministry of Planning, Steel Sales and Distribution Office.

For (2) Ministry of Planning.

For (3) Same as (1) plus Ministry of Housing and Reconstruction.

locally. Imports have always been substantial, as shown in Table 7.

The figures in the table show the overall picture. The upward trend in the production of rebars since 1960 has been consistent but has been interrupted by several slumps: in the mid-sixties, in 1970, 1973 and again in 1975. The 1965 slump, however, was accompanied by a decrease in importation of rebars, while the last two were accompanied by a considerable increase in the import figures. The 1973 decrease can be explained by the war that year; local factories were unable to produce their normal output, probably due to equipment and spare parts problems. This clearly shows that while the problems in the mid-1960's may have been due to a decrease in demand for rebars, this has not been the case in the mid-1970's.

Investigating some of the production characteristics of steel in Egypt can highlight some problems facing this industry. Two types of rebars are produced in Egypt: steel 37 and steel 52; the production of steel 37 is much larger. It represents between 68 and 74% of all diameters. Because production of smaller diameters reduces the capacity of the plants, small diameters are rarely produced. Actually no steel 52 with less than 13 mm diameter, and no steel 37 with less than 6 mm are produced. Furthermore, most of the 8 and 10 mm steel 37 are produced by the private sector firms and are usually priced higher than official prices. Finally, because plants usually produce one diameter at a time for a certain period (to increase their productivity), some of the diameters are temporarily in short supply [18].

Production figures for the four public sector plants in the mid-seventies are shown in Table 8. Three of the plants are not producing to capacity. This situation is not restricted to that year, but seems to be a typical case. It is important to note that the lowest productivity was that of the Iron & Steel Co., which is the first inte-

Table 8: PRODUCTION CAPACITIES AND ACTUAL PRODUCTION OF REINFORCING STEEL BARS BY COMPANY IN 1973

Company	Production capacity of reinforcing steel bars (metric tons)	Production in 1973 (metric tons)	Production in 1973 / Production capacity (percent)
<u>Public Sector</u>			
National Company for Metallic Industries at Abou Zaabal	85,000	101,292	119.2 <sup>a</sup>
Egyptian Copper Company	70,000	65,084	93.0
Delta Steel Company	60,000	46,788	78.0
Iron and Steel Company	40,000	24,868	62.2
<u>Private Sector</u>	<sup>b</sup>	21,000	_____
TOTAL		259,032 <sup>c</sup>	

- This may be due to use of more than one shift or by allowing for a lesser quality product.
- According to the Ministry of Industry the total production capacity of steel rebars and other steel products by 17 factories of the private sector is 43,800 tons based on one shift. Production capacity of steel bars alone is not given, and it is not constant.
- Includes rejected production which amounts to about 5%.

Source Ref. (18). Original Source given: General Organization for Industrialization.

grated steel plant in Egypt, starts production from iron ore. The other three plants are scrap-based plants; i.e., they accept scrap and pig iron as raw materials for their production.

The very low utilization of the Iron and Steel Co. is a reflection of the problem this company faced and continues to face in the production of its steel. These can be summarized in the low quality of the ore it uses and the expenses in transporting it 900 kms from Aswan. This increases the costs of production due to extra costs of transportation and use of large quantities of imported coke. The quality and quantity of the labor used in this factory is another problem. The factory employs poorly trained workers and employs more people, as a government policy, even at a time of decreased output. Finally, the plants also exhibit some problems in design with respect to economic size of their components and the adequacy of the technology of production itself [15].

The scrap factories are suffering from changes in the scrap situation. Since local scrap has become less abundant, they have had to rely on imported scrap. This subjects them to foreign exchange problems and the international scrap market, with its fluctuating prices.

Government control, as in the cement case, is also extended to the regulation of prices and distribution of steel rebars. Such control and price fixing fosters the black market in rebars. The situation, however, was much better than that of cement until mid-1979. Black market prices were only 20 to 30 percent more than official prices, and waiting time for official delivery averaged only one month [23]. Unofficial prices averaged some L.E. 225 per ton in 1978, while official prices were set at L.E. 180. Furthermore, the allocation system for rebar distribution seems to work more smoothly than that of cement. Even so, some inefficiencies do exist in the allocation; recent studies reveal allocations of quantities

somewhat in excess of that required by wall construction but somewhat less than that needed by skeleton-type buildings [11].

The main problem that faces the contractors in the acquisition of steel is the sporadic shortages of certain diameters. As was described earlier, the management problems of the government-controlled companies in producing and maintaining their production have led to shortages in certain diameters. Government steel importation policies and control have also in the past exacerbated the situation. Up till 1977 the importation of steel rebars was permitted only for public sector companies [24]. The Ministries of Housing and Industry decided on the quantities and the specifications. These decisions were not always in harmony with the mix of locally produced rebars. Imported diameters often did not complement locally produced ones, which added to the shortages in specific diameters. This has led to delays in delivery, and eventually to increases in costs either due to waste in the usage of rebars or due to acquisition on the black market.

Inefficiencies in the production and importation of rebars, coupled with increases in the cost of the raw materials, have led to increases in both the official and unofficial prices of steel rebars. The official base price, i.e., before any additions for transport or diameters and lengths, has increased 156 percent between 1970 and 1977, from L.E. 125 per ton to almost L.E. 200. The unofficial price is almost 20 percent higher. If government controls are not relieved both on the production and trading of steel rebars, and if new plants for production facilities do not come on line, the situation can be expected to worsen as demand for rebars increases with the increases in construction.

### III. A.3 Bricks

The most used building material in Egypt is burned

brick, the "red brick," made in 7x12x25 cm. standard sizes from a mixture of silt and sand. Production of red bricks accounted for about 92 percent of the total brick production in 1976. Despite its importance, data on the production of red bricks is difficult to find. First, wide-scale interest in brick production has been relatively recent in Egypt. It really started only when brick prices rose dramatically in the mid-1970's and attention was focused on the serious problem of non-renewal of the silt deposits in Egypt as a side effect to the construction of the High Dam. Secondly, unlike cement or steel, at least 90 percent of the bricks consumed in Egypt are produced in small private sector factories scattered around the banks of the Nile River. For these two reasons, recent interest and the fragmentations of production, the estimates of brick production in Egypt are quite varied, as seen by the low and high values in Table 9. Although the figures should be viewed with caution, red brick production is expected to slow down due to the raw materials problem.

The second largest group of brick produced in Egypt are cement bricks. These accounted for only about 5 percent of brick production in 1976. The majority of cement bricks are produced in blocks larger than a red brick and are hollow to decrease raw material and weight. Contractors themselves account for about 90 percent of the production of cement bricks, and usually produce bricks for their own consumption on large building sites. Cellular concrete, a mixture of sand, lime, cement, and imported aluminum powder, is also produced in small quantities by the Sand Bricks Co., the sole public sector brick producer in Egypt. This company also produces sand-lime bricks which accounted for about 2 percent of the total production of bricks in 1976. Finally, clay-facing bricks are also produced in negligible quantities by another public sector refractory firm.

With the exception of sand bricks produced by the public sector, pricing and trading in bricks is left to the open market. The shortages in raw material and the increase in labor costs of production are transferred to the consumer, i.e., the contractor and ultimately the client. There has been no indication until recently that substantial delays occur in obtaining bricks. The average delay quoted was between one and two weeks from order to delivery [23]. This is very short when compared to cement, for example.

There is no external trading in bricks. The production is consumed internally, and there seems to be no need for inventories. The product is fragile and heavy, and because it is usually transported to the sites by trucks, factories service only short distances around them. This in some cases poses problems of added costs to projects in remote areas, either because of exorbitant transportation costs or because of use of more expensive alternatives.

The problems faced by the public sector brick producers are very similar to those of the cement and steel producers: capital-intensive techniques are in need of maintenance and spare parts, lack of which causes breakage and interruption of production. These are compounded by an insufficiently skilled labor force and frequent breakdowns of water and electricity supply [19]. Furthermore, the price set by the government for bricks barely covers their production costs. In most cases the government is subsidizing such production, probably to be able to compete with the lower prices of red bricks in the mid-1970's.

Now the situation is different, with red brick prices jumping from L.E. 7.5 per 1000 bricks in 1970 to L.E. 20 in 1977. Alternatives are becoming more and more attractive economically and thus feasible. Red brick prices increased mainly because brick plants had to pay for the raw materials they used to get for free. Firms now pay for the silt they scrape off the agricultural top soil, instead of using

Table 9: FIGURES ON PRODUCTION OF RED AND SAND-LIME BRICKS DERIVED FROM A VARIETY OF SOURCES (UNITS ARE MILLION BRICKS, IN 6x12x25 CM SIZE OR EQUIVALENT)

Year	Averaged Red Brick Production (1)	Averaged Sand-lime Brick (2) Production	Calculated Total Red & Sand-lime Brick Production	Averaged Red and Sand-lime Brick (3) Production
1960	800	11	811	811
1961	730	10	740	740
1962	750	17	767	767
1963	700	15	715	965
	950	15	965	965
1964	705	24	729	1054
	1030	24	1054	1054
1965	702	12	714	714
	1156	21	1177	1177
1966	600	13	613	613
	1047	27	1074	1074
1967	624	16	640	656
1968	608	14	622	637
1969	708	21	729	733
1970	763	19	782	802
1971	767	19	786	810
	767	42	809	810
1972	772	45	817	835
1973	741	50	791	780
	741	50	791	1500
1974	760	46	806	764
	760	46	806	1830
1975	709	49	849	700
				1940
1976	515	47	562	1386
	1500	47	1547	2020
1977		72		1559
				2290

Note: For each column labeled "averaged" the data from the appropriate sources were adjusted to a calendar-year basis if necessary (by averaging the surrounding fiscal years, e.g., data for 1969/70 and 1970/71 was averaged to obtain data for 1970). Then all data was averaged to obtain the representative set of calendar-year figures given in the table. Some wide differences occurred in the production data for 1963-66 and 1971. In each of the above cases, the data was handled as two distinct sets, a high and a low set, both of which are being presented in the table.

The column labeled "calculated production" is simply averaged red brick production plus averaged sand-brick production.

Source Ref. [19] Original references given below:

- For (1) Academy of Science and Technology, Central Agency for Public Mobilization and Statistics, Federation of Egyptian Industries, General Organization for Housing, Building and Planning Research, General Organization for Industrialization, Ministry of Industry and Mining.
- For (2) Academy of Science and Technology, Central Agency for Public Mobilization and Statistics, Federation of Egyptian Industries, General Organization for Industrialization, Sand Brick Company.
- For (3) Same as (1) above, and Ministry of Housing and Reconstruction.

that deposited during the yearly floods that have been stopped by building the high dam. The increased demand expected in the future will sustain such practices.

The enactment of legislation to prevent the abuse of agricultural land will not alone prevent such practices, as long as it is economically feasible to pass the added costs to the consumer, and as long as other alternatives to red bricks have not been developed. The government is starting a new program for factories to produce bricks from desert shale [19]. It is also beginning to encourage several red brick factories to convert their operations to use desert shale. Such efforts will, however, take time. The factories take a few years to build; and the efforts to introduce modernized technology, extruders and dryers to the small factories need time to be accepted. Meanwhile, production costs for red bricks will continue to increase, and so will their prices.

### III. B. Construction Labor

The situation of construction labor in Egypt has been analyzed in detail in another paper presented to this seminar [7]. This section will therefore point out a few of the changes that occurred in the labor supply since the mid-1970's, when wages increased dramatically. As shown by Table 10, remarkable increases as high as 200 to 500 percent in all wages occurred between 1970 and 1977.

Both the public and private sectors rely heavily on labor subcontractors to provide the required labor for their projects. Only a small part of the work is normally carried out by the general contractor's own staff. Typically, a contractor would have small teams able to work on the structural parts of the building, and would subcontract the non-structural work [23]. Labor subcontractors have access to the pool of specialized laborers, normally in local gathering places and coffee shops and they hire the

workers individually or in teams on a piece-work basis. Compensation is based on the performance of quotas (Tariha in Arabic). This quota, so many units per working day, is established by tradition, and the completion of one or more determines how much a worker will be paid each day.

The number of labor subcontractors has increased in Egypt. In 1966 those registered with the government were about 3000. In 1971 there were 1600 and by the end of 1977 they had increased to some 6700 contractors. The numbers employed in construction on the aggregate have also increased. Despite various problems in the data, from lack of up-to-date census information to seasonality and local differences in construction employment, the available figures indicate such an increase. Employment in construction increased from some 387,000 in 1970 to some 493,000 in 1977 [7].

Along with this increase in employment there has been an improvement in the wages paid to the laborer of various skills as shown in Table 10. During the sixties, however, this increase was relatively steady, averaging about 5 to 10 percent per year, enough to cope with the rise in the cost of living. Since 1970 this increase in wages has become rather dramatic. Across the board wages jumped 200 to 500 percent between 1970 and 1977, with most of them doubling between 1973 and 1975. Such sudden change in the wages indicates a major change in conditions of construction labor supply.

The factor that really changed in the supply, however, has been the construction labor emigration to other countries. Since the mid-1960's Egypt has been providing white-collar workers and teachers to the Arab world. Since 1972 there has been an increase in the Egyptians looking for work outside the country, particularly among construction workers. The M.I.T./Cairo University research estimates the number of construction workers that left Egypt in 1976 alone to be between 200 and 250 thousand, which is

Table 10: AVERAGE DAILY MONEY WAGE IN L.E.  
FOR VARIOUS CONSTRUCTION WORKS  
(Source: Refs. 7,10)

	1960 <sup>(a)</sup>	1962 <sup>(a)</sup>	1965 <sup>(a)</sup>	1970 <sup>(b)</sup>	1973 <sup>(b)</sup>	1975 <sup>(b)</sup>	1977 <sup>(b)</sup>	% Change 60 - 70	% Change 70 - 77
Masons	0.80	0.80	0.90	1.50	2.50	3.50	5.70	87.5	280
Assistant Masons	0.60	0.60	0.70	1.00	2.00	3.00	5.70	67.0	470
Low-skill Masons	0.40	0.40	0.50	0.60	1.50	2.00	3.00	50.0	400
Excavation	0.20	0.20	0.25	0.30	0.60	1.00	1.50	50.0	480
Concrete Carpenter	0.70	0.70	0.80	0.90	1.25	2.00	3.25	29.0	260
Assistant C. Carpenter	0.40	0.40	0.50	0.60	0.80	1.50	2.25	50.0	275
Steel Fixer	0.50	0.50	0.55	0.70	1.00	2.00	3.00	40.0	329
Assistant	0.50	0.50	0.55	0.60	0.90	1.50	2.50	20.0	317
Concrete Pourer	0.40	0.40	0.50	0.60	0.90	2.00	3.00	50.0	400
Concrete Carrier	0.30	0.30	0.40	0.50	0.80	1.75	2.75	67.0	450
Plumber	0.70	0.70	0.75	0.80	1.50	4.00	5.00	15.0	520
Assistant	0.35	0.35	0.40	0.50	0.90	2.00	2.50	43.0	400
Plasterer	0.60	0.60	0.70	0.75	0.90	2.00	3.00	25.0	300
Assistant	0.30	0.30	0.40	0.50	0.60	1.00	1.90	67.0	280
Painter	0.70	0.70	0.75	0.80	1.00	2.00	3.00	15.0	275
Assistant	0.35	0.35	0.40	0.50	0.70	1.25	1.50	43.0	200
Joiner	0.60	0.60	0.70	0.80	1.25	2.00	3.50	33.0	335
Assistant	0.35	0.35	0.40	0.50	0.80	1.25	2.00	43.0	300
Electrician	0.30	0.30	0.40	0.75	1.00	2.00	3.20	150.0	325
Assistant	0.20	0.20	0.35	0.50	0.75	1.50	1.70	150.0	240

(a) Values are 70% of those in Ref. 10 to account for social security.

(b) Values are from Ref. 22.

more than 50 percent of the construction labor force at the time [7]. Such a finding can very well explain the sudden jump in the wages of all construction workers since 1973.

The figure is large enough to have in itself caused serious problems for the industry, but what is more interesting is the composition of such emigration, which includes a large concentration of highly skilled and semi-skilled workers, such as masons and electricians. This explains why the wages of some trades increased much more than others. This is also significant because although employment in the sector as a whole continued to increase, such increases must have been due to the attraction of new laborers to construction. This attraction may have been beneficial from the standpoint of the economy if the newcomers were drawn from the unemployed and underemployed; this, however, resulted in lower work productivity and quality for construction. These workers were unskilled, and their on-the-job training was particularly expensive.

Private contractors have been under pressure from the rising wages, and are having difficulties keeping their workers, even though they are usually able to pay them. Public contractors also are under the same pressures, although it seems that the security that their employment provides, as well as the added benefits, social security, and health plans, seem to offset the unattractiveness of their controlled wages. Furthermore, both sectors are being forced to use lower quality workers, causing waste and increasing rework. Most medium-sized firms are even forced to use their supervisory staff to perform manual work, further reducing efficiency of their operations [23].

Traditionally in Egypt, training for construction trades has always been an artisanal, on-the-job training of young apprentices. At the time of labor abundance, such a system was adequately responding to the demand. The present situation, however, has been pressuring the government to intervene in the training of workers of different trades; some large public sector contractors have also set

up their own training programs to cope with the situation. These efforts according to the government plan call for the training of some 500,000 workers over the next five years. Such programs require time, and most of them are in their infancy, which means that the pressures on wages are expected to continue, especially if construction demand continues to increase.

Fortunately, indicators suggest that Egypt may be past the peak of emigration, and it will stabilize, if not reverse, in the future. Arab demand for construction workers is slackening, workers from other parts of the world are competing with the Egyptians, and real wages in Egypt have increased. If such stabilization occurs, training efforts succeed, and demand continues for construction in Egypt—then labor cost increases may be a less severe problem in the future than they have been in the past.

### III. C. Construction Equipment

Until the mid-1970's Egyptian contractors relied heavily on construction labor. Equipment use was limited to special cases or large projects, for example, pile driving for foundation work of a large building, or land leveling for large government land reclamation projects. This was due to labor abundance and the fact that practically all equipment is imported from abroad. Since 1961 government limited import/export activity to public sector firms, which made them the sole source of equipment supply in Egypt. The only official figures on the equipment owned and operated by contractors in Egypt pertain to the years 1971 and 1972, as shown in Table 11. These figures, although obsolete, do show that public sector contractors had easier access to all types of equipment than did the smaller private sector firms. This reflects the government policy of giving priority to these firms' needs in foreign exchange.

Most of the equipment owned by the firms, however, is not very new. Some public contractors' records revealed

an average age of five to six years for their equipment [23]. This further shows how interrupted and irregular equipment supply has been. New equipment would be purchased not when needed to replace the old, but when foreign exchange was allocated for the purpose. Often such allocation did not coincide with the contractors' needs.

Not only was the supply untimely for the contractors' needs, but the sources and sometimes the specification of the equipment required was also imposed on the firms. Due to payment facilities and intergovernment agreements, contractors were often supplied with equipment from varied sources, and with varied specifications. The largest contractor alone has 400 equipment types from 240 makers [23]. This practice definitely complicates the maintenance problems of the firms.

Most firms do not perform their maintenance internally; only a few very large contractors have maintenance facilities. All firms, however, suffer from lack of spare parts and skilled repair labor, which adversely affects their control over their maintenance and repair activities. Government actions in the early 1960's reduced the available equipment agencies in Egypt; such agencies provided the much-needed after-sale service for the equipment, providing expertise and spare parts which would minimize the efforts required to repair and service the equipment. Without the agencies, contractors face long repair time, excessive rework and equipment breakdown. Due to the excessive variety of equipment, firms maintaining their own equipment find it expensive to train mechanics; one contractor claimed it required one year for a mechanic and about six months for an engineer to receive training [23]. Furthermore, these employees, like other construction workers, are attracted by other Arab countries, thus further increasing the costs and reducing the quality and productivity of the maintenance and repair activity.

Not until 1975 did the government start to ease its

Table 11: AVERAGE NUMBER OF VARIOUS EQUIPMENT  
USED BY CONTRACTORS IN EGYPT IN  
1970/71 AND 1971/72 (Source: Refs. 1,2)

Equip- ment	Contractors Type	Public Sector										Total	
		General Building		General Roads		General Non-Bldg.		Specialty*		Total Public Sector		Private Sector	
		70/71	71/72	70/71	71/72	70/71	71/72	70/71	71/72	70/71	71/72	70/71	71/72
Building Equipment		3.6	4.0	1.7	2.2	2.7	3.3	4.1	1.9	3.4	3.5	0.02	0.03
Transport		5.0	5.5	19.9	22.8	5.8	5.3	4.8	2.1	6.6	6.4	0.08	0.10
Earthmoving		0.3	0.2	0.06	0.08	0.4	0.4	0.1	0.05	0.3	0.2	0.03	0.06
Road Equipment		.24	0.3	7.3	8.7	0.15	0.14	0.18	0.07	0.8	0.8	0.03	0.03
Material Handling		0.10	0.07	0.70	0.90	0.13	0.15	=	0.03	0.14	0.14	NA	NA
Small Tools		2.2	2.1	1.1	1.9	2.4	2.8	1.6	2.5	2.1	2.4	NA	NA
Other Equipment		0.6	9.0	1.3	2.1	1.0	1.4	0.7	0.14	0.8	5.5	0.04	0.02
Avg. No. of Projects per firm		36	38	31	25	34	26	27	53	32	34	3	2

\*The average for specialty contractors in fiscal 71/72 is low because one specialty contractor was changed to the category of general non-building contractor in that year by the Ministry of Housing.

control over import/exports, and allowed foreign agencies to be handled again by the private sector. This move has certainly increased the accessibility to equipment. Already by May 1978 some 202 Egyptian firms were representing some 337 foreign suppliers [20]. One hundred and ninety-two of the foreign firms supplied equipment and were represented by some 118 local firms. Most of these foreign firms are from Western Europe, the U.S. and Japan, compared with the 1960's when most of the equipment was coming from Eastern Europe and the Soviet Union. Another indication of the increased supply in the mid-seventies can be seen from the import figures, which show that in 1975 the value of machinery imported was double that of 1973. The values in 1970 fixed prices were L.E. 67.4 million and L.E. 32.2 million, respectively [6].

The increase in number of supplies and the evident increase in equipment usage have not overcome all the obstacles in equipment supply. Most of these local suppliers, either through themselves or on behalf of their foreign suppliers, extend some suppliers' credits to the prospective buyers. The contractors, especially the private ones, however, still have trouble meeting the collateral requirements of Egyptian banks, which still require real estate collateral and rarely extend loans against the equipment delivered [23].

Alternatives to buying expensive new construction equipment are not available in Egypt. Equipment rental or leasing is almost non-existent in Egypt; furthermore, import regulations still prohibit the importation of used equipment for sales purposes. This deprives the contractor of valuable alternatives, and inhibits the smaller contractors from using equipment. It imposes a longer-term commitment and a higher risk on these firms.

### III. D. Management Personnel

The supply of management personnel, defined as professional, technical, administrative and clerical workers,

has increased over the years. Lately these workers have also been migrating abroad in pursuit of higher wages. The result was increasing salaries in the private sector jobs, and increasing fringe benefits and to a lesser extent salaries in the public sector jobs. This section will concentrate on the professionals, i.e., engineers and architects, because of the key role they play in managing large contracting firms and construction projects in Egypt.

The emigration of these professionals did not cause serious problems to contractors until recently. The universities and educational institutions were turning out large numbers of new professionals. There are nine universities in Egypt, three in Cairo alone. More important than the ever-increasing graduates were the Egyptian laws that required each individual new graduate to work for the public sector and the government for a period of six years before he was free to leave his job. Today this law has been changed, and only those engineers who elect to work for the public sector in the first place have to stay for six years. This has somewhat decreased the supply for the public sector firms and increased that of the private firms [11].

Table 12 shows how the number and share of management personnel has increased in construction employment in Egypt over the years. The major change, however, occurred to the professionals between 1960 and 1966, which coincides with the creation of the public sector firms in construction. The large firms created by the nationalization and amalgamation of small private sector firms were more able to support the services and salaries of an increasing number of professionals. Furthermore, being government owned, they also provided employment opportunities to new graduates in response to the needs as perceived by the government [11].

Numerical estimates of professionals leaving the construction industry are not readily available, but estimates for engineers as a group show that their emigration flow from

Table 12: COMPOSITION OF LABOR FORCE IN SOME SECTORS (Source: Ref. 7)

	Year	Professional & Technical	Administrative	Clerical	Salesmen	Craftsmen & Workers	Services Workers	Other & Not Classified	Total
Construction	1960	1.70	4.20	0.10	0.40	90.80	1.00	0.40	100
	1966	3.53	5.72	5.68	0.58	79.74	2.88		100
	1974	4.40	6.30	6.40	0.30	78.20	4.00	0.40	100
Manufacturing	1960	1.24	1.22	3.93	0.73	90.53	1.78	0.55	100
	1966	2.21	2.40	8.08	1.58	82.03	1.78	1.78	100
	1974	3.57	0.64	6.00	0.85	84.07	4.83	0.83	100
Agriculture	1960	0.07	0.01	0.19	0.04	0.39	0.46	98.84	100
	1966	0.56	0.16	0.88	0.14	1.77	0.60	95.90	100
	1974	0.38	0.07	0.72	0.03	0.87	0.61	97.33	100

Table 13: SHARE OF EACH L.E. PAID IN WAGES IN BOTH PUBLIC AND PRIVATE SECTOR CONTRACTOR OUTPUT (Source: Ref. 1, 2)

Contractor's Sector	General Building Contractor				General Non-Building Contractor			
	Private		Public		Private		Public	
	1970/71	1971/72	1970/71	1971/72	1970/71	1971/72	1970/71	1971/72
Value of work executed <sup>(1)</sup>	19,497	19,061	40,525	65,841	9,634	10,667	14,813	13,130
Wages Paid	4,190	4,049	15,557	17,398	3,513	4,220	3,630	5,739
Productivity of L.E. of Wages	4.65	4.71	2.61	3.78	2.74	2.53	4.08	2.29

(1) Public sector figures do not include work subcontracted to other firms. This work is usually supervised by the main contractors supervisory personnel.

Egypt between 1968 and 1973 increased from about 7000 in 1968 to 19,500 in 1972 to some 18,000 in 1973 [7]. Since construction employs about 2 percent of the professionals in the economy, the magnitude of those leaving construction can be estimated as between 200 and 500 per year; this accounts for about 4 percent of all construction professionals [7].

There are no readily available measures to test the efficiency of the managers used by Egyptian contractors; the lack of formal construction management training is, however, evident. While there is no doubt about the technical qualifications of the professionals, the lack of any institutional or professional education in construction management and operations makes them rely entirely on common practice in planning and controlling projects. The problems of quality of management personnel and their effectiveness is further demonstrated by comparing the performance of both public and private contractors. The productivity of the wages paid in both sectors is shown in Table 13; the indication is that there is higher productivity per L.E. of wages in the private sector. Since the private sector uses fewer supervisors than the public sector, the difference becomes more pronounced. This clearly indicates the need for improvement in the use of supervisory staff in public sector firms, and supports the view that public sector firms are overstaffed.

It is not surprising to find that wages in the private sector firms are higher than those in the public sector. For example, a starting salary of L.E. 150 per month for a new graduate is common in the private sector, while public sector salary for similar qualifications may be as low as half that figure. Fringe benefits in the public sector may include transportation, site incentives and overtime pay. The major attraction of the public sector, however, is its guaranteed position. With the exception of very few offenses, a public sector employee is usually guaranteed his position by law, and the firm cannot fire

him. This is why some professionals and administrators refuse to quit the public sector [23].

With increasing demands on construction in Egypt, it is necessary to improve the quality and efficiency of managers and professionals in order to control satisfactorily the construction operations. An important avenue to achieve such objectives lies in the continued encouragement of private sector contractors, and the attraction of foreign firms to joint venture with Egyptian contractors. Such steps are not only necessary to increase the attractiveness of the wages and salaries in Egypt and to discourage emigration, but they provide opportunities for the Egyptian managers to learn and practice new improved management techniques in Egypt.

#### IV. Effects of Resource Constraints on Contractors

All the limitations discussed so far in the delivery and acquisition of construction resources in Egypt have developed due to supply constraints and demand uncertainty. The supply has been inadequate; bottlenecks in production processes, and government intervention through price fixing and regulating trade, have been major factors. Such resource limitations have imposed serious barriers on both the size of the Egyptian construction output and the efficiency of contractors' operations. In general, the predominance of resource constraints overshadows the importance of the variables that contractors usually control, thus reducing the effectiveness of planning and control by the firms.

Time planning and control already receive low priority on most projects in Egypt, especially on medium and small projects, where time is often controlled informally. From the previous discussions, it is expected that uncontrollable delays in the delivery of resources are frequent and often lengthy. The delays in delivery of controlled materials or in the importation of spare parts cause delays up

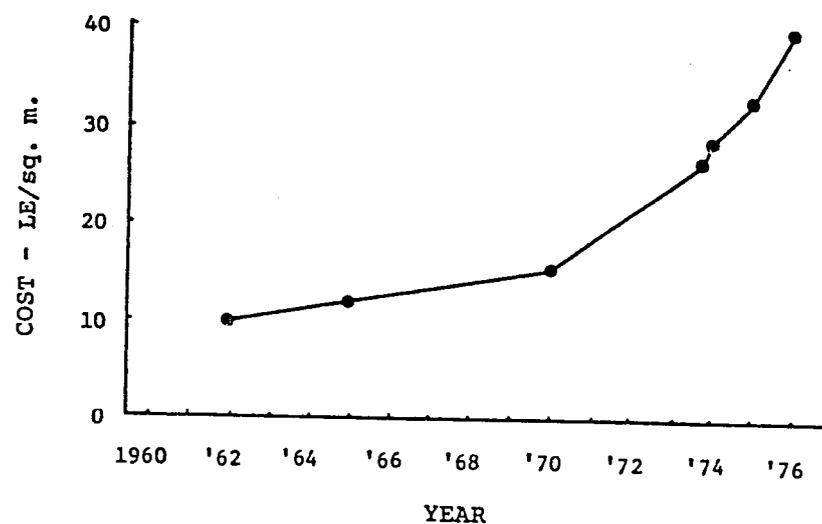


Figure 1: CONSTRUCTION COST PER SQUARE METER FOR TYPICAL PUBLIC SECTOR HOUSING PROJECT IN L.E. PER SQUARE METER (Source: Ref. 10)

to six months in project execution. This situation is aggravated by the deteriorating quality of the labor force. First there are slowdowns due to the learning effects of the on-the-job training of such workers. Then there are the delays due to misuse of equipment, as well as maintenance deficiencies, which lead to higher equipment down-time. Inconsistent quality of locally produced material, when available, often causes work stoppage; these materials often have difficulty meeting required specifications.

Such problems are also aggravated by difficulties in importation of materials and equipment; some delays are caused by difficulties in acquiring foreign exchange, others by transportation time required for arrival of foreign goods. Inadequate specification at the outset often leads to receiving inappropriate equipment. Such inadequacy may be due to mere oversight by the purchaser and sometimes due to lack of knowledge about the material being imported, but often due to lack of compatibility with the local production. Furthermore, constant changes in the import regulations governing the types of materials and equipment imported, as well as the custom duties required, can lead to unforeseen delays in clearing the imports for use once they are in Egypt. All such uncontrollable delays reduce the effectiveness of time control on the projects, and even the appropriateness of delay penalty clauses. They foster increasing reliance on informal controls and shift the concentration on how to get the resources rather than on how to use them.

By far the most measurable effect of these resource constraints in Egypt is on contractors' costs. Shortages in various resources raise their prices. Contractors' costs have reflected such increases; as can be seen from Figure 1, their costs increased about four times between 1961 and 1976 for building a standard five-story walk-up apartment building in Cairo. While some inefficiencies related to contractors' performance certainly increase costs, the main increase is due to a sudden rise in both

labor wages and materials prices between 1974 and 1976.

Inefficiencies in acquisition of various resources impose added costs on contracting firms. The uncertainties in delivery of building materials and spare parts add to costs either through the cost of idle time or through added prices on the black market. Furthermore, they add to the costs of doing business by imposing high inventory level requirements on the firms. Difficulties in securing credit and having to pay in advance also increase the firms' indirect costs.

Labor shortages and equipment maintenance problems also impose increased costs, first through the costs of downtime and delays, then through the increased costs of rework required. Furthermore, this situation forces general contractors to maintain a higher level of overhead than would otherwise be necessary. Firms cannot lay off skilled workers for fear that they might not be able to rehire them. Also they often have to buy more stand-by equipment, especially with no rental market to satisfy their short-term needs.

Resource problems in Egypt complicate the quality control activities on projects. Already such practices are subject to question; a cursory look at recently completed buildings emphasizes this concern. The main problem seems to be that existing standards concentrate on meeting specific requirements such as an allowable strength rather than establishing allowable tolerances for the various construction activities. As a result, enforcement of such standards is left mostly to the discretion of the participants involved. This encourages these parties to agree on trade-offs and to sacrifice some quality issues for the sake of other measures such as expediency or lower costs.

The predominance of delays and added costs due to labor shortages, questionable quality of some materials, or materials delays caused by government intervention reduce the priority attributed to quality control. More importantly, since most of these constraints are outside

the control of individual firms, their existence builds a case for sacrifices and relaxation in quality control enforcement.

In general the preponderance of these resource problems in the Egyptian construction industry increases the risks as perceived by the contractors. It reduces the importance of variables under the control of the contractor such as the usage of resources and their productivity on the job, and increases the importance of factors outside the control of the firms. This results in a low priority attributed to formal construction management techniques and reduces their possible effectiveness in improving efficiency of the firms.

The increased risk does not only reduce the importance of planning and control; it also affects the firm's field of operations. Larger firms may seek to diversify their activities through vertical or horizontal integration; smaller firms may just shift their construction operations entirely to a new field. Many firms have already started to invest in real estate activities, design building activities, or in import/export of building materials. Such practices, if continued, will certainly pose capacity limitations that would not otherwise exist.

#### V. Conclusion/Recommendations

On the basis of the foregoing discussion of resource constraints, certain general conclusions can be drawn. These recommendations concern resource supply, as well as the environment in which they are delivered to contractors. Alleviating constraints on the supply of resources will allow firms to concentrate more on the efficiency of their use of these resources rather than on their acquisition, a situation which clearly hampers the development and effectiveness of construction management techniques.

In general, efforts are needed to increase the supply of all resources to the industry. A necessary step towards achieving this goal is to increase the efficiency of their

production. Steps must be taken to alleviate constraints on supply of the various resources. These constraints have fallen into three main categories: technical, managerial, and regulatory. Technical problems in the supply of building materials must be solved. The low quality of iron ore and the supply of scrap for steel production have to be reviewed and upgraded. Alternatives to problems in packaging cement in paper bags must be studied and tested. Quality control in the production of local materials should also be enhanced. In labor supply, obstacles to training skilled labor have to be overcome. More efforts should be directed toward enlarging the base of laborers entering the industry. Finally, so that the supply of management personnel can be improved, education of professionals in Egypt should be made more responsive to the needs of contracting firms.

Regulatory problems cause serious inefficiencies in the supply of many resources in Egypt. The government should stop its policies of material price fixing so that materials can be attracted back to the formal markets. Rigid employment and compensation regulations imposed on public sector firm employees should be relaxed to stimulate labor productivity. Intervention in the trading of resources and preferential treatment of the public sector needs for materials, capital, or foreign exchange should not be allowed to continue. Furthermore, the constant changes in regulations should be discouraged, and consistency, clarity and stability should be the aim of regulations impacting the availability and consequently the prices of the various resources.

Reduction in the rate of emigration and existence of the informal sector indicate that the shortages now may not be so severe as they have been in the past; however, it is expected that shortages will continue to exist in some resource or the other in the near future. The standard approach to dealing with shortages in Egypt has been to expand production of the resource in question, while almost

no thought is given to the possibility of substituting another resource for the one in short supply. It is important to study the potential of substitutes, especially the locally available ones, to alleviate shortages in the traditionally used materials or labor. The role that gypsum walls can play in reducing reliance on bricks and cement is an example; the use of small power tools in reducing the need for highly skilled labor is another.

Expanding the existing production of resources, whether through increased efficiency or by adding new production capacity, relies on the available estimates of demand for the resource under consideration. In order for the planning of such new production to be efficient, there is clearly a need to improve the data base for such demand estimates. Reliable figures on the use and consumption of the various materials, equipment and labor are badly needed. Large disparities in demand estimates cannot be tolerated if costly plans are to be implemented for increasing the production of materials or for initiating training programs.

The government can and should use both its position as regulator and as major industry client in implementing these recommendations. As a regulator, it should reduce its intervention in the market places for different resources through subsidies and allocation controls. It should continue to deregulate the trading of locally produced building materials and imports, as it did with cement. It should also encourage the increased involvement of firms and the attraction of new firms to the industry, especially by using incentives, as it did in the foreign investment and joint venture laws. As a client it should investigate relations other than the traditional general contractor fixed price approaches to contracting. Such actions, if adopted, can reduce the present risks born by the contractors, and reduce the adverse impacts of variables outside the control of the firms; firms should then be able to focus their attention on the variables affecting their internal performance.

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- A. Farag (general contractor)
- M.M. Hafeez, Vice Chairman, Giza General Contracting Company (Giza Co.)
- F. Haggag, Undersecretary for Public Sector Companies, Ministry of Housing
- A. El Hellwe, Egypt Company for Engineering Works
- K. Ibrahim, Undersecretary for Legal Affairs, Ministry of Development and New Communities
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- A. Louca, Office of Private Sector Contractors, Ministry of Housing
- Mahfouz, Office of Private Sector Contractors, Ministry of Housing
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- I. Osman, Arab Contractors
- S.K. Rasmy, General Director, Construction and Building Division, Ministry of Planning

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Management of the  
Construction Industry in Egypt

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CONSTRUCTION AND DEVELOPMENT:  
THE EFFECTS OF LABOR MIGRATION

Dr. Nazli Choucri  
Professor of Political Science  
Massachusetts Institute of Technology

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## CONSTRUCTION AND DEVELOPMENT: THE EFFECTS OF LABOR MIGRATION

### Introduction

Conventional views of economic growth in developing countries generally focus on the gap between traditional and modern sectors and on rural/urban differences. These views stress the importance of agriculture in relation to an often nascent industrial sector and emphasize the processes that generate a redistribution of economic activity away from traditional to more modernizing sectors of the economy. Conventional views, although predominant in both policy-making and academic circles, neglect a critical sector of development and therefore ignore one of the more potentially dynamic vehicles of growth in a developing economy.

This sector is construction.

The perspectives and analysis imposed by conventional views of economic growth are particularly unfortunate and potentially misleading, since this sector has, in fact, a distinctive role in the economy and a unique relationship with other sectors. An economy cannot grow faster than its construction activities and constraints on construction, by necessity, impose critical constraints on the rest of the economy. And since the demand for construction is tied to the output of other sectors, and the supply of construction is a critical input to other sectors, the intersectoral linkages of construction to the rest of the economy assign it a position that is not captured by conventional analyses of growth and develop-

ment.

This paper first briefly reviews the role of construction in the economy, then focuses specifically on the role of labor. The emphasis is on the significance of labor migration on employment in this sector and the impact of changes in employment on output and productivity.

The migration of construction workers to other Arab countries is part of the recent massive flow of Egyptian workers, of all types, to other countries of the Middle East. This movement has important economic consequences for Egypt and the Arab world generally, as well as effects on specific economic sectors in each country of the region. It reflects a pattern of labor movement comprising a wide range of skills--from engineers, contractors and other technicians, on the one hand, to brick layers and sand haulers, on the other. This movement, generated by the events of 1973, created major transformations in the pattern of employment in both skilled and less skilled workers, and the changes have affected the construction sector. Both the large formal construction sector and the unorganized sector are affected by fluctuations, changes, and even shortages of labor.

Migration of construction workers is mainly of a temporary nature. The return flow is regular and frequent and returnees may well have new skills as well as new patterns of consumption. This movement of labor created shortages of some skills and even some imbalances between skills required for the construction sector and domestically available skills. Increasingly, this migration has required government intervention and regulation, thereby placing contractors, government officials and construction workers in a new relationship designed to meet the demand of construction for labor, generate a supply of labor to other countries, and create basic

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procedures for assuring adequate working conditions for Egyptian labor. While most labor migrates as part of a "free market," government-to-government agreements are beginning to impose some regulation in the responsiveness of labor to demand in other Arab countries, and a new policy context for the movement of labor.\*

#### Construction and Development

Construction activity is critical to growth because of its crucial role in investment and the expansion of productive capacity. Since capital formation is a necessary condition for economic development, a country cannot grow without a substantial rate of investment. A large part of investment is undertaken by the construction sector. The demand for construction and the supply of construction are both shaped and constrained by labor, capital and technological endowments of the economy. And constraints in construction activity impose, by necessity, critical constraints on economic growth.

Construction activity is important in Egypt for several additional reasons. First, much of the country's reconstruction activities are undertaken through construction and involve a substantial rate of interest in infrastructure. Second, the expansion of the country's industrial base and urban centers entails extensive investment in construction and in construction activities. Planning for cities, new industrial centers, and new regional developments place strong pressures on the construction sector. That sector's ability to deliver output to other sectors of the economy will determine the country's capacity to undertake planned expansion. By the same token, the ability of other sectors to deliver

inputs into construction tie construction activity to the rate of growth and productivity of other sectors. Third, construction activity in the Arab world as a whole has increased at rapid rates during the past several years, placing additional pressures on Egyptian resources, particularly manpower, construction firms, material skills, and so forth. Fourth, in addition to this pressure, there is an intimate association between the construction activity in Egypt and in other Arab countries which is tying the rate of growth of one country to the resources and rate of growth of the other countries. The link is most dramatically imposed by manpower requirements and demand for labor, not only in Egypt, but in other countries as well. The critical point, of course, is that the expansion of construction activity in Egypt and in other Arab countries appears to be constrained not by capital or technology, but by the availability of labor.

The importance of construction to development far outweighs its importance as observed by some initial indicators. For instance, in Egypt, which is not atypical of developing countries, construction is estimated to produce about 7.7% of GNP in the past ten years and employs about 5% of the labor force. There are some estimates to the effect that construction labor is an even smaller share of total employment. But the proportion of construction to total capital requirements is 40-45% and in some countries as high as 60%. More important, however, is the fact that there are no substitution possibilities between contracted facilities in an economy, on the one hand, and capital and labor on the other. This means that within the construction sector, substitution between capital and labor occurs sometimes even to a high degree, but constructed facilities cannot be substituted for capital or for labor.

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\*See References for the reports on which this paper is based.

Construction activity and the construction sector have additional characteristics that render it critical to an economy. Construction must be produced on the spot; it cannot be imported. As a nontraded good, it ties the economy to its own output. The timing of construction also generates additional ties to other sectors. Inputs into the sector are dependent on the productivity of other sectors, by the output of construction, and its timing, to production in other sectors. Equally critical is the fact that the growth of an economy at one point in time is tied to the productivity of the construction sector during the previous years--sometimes one, two, or three years. Thus, the decisions made in construction activity impose constraints on economic expansion and the productivity of other sectors.

In most developing countries, capital is the scarce factor of production and labor is abundant. But in the Arab world today, it is labor that imposes critical constraints on growth. Since 1973, the growth of investment in the economies of the oil-rich countries has required massive inflows of labor. And the open door policy in Egypt with its concomitant expansion of investments and economic activity has also generated a strong demand for labor. The juxtaposition of these two trends has resulted, so far, in a large out-migration of Egyptian workers to other Arab countries--due to higher wages, greater employment opportunities, and an accelerated demand for labor that has far outweighed the current demand generated by the Egyptian economy.

#### Labor and Employment

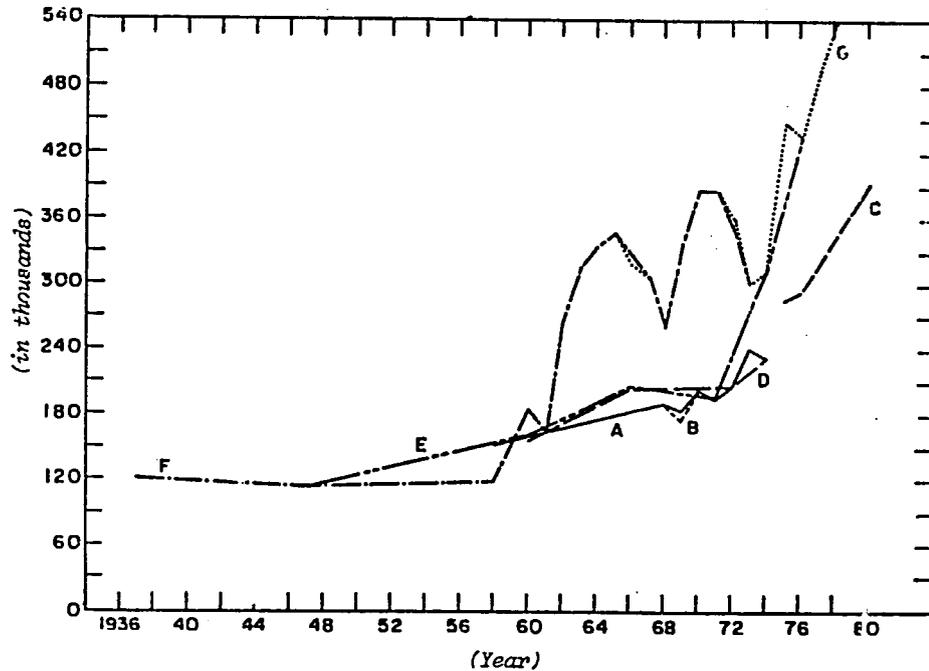
The 1976 census placed Egypt's population at 38 million and the growth rate during the past ten years at 2.31%. About 25% of the total population can be regarded as comprising the "labor force." This figure has remained

relatively stable over time. For the country as a whole, employment is concentrated largely in agriculture, although there are important regional differences. In recent years, there has been a notable decline in employment in agriculture, indicating that labor is moving to other sectors. This is further evidence, noted below, that construction is absorbing labor from agriculture.

In terms of total employment patterns, services is the second largest employer of labor, followed by manufacturing and by commerce. These sectors have all demonstrated some notable changes in employment, even prior to 1973. The official statistics, however, do not reveal any dramatic changes in employment in construction for that period. Since employment in construction is a function of the general level of investment in the economy, the pre-1973 period was one of low investment levels relative to the present time. During the two decades preceding 1973, the construction share of the labor force remained stable, at around 2.1-2.6% of total employment. Since 1973, the increases in employment in construction have been extensive. While the total number of those employed in construction has remained low, relative to other sectors, the additions to the labor force in that sector have been greater.

Many of the inferences regarding employment are based on census data, labor sample survey, and other government figures which are available largely for the period prior to 1976. The census of 1976 is available, yet critical components of it are not yet revealed in detail. So, the observations one can make on employment generally, and on construction in particular, are based on inferences from other kinds of evidence, and on trends spliced from different sources of data.

Figure 1 presents alternative estimates of employment in construction, derived from a variety of sources,



Sources to Figure 1:

- A. Ministry of Labor study based on Labor Force Sample Surveys--May rounds by CAPMAS, 1958, 1968-1974.
- B. Labor Force Sample Surveys, 1968-1974.
- C. Calculated from Ministry of Labor and Labor Force Sample Survey data.
- D. Population Censuses, 1960 and 1966. Labor Force Sample Surveys, 1972 and 1974.
- E. Population Censuses, 1947, 1960, 1966 and 1976. Labor Force Sample Surveys, 1971 and 1974, CAPMAS. "Egypt: 1976-1980 5-Year Plan," Ministry of Planning.
- F. 1937 and 1947 data are from census figures; the rest of the data is from the Labor Force Sample Surveys.
- G. Ministry of Planning Followup Report.

Figure 1:  
EMPLOYMENT IN THE CONSTRUCTION INDUSTRY: ALTERNATIVE ESTIMATES FROM SEVEN SOURCES

From:  
Nazli Choucri, Richard S. Eckaus, and Amr Mohie-Eldine, *MIGRATION AND EMPLOYMENT IN THE CONSTRUCTION SECTOR: CRITICAL FACTORS IN EGYPTIAN DEVELOPMENT*. M.I.T.: Technology Adaptation Program, October 1978. p. 29.

and Table 1 presents trends in total employment and in the construction sector. Despite the relatively low levels of employment in construction and the yearly fluctuations, it is clear that evidence points to greater movement of labor toward that sector. If an estimate for 1978 is to be believed, we can place employment in construction at about 5% of total employment.

The trends observed in Table 1 can be explained largely in terms of the country's investment history and the dependence of investment on economic and political conditions of the country. During the years 1966 to 1974, there was only a slight increase in employment in construction. After 1967, new investments came to a halt, and this was reflected in construction employment. However, construction associated with military expenditures compensated, to some extent, for the slack in employment in that sector. Since 1973, construction increased, and employment in construction also grew. But new trends emerged. First, the growth in investments and the expansion of construction in housing placed greater demands for construction labor. Second, the growth of economic activity in Arab countries also generated demand for Egyptian labor. The conjunction of these two factors created new constraints in the construction sector, namely limitations imposed by potential shortages of labor.

Given the degree of uncertainty in estimates of total employment, particularly in construction, these inferences must be considered tentative at best. Labor in this sector traditionally has manifested a high degree of mobility. Workers move in and out with relative ease and there is notable temporary employment. These employment features are common in agriculture, but their implications for construction cannot be ignored.

The levels of employment in the construction industry

have traditionally been higher than in other sectors, and in the country's overall level of employment. There is some evidence, though difficult to document specifically, that unemployment in construction has declined substantially since 1973.

While trends in wages do not mirror employment patterns, it is possible to determine critical changes in labor trends by observing wage rates. In general, there has been a marked increase in construction wages since 1960, with even sharper increases since 1973. The average annual increase in construction wages from 1974 to 1978 was similar to that in agriculture. This similarity in wage rate increases is important although, of course, the wage structure in construction is at least three times higher than in agriculture. During the past two years the differential was greater still.

In some construction skills, wage increases range between three and fivefold from 1970 to 1977. The traditional system of labor contracts ("tariha") is based on the volume of work to be completed. It is difficult to convert that wage system into hourly rates, but it is clear that wage rates have increased markedly.

#### Labor Migration

The traditional view of Egyptians as close to their land and reluctant to move is severely shaken by the flows since 1973. It is currently estimated that about one million Egyptian workers are working in other countries of the region. Of these, the principal destinations are Libya (59.6%), Saudi Arabia (20.4%), Kuwait (9.5%) and the U.A.E. (3.1%), with the remainder in other countries. One estimate places the flow of Egyptian construction workers at 250,000 annually since 1975. It is possible that the figure might be as high as 300,000 for 1978. Depending on the estimates employed, it may

Table 1:

## PARTICIPATION RATES: ALTERNATIVE ESTIMATES USING LABOR FORCE AND TOTAL EMPLOYMENT AS A PERCENTAGE OF POPULATION

Year	Population (1)	Labor Force (2)	% (2/1)	Total Employment (3)	% (3/1)
1937	15,933	5,838	36.6	5,806	36.4
1947	19,022	6,995	36.8	6,641	34.9
1959	24,372	6,486	26.6		
1960	26,085	6,891	26.4	6,006	23.0
1961	25,125	6,589	26.2	6,492	25.8
1962	25,300	6,389	25.3	6,657	26.3
1966	30,076	7,635	25.4	7,480	24.9
1968	30,372	8,534	28.1	7,893	26.0
1969	31,996	8,773	27.4	8,132	25.4
1970	32,816	8,655	26.4	8,361	25.5
1971	33,569	9,055	27.0	8,458	25.2
1972	34,323	9,471	27.6	8,672	25.3
1973	35,092	9,267	26.4	8,860	25.2
1974	35,879	9,678	27.0	9,038	25.2
1976	38,228	10,648	27.9	9,628	25.2
1980	41,700	11,868	28.5		

## Sources to Table 1:

Total Employment: 1937 and 1947 from the 1937 and 1947 censuses  
1960-1976 from the Ministry of Planning Followup Report

Labor Force: 1937 and 1947 from the 1937 and 1947 censuses  
1959, 1960 and 1962 from the Labor Force Sample Surveys, May rounds, Central Agency for Population, Mobilization and Statistics (CAPMAS)  
1961 from the Labor Force Sample Survey April round  
1966 from the 1966 census  
1968-1974 from the Labor Force Sample Surveys (CAPMAS), May rounds  
1976 data from the 1976 census  
1980 data from the Ministry of Labor

Population: 1937 and 1947 from the 1937 and 1947 censuses  
1959, 1961 and 1962 data from the Labor Force Sample Surveys (CAPMAS) May rounds  
1960 from 1960 census  
1966 from 1966 census  
1968-1974 from the Labor Force Sample Surveys (CAPMAS), May rounds  
1976 from the 1976 census  
1980 from the Ministry of Labor

From: Nazli Choucri, Richard S. Eckaus, and Amr Mohie-Eldine, Migration and Employment in the Construction Sector: Critical Factors in Egyptian Development (M.I.T.: Technology Adaptation Program, October 1978), p. 12-12.

be that the proportion of migrants to the total work force in construction is as high as 80%. This means that there must be a high rate of recruitment of workers from the agricultural sector into construction. If this is so, then it might help explain the high rates of wage increases in the agricultural sector as well.

These observations are based on incomplete data. However, using the case of Libya as a point of departure, it is possible to determine the skill composition of the migrants in the construction sector. The highest single concentration of skills are carpenters, builders, and whitewashers. Electricians, plumbers, and tilefillers are also in demand. Data from the Libyan Ministry of Labor suggests that workers of all skills are migrating and that the entire construction industry is affected.

It is difficult to say precisely what proportion of the Egyptian construction migrants are migrating to which Arab countries. However, we can make rough estimates by using the proportion of construction workers among the migrant workers in the destination countries. Roughly 50% of the migrant workers in Libya are in construction (although the figure could be as high as 70%), and the corresponding figures for Saudi Arabia and Kuwait are 30-35% and 50-55%, respectively. By multiplying these percentages by the number of Egyptian migrants one would have a rough number of the Egyptian migrants in construction. Other countries of the region absorb the remaining migrants in the sector.

With respect to total Egyptian migration, one can estimate that construction workers represent 40-50% of all migration. These figures are approximate at best, and can be considered only as roughly indicative. There is no doubt that Libya is the principal destination, followed by Saudi Arabia and Kuwait.

### The Effects of Labor Migration

There has been a dramatic increase in the output of the construction sector over the past ten years. As Figure 2 indicates, the major rise has been since 1973. However, throughout the whole period there are years in which output declines relative to the previous years, suggesting the importance of constraints in that sector. In order to determine the effects of emigration of Egyptian labor on the construction sector as a whole, it is necessary to examine the role of other constraints. There are constraints on the demand side for the output of that sector, and on the supply side with respect to the availability of input materials and equipment needed for construction.

Since the output of that sector has grown dramatically, although for some years notable declines are observable, we may infer that demand is not a constraint. Indeed there is considerable evidence to suggest that there continues to exist excess demand for construction in Egypt. Nonetheless, increases in demand may lead to increases in the prices of construction output, which, in turn, affect the prices of inputs into construction, thus generating constraints on the supply side.

Supply constraints may be in terms of equipment for construction. Although the role of equipment is small relative to other inputs, this may nonetheless be an important factor. But most machinery can be imported in short order. A period of world wide recession such as in 1973-74 would tend to make the acquisition of capital equipment relatively easy. And the availability of foreign exchange since then has made it possible for Egypt to reduce this source of constraint on construction.

Other sources of constraints on the supply side include availability and prices of current input materials. There is evidence to suggest continued reliance

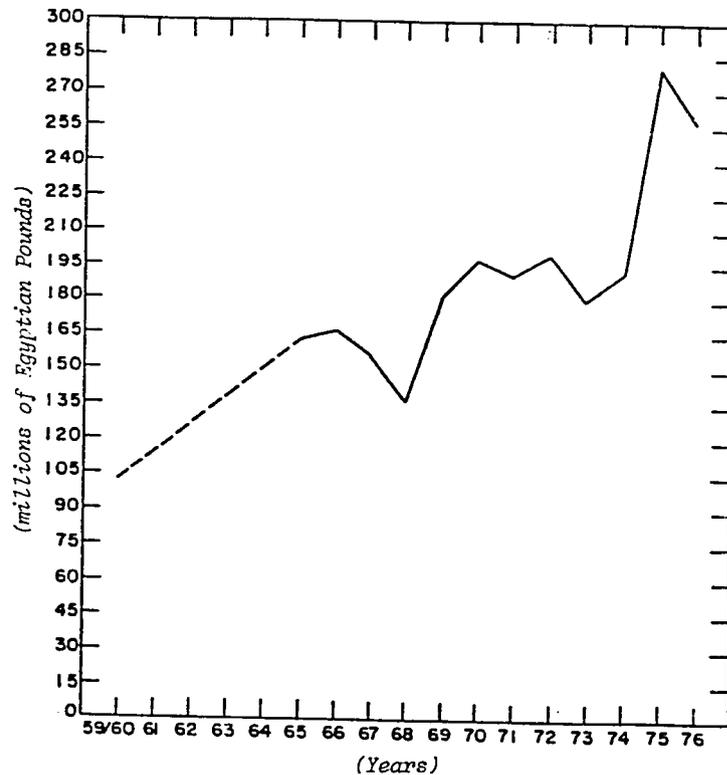


Figure 2:  
CONSTRUCTION OUTPUT AT CONSTANT 1959/60 PRICES

From:  
Nazli Choucri, Richard S. Eckaus, and Amr Mohie-Eldine,  
*MIGRATION AND EMPLOYMENT IN THE CONSTRUCTION SECTOR: CRITICAL  
FACTORS IN EGYPTIAN DEVELOPMENT. M.I.T.: Technology Adapt-  
ation Program, October 1978. p. 99.*

on imports of construction materials. This means that foreign exchange availability is important. The prices of input materials have risen sharply since 1973, with a widening gap between official and black market prices. However this gap cannot be interpreted as indicating real scarcities, but rather that the market does not clear at official prices. This pattern is reflected in cement and steel reinforcing bars, although the effects are more pronounced with respect to cement. Scarcities of materials and increases in demand have contributed to the increases of prices of construction output as well as of construction materials. In this context, therefore, it is difficult to disentangle the effects on construction workers' emigration.

Recalling that the estimates of construction labor migration can be as high as 80% of all employment in that sector for any year, it is clear that some effects can be important. As noted earlier, the wage rates in construction have increase sharply over the past several years. Yet even wage trends cannot be isolated from other influences in the economy as a whole. Given the complexity of the wage structure in the construction sector, it is necessary to determine an overall index of wage changes. We estimate an increase of 373% between 1970 and 1977 at an average annual increase of 22%. After 1973, the increases in wages was around 28% per year. While wages were rising, so was employment in construction. This means that labor has been clearly responsive to the changes in the wage rate. Recall the "pull" from the agricultural sector noted earlier.

Although entry into the construction labor pool is relatively easy, there are certain skill constraints which may deter entry. Nonetheless, the migration of construction workers has created strong upward pressures on wages in the sector, and increases in wages, in

conjunction with changes in the prices of other inputs, have created general increases in overall costs of construction.

The demand for labor can be inferred from the demand for construction output. The supply of labor is affected by the migration of workers; the relationship between the demand and the supply of labor in the Egyptian economy results in increases in labor employed in the sector and increases in wages. Thus, both employment and wages are affected. This means that domestic labor supply elasticity is relatively high, and the impact of demand sufficiently strong that employment in construction increases despite large scale emigration. This process suggests that increases in wages have, in fact, attracted labor into the construction sector, drawing away from employment in other sectors.

The demand for Egyptian labor is determined partly by the general level of economic activity in Egypt, and in the construction sector particularly, but also by the demand in other Arab countries. The interaction of these two demand schedules places pressures on the supply of labor, creating adjustments in the domestic labor force. This adjustment is partly in terms of pulling labor from other sectors, partly drawing from the unemployed or disguised unemployment pool, and partly from the internal redistribution of workers within the construction sector itself. In short, the adjustment of labor and the large outflow of workers in the construction sector has had repercussions not only for employment in that sector, but also for economy-wide employment more generally.

Apparent shortages of labor in the construction sector, during the adjustment processes, has affected the output of that sector on a periodic basis. This is observed most clearly in housing, where supply and demand

are subject to relatively free market pressures. Most of the adjustments in the output of the construction sector that must occur due to the shortages of labor are reflected in the prices of uncontrolled private housing. There we can observe the skyrocketing effects of prices due to constraints in construction.

A second, important economy-wide effect of labor migration in the construction sector is the higher incomes of construction workers. Higher incomes mean greater purchasing power which is translated partly into demand for consumption goods. This also creates a redistribution of income toward construction workers, affecting habits, tastes, and the general pattern of demands for goods and services. The earnings for construction workers yield private benefits for their families as well as public benefits. The latter are more in the nature of experience gained, greater skills of individual workers, and a general improvement in the quality of the labor force. But there are also specific public benefits of an economic nature. The remittances of workers are clearly among the more critical of such benefits resulting from labor migration. It is extremely difficult to determine the proportion of remittances due to construction workers, but since they represent such a high percentage of total emigration and since their consumption habits are tied to habits and tastes of the domestic environment, it is reasonable to assume that a high proportion of savings are remitted.

#### Conclusion

These observations have focused on the effects of labor migration in the construction sector. We noted the critical role of construction in an economy, and the importance of labor as an input into construction. By observing the general trends in construction output over

the past several years, it is clear that there has been a notable increase in output. The demand for construction cannot be considered a critical constraint on that sector. Important constraints emerge more directly from the supply side. Some are due to the prices and availability of input materials, but more notable constraints are due to the availability of labor.

Large scale migration of construction workers to other Arab countries--as part of the general outflow of labor since 1973--has affected not only employment and wages in the construction sector itself, but in the economy as a whole. The responsiveness of agricultural wages to shifts in economic activity suggests some "pull" of labor from that sector into construction. And economy wide adjustments in employment are clearly observed during the past several years.

These adjustments have some policy effects that bear directly on labor productivity and supply. The new entrants in the construction sector are less skilled than those they are replacing, thereby affecting, in the short run, the productivity of labor and the quality of the output. Emigration has affected the skill composition of the labor force in construction, and policies designed to increase skills and productivity of the domestic labor force appear a necessary response to such trends. Conversely, since the migration phenomenon has essentially pulled labor out of the construction sector into foreign economies, policies designed to regulate and accelerate the replacement process may also be a priority at this time.

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Management of the  
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BUILDING MATERIALS PRODUCTION AND  
REQUIREMENTS IN EGYPT

Engr. Abdallah El-Mosallamy  
Under Secretary of State for Material Supply  
Ministry of Housing

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## BUILDING MATERIALS PRODUCTION AND REQUIREMENTS IN EGYPT

In Egypt we have natural resources for the essential raw materials which are necessary for the industry of most building materials such as: cement, steel, glass, bricks and refractories, gypsum and lime.

I shall clarify hereafter the volume of the local production and the requirements of the main building materials. As the following studies are made on the requirements of the plan of year 1980, then in the subsequent years, these figures will increase according to the successive increase in the plan.

### 1. Cement

- \* The local production goal in 1980 is 3.6 million tons, and is produced by four governmental companies.
- \* The actual production in the last year (1979) was 3.0 million tons.
- \* The requirements in the year 1980 will be 7.5 million tons, so the local production is less than the requirements. This excess demand has to be covered by importing cement from other countries through public tenders.

To limit the increase in cement imports, local production must be increased to cover the ambitious plans in the future. So studies and new projects were approved for new plants for the extensions in the existing plants of the four above-mentioned companies. The extensions are estimated to reach their full capacity around 1984,

and it is expected that at this stage, we shall not be in need to import cement, as it is estimated that the requirements in 1984 will be about 11.0 million tons and the production will be about 12.0 million tons.

### 2. Reinforcing Steel Bars

- \* The local production in 1980 is 300 thousand tons.
- \* The requirements in this year (1980) will be 900 thousand tons, so the local production is below the requirements; this excess has to be covered by importing it through public tenders.
- \* Beside the steel bars produced locally, there is a new plant in "Dekhela" for the production of steel bars and fillets beginning with a production of 120,000 tons in 1983, and after reaching its maximum capacity which is 750,000 tons in about 1985, we shall be in no need for importing steel bars.

### 3. Ordinary Steel Glass

- \* The requirements in the plan in the year 1980 are 6 million square meters.
- \* The local production is 1.7 million square meters.
- \* The difference will be imported through public tenders. The mentioned excess in requirements is regarding the 3 mm. thick sheets. As for the other thickness, the local production can cover the market requirements.

### 4. Timber

As there are no natural sources for timber in Egypt, all the requirements are imported from foreign countries, especially from the Northern European countries and from Russia. The main sorts of imported timbers are:

- \* White sawn softwood, Red sawn softwood, and

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Felleries (Balks).

\* The estimated requirements from these items in 1980 are:

One million m<sup>3</sup> white and red softwoods

200 thousand m<sup>3</sup> Felleries (Balks)

Besides, there are two local governmental companies for the production of manufactured kinds of timber such as plywood and hardboard wood, which helps in decreasing the imported quantities of timber.

#### 5. Bricks

Due to the erection of the Aswan Dam, the major part of the red clay in the Nile waters was retained south of the dam, which affected the production of bricks. As a result, studies were done to use the clay found in different parts of Egypt for producing clay bricks. There is also a governmental company for producing sand bricks, whose capacity is around 200 million bricks/year.

The estimated requirements for bricks in 1980 is 2,400 million bricks. The remaining quantities from the requirements will be covered by the new extensions and new factories besides the quantities produced by the private sector from the still existing small factories of red bricks.

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**EQUIPMENT AS A RESOURCE OF CONSTRUCTION**

Engr. Hani Salem  
Head of Mechanical and Electrical Department  
Arab Contractors

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## EQUIPMENT AS A RESOURCE OF CONSTRUCTION

### 1. Introduction

The market for construction equipment has grown considerably in Egypt over the last six years, and especially since government adoption of the open-door policy. Severe infrastructure and housing problems, ambitious development plans for industrialization, increasing investment opportunities, availability of foreign credit facilities and financial aids are main reasons for this growth.

To meet the requirements of the growing construction market efficiently, it became necessary to achieve a higher degree of mechanization to replace the more expensive, and not always available manpower.

The equipment to carry on construction work is an extremely vital force in modern competitive operations. The production planning for a project often focuses on the productivity of equipment which governs the operational output. Furthermore, the financial planning for an entire construction business often stems from the investment in equipment, since the total of these elements constitutes the largest long term capital investment in the business. A compromise between both aspects should be reached to achieve satisfactory results.

Mechanization raises problems to be faced by contractors, particularly in a developing country like Egypt. It also raises a number of important aspects to be considered, such as proper selection, costs, optimum use of a piece of equipment, and proper maintenance.

### 2. Problems Facing Mechanization of Construction in Egypt

Some of the main problems a user of construction equipment has to face in Egypt are:

#### 2.1 High Investment Costs

The high investment costs required for construction equipment makes it a risky matter for small contractors to own such equipment, as having the equipment on hand necessitates finding work of the right sort to keep it busy. Even for the big contracting companies such as the Arab Contractors, owning equipment means that money invested in it cannot be used, as such, to help finance other expenses of the construction work. Just to mention a figure, the total sum invested by the Arab contractors in construction equipment in 1979 was about L.E. 28 million. In developed countries like the U.S.A. or England, there are other alternatives to owning equipment. These are leasing or renting it. The leasing alternative is a way of having the use of equipment on a long-term basis without having to make the initial investment for it. A leasing company purchases the equipment and leases it to the user, who makes lease payments.

#### 2.2 Lack of After Sale Service

A very serious problem facing Egyptian contractors is the lack of after sale service. Guaranteed continuous supply of spare parts, availability of training facilities for operators, maintenance facilities and possibility for technical consultancy are the main items of this service. Moreover, dealers are not always eager to be in continuous touch with customers for following up their equipment after getting orders.

To overcome the problem by the buyers means additional unnecessary and risky investments, which leads to more cost and less profit.

In order to help solve this problem, the government has issued a law in 1978 that prevents permitting any sales agency to act in Egypt unless it is able to offer a complete after sale service facility. However, there are still not many detectable improvements.

### 2.3 Availability of Skilled Manpower

Availability of skilled manpower is an important factor to be considered when thinking of a high degree of mechanization. It is a fact that all pieces of construction equipment are made to be run by an operator. If the equipment is highly automated this person merely has to push the right buttons to run it. However, most construction equipment is not so simple to operate, especially the mobile pieces. Much skill is required of the operator to work the piece of equipment efficiently. Such a skilled worker, or even a semi-skilled one, is expensive to train and hard to replace.

Although many skilled laborers, operators, mechanics, etc. have already left the country during the last six years for work in the oil wealthy countries, no training schemes on the nationwide level have been encouraged by the government to replace them until now.

### 3. Choice and Procurement of Equipment

The problem of equipment selection has two principal aspects, these are:

- Technical aspects concerned with the suitability in the performance sense.
- Economic and commercial aspects concerned with viability in the business sense.

The engineer on a particular construction project is concerned mainly that the equipment should be the "best" technically to satisfy his method and program requirements. The plant manager or director, on the other hand, needs to ensure that the purchase of any new equipment

makes sound commercial sense, taking an overall view of the company's policy and operations. Sometimes, therefore, there is a conflict between technical and commercial considerations. In such a case, it should be emphasized that a satisfactory solution of the problem cannot be obtained if the technical and commercial pressures do not result in a reasonable compromise.

The most important factors in the selection of equipment are cost and maintainability. That is, to choose the equipment which can do the job at the least total cost, other elements being equal. There are however a number of other significant factors that must be considered in every equipment selection. They include accounting for:

1. Specific job or operation to be done.
2. Specification requirements.
3. Mobility required for the equipment.
4. Weather's influence on equipment performance.
5. Time scheduled for doing the job.
6. Versatility and adaptability of the equipment.
7. Operators' effectiveness with the equipment.

According to the procedure adopted by the Arab Contractors for the selection and procurement of equipment, the project engineer will select the suitable equipment, together with the department of equipment coordination. The decision will then be reported to the top management for discussion and approval. After approval, the department of equipment coordination will then open a tender among the different suppliers already selected according to the company standardization.

### 4. Equipment Cost

A most important factor in planning for construction

equipment is its total cost to management. The total cost includes the initial investment, that is the cost for buying the equipment and getting it into the contractor's yard or to the construction site ready for operation, and the cost of operating and maintaining it in good running order.

The ownership cost components as considered by the Arab contractors include:

#### 4.1 Equipment Depreciation

The depreciation rate is dictated by the "unified accounting system" of the government. For construction equipment, it amounts to 20% of the original investment annually.

#### 4.2 Major Repair and Overhauling Charges

Such charges are not expected to be a regular annual amount, but tend to increase with the equipment's age. The average total cost of this item is taken as 12% of the original cost of equipment.

#### 4.3 Interest, Insurance, Taxes and Storage Charges

The interest rate on investment considered by the Arab Contractors is 8% of the original investment annually. Insurance, taxes and storage amount to 2% annually altogether.

The equipment operating costs are those that are necessary for the continuous effective running during the anticipated economic life of equipment. They include:

1. Cost of minor repairs and adjustments, which amount to 8% of the original cost of the equipment annually.
2. Operators charges.
3. Cost of fuel and lubricating oil.
4. Cost of tire repair and replacement.

#### 5. Depreciation of Equipment

Depreciation is the regular charge to account for the decrease in equipment's value due to used-up life.

The sum of the regular charges over the useful life of equipment reduces its value to the so-called salvage value. In some cases, the salvage value may equal zero.

Among the different methods of depreciation already known, the straight-line method is the one accepted by the government as dictated in its "unified accounting system" used by the governmental and public sector companies. The annual depreciated value can be obtained by dividing the original cost of equipment by its useful life.

It is obvious that the straight-line method does not lead to a realistic value for the piece of equipment before the end of its useful life, i.e. in case of early replacement due to outmoding or obsolescence. In such a case, the constant percent method, which calls for a constant percent to be applied to the previous book value for determining depreciation, may be more realistic. According to this method, the annual depreciated value is higher when the piece of equipment is new than at the end of its life. However, even this will not hold true under the present circumstances of the Egyptian market. It is not strange today to get for an old piece of equipment more than the residual value calculated by any method of depreciation.

In the Arab Contractors, the actual present value of a piece of equipment will be estimated by company technicians.

#### 6. Economic Use of Equipment

In order to achieve maximum profit with a minimum of cost, i.e. to have your piece of equipment working under optimum conditions, there are two major aspects to be

considered. These are:

### 6.1 Equipment Replacement

There is a serious unavoidable problem concerning replacement, and that is the problem of timing.

Replacement could take place either at the end of the equipment's economic life, or in case of the need to consider purchase of a new mode or new development.

The estimation of an economic life is necessary in order to establish, from the very beginning of the equipment's life, a reasonable cost or charge for using it. However, a more realistic way to determine the practical life of a piece of equipment is based on economic reasons.

The economic life could be determined based on either the minimum hourly cost to use the piece of equipment, or the maximum financial return. However, it should be noted that little can be done in this direction if reasonably accurate records have not been kept on working hours and repair costs, together with some information on site conditions which have affected these costs. Due to continuous mobilization of equipment to different sites, keeping such records is still a problem in the Arab Contractors. For this reason, replacement of a piece of equipment is decided by the technicians after examining it.

### 6.2 Maintenance

A good maintenance program is essential to keep construction equipment in good working condition, thus reducing breakdowns. It should be recognized that there is more than the loss of value in the equipment when it is not working as it should be. A breakdown would be very costly if the equipment were working with its operator, many other workers and interdependent equipment

connected with its operation.

One of the key points of a good preventive maintenance program is the timing of maintenance operations. This is frequently based on either the mileage travelled by high-speed hauling equipment, or the hours of operation for all other construction equipment.

Despite continuous attempts to improve the maintenance system in Arab Contractors, the traditional conflict between the civil engineer and the mechanical engineer always leads to interruption of the maintenance program. While the one is mainly interested in having his project executed as soon as possible, the other is only concerned with keeping his equipment in good condition.

### 7. Arab Contractors' Policies to Overcome Mechanization Problems

To overcome the problems previously mentioned, the Arab Contractors--as a leading company--follow two policies, one for the short- and one for the long-run. The main features of the short-term policy are:

1. Making studies on the different types of company equipment to select the most efficient kinds and more suitable sizes to be purchased in the future, taking into consideration operating costs and back-up service. The selection is also based on achieving the highest degree of interchangeability between parts of similar equipment.

The main aim of this concept is to minimize storage capacity required for spare parts, and to decrease the number of dealers to be dealt with, thus allowing for a certain extent of specialization and better suppliers' service facilities.

2. Establishing a training center for skilled personnel.
3. Establishing maintenance workshops with specialized activities.
4. Signing consignment agreements with the main suppliers. According to these agreements the supplier has to guarantee for the availability of his spare parts in his local store, while the Arab Contractors as a customer has only to pay for the spare parts it withdrew from the store. Two such agreements are being negotiated at the time-being, for a Caterpillar and KHD.

For the long-term policy, the Arab Contractors is planning to establish an Equipment Hire Company to serve the whole construction market in Egypt. The company services should include equipment leasing, supply of spare parts, maintenance and training.

The important advantage in leasing equipment is that the user can have the equipment he needs for an extended period of time without paying lifetime ownership expenses. The leasing payments will of course cover all the equipment ownership and operating costs, plus a reasonable profit for the leasing company.

#### Conclusion

The time of cheap manpower is over in Egypt. The rapid development and growth of the construction market necessitates the need for more mechanization, to meet the market requirements efficiently.

The expected hard competition, due to the participation of foreign companies, makes it essential that dealers should help solve the problems of their customers through better service. It also implies that contractors should make intensive efforts to improve their production systems in order to achieve higher productivity with lower costs.

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ON MODERN CONCEPTS OF MANAGEMENT  
AND PRODUCTIVITY

Dr. Amina El Hefny  
Secretary General  
Egyptian Society of  
Management Engineering

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## ON MODERN CONCEPTS OF MANAGEMENT AND PRODUCTIVITY

### Outline of Major Modern Concepts of Management:

Modern management concepts apply the recent scientific principles to improve the two main aspects of management, namely, decision making and leadership. They are aids for the five basic functions of management, i.e. planning, organization, direction, coordination and control. They have their roots in various social, technical and economic disciplines, but complement each other and aim to raise management's efficiency in working towards the highest possible targets and with the greatest cooperation and willingness of people.

### The Main Concepts are the Following:

- 1- Management by systems.
- 2- Management by exception.
- 3- Management by objectives.
- 4- Management by goal integration.
- 5- Management by self control.

There are many other titles for modern concepts in the management references and literature, but in my opinion the above-mentioned principles cover the major concepts.

In fact, all these concepts are complementary to each other and should be taken into consideration, integrated when applied to the management of the different projects or industries, including those of construction. This paper covers the first three.

### 1- Management by Systems

A system is defined as an integrated assembly of interacting elements designed to carry out combined, a certain function with predetermined results. The system might have a number of objectives, some of which might contradict each other and system engineering methods seek to optimize the functioning of the subsystems to achieve the maximum output of the overall system.

The main objectives of a system embrace the desire to accomplish a certain level of performance within some acceptable quality and cost goals. Related to these objectives are the limitation of available resources and time and the reliability of performance.

The systems concept treats an enterprise or a project as an integral function. These elements have relationship to each other and their behaviour interacts with each other. Management gets results through the integration of the different resources of men, machines, materials and money into a total system which it operates at optimum function toward its goals.

The systems approach is applied to the various functions of management, i.e., planning, organization, direction, coordination and control with the required adjustments to benefit from the analogy of the enterprise as a socio-economic machine to the technical engineering systems. However, a certain change of emphasis is necessary to have these functions work in conjunction with the overall operation of the system and not as separate entities of it. Each function is then applied to a bigger size of activity, more complex and dispersed interacting elements and where the dimension of time becomes more important in terms of length and innovation. The development of each function for the adaptation to the systems concept is briefly summarized in the following:

Planning

The function of provision of the framework for integrated decision making is concerned with the selection of the organizational objectives and policies, as well as of progress procedures and methods for their achievement.

Planning according to the systems concept occurs at the three following levels:

- 1- Top-Level Planning, where top management relates the enterprise system to its environmental system. This embraces the establishment of the broad policies, fixing goals and making general decisions concerning the activities to be performed (types, quantities, quality, timing, organizational relationship, ...etc.) all within long range established policies and without involvement into details.
- 2- The planning of facilities, acquisition and allocation of resources to the various activities of the operating level. This includes the supply of technical assistance for the performance of operations and activities and provision of services, to assure the optimum utilization of available resources, facilities and time to accomplish the designed plans.
- 3- The detailed planning of the activities performed to assure the realization of goals planned for in the above levels with the highest possible rate of performance, optimum utilization of allocated resources and facilities, and within the fixed policies and strategies.

Organization

Organization was originally considered as the means of dividing work to be achieved by a unit and the assignment of duties and responsibilities among its people.

Then its concept was modified and greater emphasis was put upon individuals as individuals and as members of the group they are formally placed in, or create informally, if their interrelationships in the former hamper the satisfaction of any of their personal or social needs.

The concept of organization was further enlarged to stress its importance for the efficient control of the activities of an enterprise for the optimum achievement of its targets. The enterprise must therefore be constructed such that its management is able to control the following simultaneously:

- 1- The decisions made at its various centers to maintain stability and keep operations work within the desirable limits and with minimum disturbances.
- 2- The procedures and regulations guiding and coordinating the work for the efficient communication of information.
- 3- The behavior of people such that the informal decision centers coincide with the formal one to achieve satisfaction of personnel needs.

Inserting the systems concept to the function of organization involves the aligning of the various activities undertaken in our enterprise with the integrated goals of the subsystems working towards the achievement of its main goals. The organization pattern should lead to the creation of the incentives to personal development depending on dynamic group work and self-controlling communication systems for the consolidation of cooperation between the different parties involved, thus raising the productivity of the whole system.

Following the division of the function of planning into its three levels of occurrence according to the systems concept the enterprise is organizationally divided into three levels with their clearly delineated

responsibilities for their planning and execution and control functions. These are the following:

- 1- The top level where master plans are made and integrated planning, budgeting and control are manifested in a broad sense.
- 2- The middle level where resources are allocated to operating units and facilities designed for their aid.
- 3- The operation level where the activities are performed and the end results realized.

Other advantages of the application of the system's concept for the organization are the feasibility of application of various modern management tools and techniques, e.g. the decentralization of decision-making and its assignment to the closest center responsible for the implementation, the allocation of resources and distribution of work responsibility and the setting of overall targets and plans, thus determining the accountability of each for its performance.

This organization structure is also integrated with the information system and those leadership concepts that improve the control function.

#### Direction

The function of direction or leadership is also influenced through the application of the system concept to management. For the systems approach considers the enterprise as a socio-economic system or machine to which modern engineering techniques could be applied to make it perform at its optimum. The social side of the machine involves the human element of both management and those they work with and through whom they accomplish objectives.

Many modern leadership techniques are applied in an integrated form and people become motivated through their being able to satisfy their needs through the work and

while performing it. Some of these techniques will be mentioned later in this paper when treating the relationship between management by systems with the other modern concepts of management, e.g., management by objectives, by goal integration, and by self-control.

On the whole, the direction function becomes more important when using new leadership tools within the frame of the systems approach, for then the goals become more significant and useful for the motivation of people. It also allows them more participation in decision making which gives them more confidence and greater sense of responsibility and hence their productivity is increased.

#### Coordination

Coordination is on the dynamic side of the management functions and complementary to the function of organization which takes place before the start of work. Therefore, if organization subdivides the work to be performed and assigns responsibility and specialization, it is through the function of coordination that the disconnected efforts are unified to form an integrated whole and the optimum achievement of objectives is manipulated.

The flow of materials, energy and information for the processing activities and their management are coordinated through the design of appropriate systems of communication that relate the parts throughout the enterprise.

Cybernetics, the science of communication and control, is primarily concerned with information flow in complex systems and it is there where it is applied leading to the coordination for automatic control.

Coordination should lead to the reduction of as many decisions as possible to form a set of automatic decision rules through the use of integrated information. It tends to avoid duplication and redundancy in the circulation of paperwork and becomes easier when the information

system is built around one central data base where they are classified according to their nature, activity and managerial level or department using or giving them.

This requires that organization should be determined according to the responsibility for decision-making and for action-taking with respect to the information required for them and issued through them.

In fact, the organization chart should be constructed according to the flow of information necessary for the coordination of activities rather than vice versa. Organization will therefore divide the enterprise in the three previously mentioned layers.

- 1- The top layer of non-programmed decision processes whose parameters are more related to the changes in the surrounding environment.
- 2- The middle layer where decisions are related to the provision and allocation of resources. These could be programmed and automated to a large extent.
- 3- The operational layer where the productive and distributive activities are undertaken.

### Control

Control is the function of management that assures that the various subsystems of an establishment are performing according to the preset plans. It is concerned with the follow-up of performance and the measurement of results and the correction of the activities of subsystems to assure the accomplishment of overall objectives.

The system's concept features the objectives of the system as to perform a determined function and that of control as to maintain the performance output within the specified limits and assuring their satisfaction to the system's requirements.

To explain this, the fundamental aspects of the function of control are cited as follows:

- 1- Setting the goals desired to attain in terms of quantity, quality, cost, time, safety, and reliability.
- 2- Establishment of the organization structure and setting of procedures to guide actions for achievement of results.
- 3- Development of standards and criteria that constitute the desired variables and limits of performance.
- 4- Development of systems for measurement and appraisal of results and their comparison with the preset.
- 5- Design of effective reporting system, content, timing, and circulation, and for measures of correction.

The system's concept when applied to the control function relies on the following four basic elements:

- 1- The characteristics or conditions to be controlled. These are concerned with quantity, quality, cost, time, safety, and reliability.
- 2- The sensory method and device with which each of the characteristics or conditions could best be measured, e.g., measurement of temperature with thermometer.
- 3- The control component or center which compares measured data with planned performance and directs a corrective mechanism to assure the conformance of results with those requested and to determine any deviation.
- 4- The activating group or mechanism which uses the feedback and former direction to bring about the necessary change in performance.

A control system is considered to be of open or

closed sequence according to the direction and utilization of its feedbacks, which is directed outside the operative system for the former, while in the latter it forms part of the system and does not require any human intervention to maintain the operating system in control.

Further, the efficiency of management in practicing its control function depends on the following factors:

- 1- The accuracy with which variations from standards or plans could be identified and measured.
- 2- The speed with which the need for correction could be reported to the responsible center for corrective action to be kept in phase and errors to be overcome in time.
- 3- The capacity to display the potentials for further improvements and developments of both methods and systems.

These three factors are growing in size, complexity and span of space and time, and, therefore, it is becoming more and more a necessity to apply the modern concepts of management in order to cope with them and achieve optimum results.

## 2- Management by Exception

Is a tool to simplify the process of management in making it quicker and more directed towards future progress? According to F.W. Taylor, who proposed it, "Under the exception principle, the manager should receive only condensed summarized and invariably comparative reports covering, however, all the elements entering into management, and even these should all be carefully gone over by an assistant before they reach the manager, and have all of the exceptions to the past averages and standards pointed out, both the especially good and the especially bad exceptions, thus giving him in a few minutes a full view of the progress which is being made, or the reverse, and leaving him free to consider the broader lines of policy and to study the character and fitness of the important men under him."

This concept could only be applied where there is the possibility of measuring outcome, for which Taylor's "Time and Motion Study" provides a great deal. For exceptions could not be identified without some measurement of results and comparison against predetermined standards for expected performance. Only, those exceptions that require attention are reported to management, to make the decisions and prescribe the actions and adjustments necessary to bring performance back into control. These might involve modification of targets, plans, organization or executive methods.

This concept raised the efficiency of management to control activities towards the achievement of targets in the following aspects:

- Placing efforts only where and when needed.
- Saving time for long-term planning.
- Allowing a wider span of control while improving coordination of activities.
- Improvement of performance quantitative, quali-

tative, cost and time standards.

- Reinforcing application of modern techniques, e.g. general supervision, decentralization, self control, and management by objectives.
- Provision of fair basis for appraisal of performance, hence motivating people for performance improvement.

It is very important to build the application of the management by exception concept on the participation of people in setting their objectives and standards and in the measurement and evaluation of the results of their work.

### 3- Management by Objectives

Management by objectives is very useful for raising work productivity through increasing the motivation of people, for it creates their interest in reaching targets rather than accomplishing work. Targets are expressed in determined objectives for the different areas and aspects of activities of an enterprise such as profitability, efficiency, cost, and quality. Further, employees and workers are helped to identify themselves with the enterprise and to relate their work with those means that help satisfy their needs. This is attained when they know what is expected from them and agree with it, are told how they are progressing at work and are rewarded according to the results they achieved.

It is, therefore, important for the purpose of performance appraisal, training and development of skills, assuring the assignment of the right people at the right place and the establishment of incentive schemes to identify the tasks and position of each person in the organization, his relationship with the others as well as the interaction of his work and results with those of the others.

The application of the concept of management by objectives combined with the other modern concepts of management, e.g., management by systems and by exception, and the different practices of management have to undergo some adjustment, similar to those undergone for the other concepts.

First, each job in the establishment is defined in terms of some objectives derived from the overall objectives. The job is then related to the organizational structure within the framework of its policies and procedures in the form of a Management Guide. This guide contains the collection of job descriptions and their objectives, and specific aims are identified in terms of

the following:

- 1- In relation to the overall objectives with respect to purpose, contribution to end result and effect on the benefit of consumers.
- 2- In relation to work of others, limits of authority, contacts, and interrelationship of results.
- 3- In relation to achievements, limits of accepted work, extent after which higher authority is to be approached, responsibilities for resources used and their effect on costs.
- 4- Possibilities for improvement of procedures and methods in an attempt to improve effectiveness of objectives.

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Management of the  
Construction Industry In Egypt

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CONTRACTS IN EGYPTIAN CONSTRUCTION

Mr. Tarek Selim  
Research Assistant  
Massachusetts Institute of Technology

Dr. David B. Ashley  
Assistant Professor of Civil Engineering  
Massachusetts Institute of Technology

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## CONTRACTS IN EGYPTIAN CONSTRUCTION

### Purpose and Scope

In light of recent changes in the Egyptian economy in general and Egyptian construction in particular, contract award to contractors rose as an issue that faces the contractors in both the public and private sector. Government, the major client in the economy, saw the contract award on direct order basis as a main reason behind price increases on public sector projects, as well as being a major discriminating factor against the smaller private firm. The feelings led to the Prime Minister's direction in 1978 not to award any contracts except through open competition.

Although the full effect of such a change is still to be measured, evidence to date might indicate that this change may have eliminated a claim of discrimination against the private sector; however, it does not seem to have encouraged the private firms to bid on projects they previously would not have bid on. Public sector firms also complain about a lack of forwarded end of year work, meaning that the consistency of work allocated to them was being jeopardized. This does not mean that the previous discrimination was better for the firms, but it does indicate that deregulation or eliminating the discrimination in contract award alone may not be sufficient to effect changes in the behavior of the contractors in the industry.

The purpose of this paper is two-fold: 1) to seek feedback on the issue of contract letting and contractual relations that would be suited for Egypt, and 2) to

discuss the strategies and objectives of the clients and contractors when faced with different contract options. It is hoped that the discussion of the various motivations of these two participants in the U.S. will start some discussion with respect to their respective goals in Egypt. The paper will further provide some background on the changes that occurred in Egyptian construction and their motivations, to set a context for the reaction of the firms in the industry to further changes.

### Introduction: Significant Changes in Construction in Egypt

In 1959/60, the government started to consider its first five-year socio-economic development plan. Construction firms were all in the private sector and were responsible for most of the output of the sector, which amounted to L.E. 115 million. Since this plan was considered to be the basis for the development and industrialization of Egypt, it had a construction component for the five years of L.E. 717 million (1). This figure suggests a yearly construction budget averaging some L.E. 140 million, which does not seem to have been much beyond the capacity of the industry at the time.

Since the majority of projects in this five-year plan were comprised of large government-financed projects, it was contended that the existing contracting firms, with their lack of management and financial capabilities, could not undertake implementation of the plan without some kind of government support. This assumption was based on actual assessment of the capacity of firms in the industry or how it was affected by the socio-political views of the government regarding the distribution of income in Egypt. Of the many firms in construction, the government considered that only between 150 and 180 were capable of undertaking the government projects. This

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would suggest that the available capacity was very limited, but actual figures on the capacity of the firms are not available. Furthermore, most private contractors were regarded at the time as "people exploiting the situation to realize the maximum personal profit with but a few considering the development of Egypt." (1)

With the ambition of realizing the goals of the development plan, the government acted in 1961. Instead of considering enlarging the base of firms working on its projects by providing incentives, the government decided to perform the construction itself. In July of 1961 the socialist laws were passed, and some 13\* large contracting firms, along with some other private firms in other sectors of the economy, were brought under government control. One firm was fully nationalized, while government participated in 50 percent of the capital of the other 12 firms. At the same time, a presidential decree was issued: the amount of work let by government agencies and public sector organizations to private sector firms in which government had less than 50 percent interest was limited to L.E. 30,000 per year. Shortly thereafter this ceiling was raised to L.E. 100,000 (2).\*\*

Although this ceiling on private contractors was implemented to insure that the profits realized on government-financed projects went back to the government, this action severely limited the capacity available for implementing the plan. Government-controlled firms at the time had a capacity of only some L.E. 15 million per year. The 150 to 180 private firms qualified to work for the government had not increased in number, and with the

L.E. 100,000 per firm ceiling, had a potential output of only another L.E. 15 to 18 million per year. This output of L.E. 30-32 million was clearly below the L.E. 140 million by the plan.

In September of 1961 the government allowed private sector firms to apply for membership in the public sector by asking the government to participate in 50 percent of their capital. By 1963 some 70 private firms had been accepted to join the public sector, thus increasing the capacity available to execute the plan. But the government was still faced with problems in running these firms with mixed ownership. Contractors were not bidding on new work as fast as the government wanted them to.

It is not quite clear why contractors did abstain from bidding. The documents of the time attribute this abstention in large part to the fact that in many cases managers in the newly formed public sector contracting firms were the previous owners of the firms before government participation. It was argued that this provided them with a motive to stand in the way of the government that limited their previous influence. It was felt that these managers, who had a personal interest in the firms, used the privilege of being backed by the government to secure loans from banks at more favorable terms than would otherwise be possible. It was also contended that some of them did so to their own personal benefit.

The government, pressed for time, instead of investigating the matter any further, took some action. In 1962 a law was passed giving the Minister of Housing power to give direct orders to public sector firms to carry out work included in the government plans on a cost-plus basis (3). This step had a serious effect on contractors, as it altered the traditional contract award system and reduced the incentive for competition

\* Some sources state the number as being 17.

\*\*The ceiling remained at that level until 1974, when it was again raised to L.E. 500,000 per year - or L.E. 1,000,000 over 2 years. It was not until March of 1978 that this ceiling was removed altogether.

between firms.\*

Furthermore, in March of 1964 the government took a further step by fully nationalizing around 120 contracting companies, the 70 or so firms that had joined the public sector voluntarily as well as some of the larger private firms that had not joined.

Most of these firms at the time were relatively small in size, ranging from firms having assets with a market value of a few thousand pounds to a very few firms with assets worth more than one million pounds. The government therefore grouped some of the smaller firms together, formed new companies, and placed them under the supervision of general organizations to coordinate their work.

The management and organization of the sector, however, did not stabilize quickly. Rather, the number of firms changed from time to time when decisions were made for reorganizing the sector. For example, the number of companies affiliated with the Ministry of Housing in 1964 was 35; they were first broken into 41, and finally reorganized as 36; now, after liquidation (i.e. cancellation) of some of them, they number 29.

Adding to the potential problems resulting from this instability were other changes in the affiliation of these firms. First, the reorganization efforts usually extended also to the general organizations supervising the companies (reduction or proliferation)--until 1974, when they were cancelled altogether. Then, these changes in affiliation extended also to changes as to the Ministry in charge of supervising the companies in question; companies' supervision alternated between

ministries (4).

Despite such changes, the output of the public sector companies grew considerably over the years. For example, while the production of the 120 companies nationalized and affiliated to the Ministry of Housing in 1964 was estimated to be about L.E. 75 million, in 1977 the 29 companies affiliated to the Ministry accounted for an output of some L.E. 522 million in current terms. Also, in the mid-sixties some of these firms started to work outside of Egypt. While in 1966 only 4 firms were working in other Arab countries, by 1977 more than 12 of these firms had projects abroad. Actually some 20 per cent of the output of these firms was realized from foreign work (5).

Private sector contractors, on the other hand, have assumed a secondary role in contract construction since 1961. While in 1959 their estimated output was around L.E. 100 million, official figures might, however, have understated the output of these firms.

It is anticipated that the official figures might not accurately represent the amount of work carried out by private firms for the private sector of the economy. The figures of the private sector contractor's office in the Ministry of Housing, which is responsible for registering the work private contractors perform for the government and the public sector, show that for these two clients alone in 1975 private contractors produced an output of some L.E. 150 million. Also, as with public contractors, many private firms are currently working outside Egypt. Some firms, in fact, operate mainly outside of Egypt, maintaining only minor activities inside the country. Even if one allows for such omissions in the output data on the private sector, he must conclude that private sector contractors have not grown substantially in size over the past two decades compared

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\* Although in 1978 the government issued a directive to the client agencies to return to competitive bidding in awarding contracts, the direct order law has not been revoked.

to public sector firms.

In the early 1970's, however, the government decided that to achieve the domestic goals the open-door policy was the way to secure new resources and foreign expertise, which would enhance the use of the local ones. By 1974 Law 43 for investment of Arab and foreign capital, free zones was passed, at a time when the government also intensified its building and construction efforts, through a program of reconstruction and new towns. Under the same attitude, in 1975 the government first raised the ceiling on government and public contracts with private contractors from L.E. 100,000 per year to L.E. 500,000. In 1978 it then removed this ceiling altogether.

Such actions have helped increase the demand for construction in the economy even further, and have tried to increase the construction supply by contractors. This policy, however, has not fully succeeded in stabilizing construction costs in Egypt, which according to some studies have continued to increase on the order of 400 to 500% between 1970 and 1976.

Studies to date have almost all indicated that the phenomena of construction cost increases in Egypt is caused both by demand pull as well as by supply push reasons.\* As demand for construction increased, so did the pressure on the costs. As building materials problems persisted, and labor migration continued, resource bottlenecks caused and increased pressure on costs. However, supply push on costs was also magnified by the concentration on the part of the government on actions that concern contractors alone, without regard to their interaction with other participants.

It is true that alleviating the resource bottlenecks

will certainly help contractors improve their performance. Without understanding the varying goals of the different participants, however, these actions will not be fully effective in alleviating other constraints that inhibit contractors in Egypt, such as performance of the firms on the various projects.

#### Participants' Interaction on Projects

The participants in the life cycle of a particular project can be conveniently grouped into three categories: the client group, the professional group, and the contractors group. The client group can be thought of as composed of the owners and the financiers of the project. The professionals are the designers of the project and often act as the client's representatives. The contractor group can be considered to be composed of main contractors and subcontractors. In addition to all these groups--which can be individuals, private or public firms--are the supplies of the main resources that are required by the construction process itself. However for our purposes these can be considered as ancillary to the process, especially since the problems of resources and their finance have been covered elsewhere in this Proceedings.

The three main participants interact in the project life cycle at various points in time. The contractors are traditionally the last group that is brought into the picture, after the clients and professionals have in many cases made decisions that influence the contractors' performance. Professionals set the standards and specifications that contractors must abide by in their work. Clients, who often are not specialized in construction, have to rely on a third party for control and feedback on the progress of work. These facts put the contractor under the influence of the link between client and

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\* See "Resources and Contractors in Egypt: A Review", by Selim and Ashley, in this volume.

professionals, and complicates the interaction of the participants.

The multitude of goals that motivate each of these three categories is the driving force behind these issues. In the U.S., for example, clients' goals are manifested in their interest in control of the time, cost and quality of the work. They want quality construction in the least possible time. They want to know the costs in advance, because they want only to pay the lowest possible price that would compensate the contractor for the work plus a "fair" and "reasonable" profit. Contractors feel that these goals are partly mutually exclusive; highest quality means high cost and slow completion. They think that owners must achieve a compromise among the three goals to achieve the mix that is best suited to themselves and the other parties (6).

Contractors think that their motives to perform satisfactorily on a project are simply two: reputation and profit. Reputation is a motive that drives the contractors to meet standards. To make maximum use of that motivation, however, clients have to choose those contractors that qualify on that score, which might give rise to prequalification problems. Profits are a more evident motivation due to the fact that they are directly manipulated by the contract, which can make sure that higher profits coincide with the achievement of the most important client goals.

Professionals are themselves motivated by the same two objectives--reputation and profit--maybe with different emphasis. Since they deal more in abstract concepts in design, their selection might rely more heavily on reputation than in the case of the contractors. The professionals' goals, however, might increase the conflict in their behavior. For example, by being motivated to reduce their costs they might be inclined to aim for

less details to be produced by their firm. Their motivation induced by their goal to represent the client, on the other hand, pushes them to require more detail to be produced, that is, higher costs. Like owners, they have to maintain a certain compromise in enforcing these various objectives in actual contracts.

The interaction of these motivations are the main items that govern the contracts between any of the participants. The type of contract and the way it is awarded depend on the clients' and contractors' motives in addition to those of the professionals. For example, clients who worry only about time of completion might decide to adopt direct order negotiations for the design and the construction of their projects on a turnkey approach. On the other hand, if they only worry about costs, they might decide to award their projects on a competitive basis after a specific detailed design has been completed.

#### Contract Types and Contractual Relationships

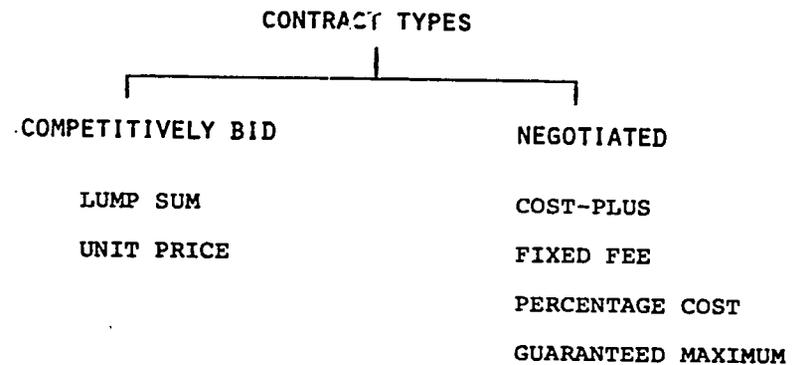
By considering the clients' and contractors' interaction under different types of contracts one can begin to understand the implications that the contracts have in governing the performance of the firms on the projects. Despite the many different types of construction contracts, they generally can be grouped under two large divisions: those that were competitively awarded and those that result from negotiations, as shown in Figure 1.

The lump sum contract is the one in which the contractor agrees to carry out a stipulated job in exchange for a fixed sum of money. The contractors thus bear all the difficulties and troubles they may encounter during construction. These contracts are obviously preferred by clients; however, they require that the work be accurately determinable at the time of bidding.

The unit price contracts, which are based on certain well defined items of works and costs per unit, do not determine the total sum of money paid to the contractor until the work is completed. The contract is made based on quantities compiled by the professionals; the unit cost bid by the contractors and payment is based on the actual units of work completed. This type of contract is the most common on Egyptian construction. Although it allows for some uncertainty with regard to the quantities of the work at the time of bidding, it requires an active involvement from the professionals, with available drawings and specifications, and with active involvement in the supervision of the work.

The cost-plus contracts are usually used when work is carried out based on terms negotiated between the clients and the contractors, as used in the direct order system that has prevailed for years in Egypt between public sector contractors and the government. Such contracts require that some items be carefully considered by the parties involved. Subcontracting procedures, for example, might be an area of conflict between the two parties, particularly when the items being subcontracted are not easily defined. Contractors' fees are another area that needs clarification, especially in determining the reimbursable and non-reimbursable costs. In general, in such contracts it is extremely important to agree on a method of record keeping and reporting, as well as to agree on methods for purchase and reimbursement of the contractors. (7)

There are many types of cost-plus contracts, the most popular one being the cost-plus percentage of cost contracts. These are the ones that had been widely used in Egypt. These contracts are very advantageous for the contractors, and usually are suitable for work that is poorly defined at the outset of operations. Other



*Figure 1: CONTRACT TYPES*  
(Source: R.H. Clough, CONSTRUCTION CONTRACTING.)

forms also exist that would allow for a guaranteed maximum cost for the project which even further require attention and concurrence from the contractor. Other incentives also exist to encourage contractors to keep costs low. Bonus for early or cheap completion can be considered one, while penalties for late or expensive completion is another. These, however, are just a combination of the two contract types previously discussed, a combination trying to capture the benefits of both competition and the direct order systems.

All these contracts, however, are based on different contractual approaches that determine certain relations between the participants. These relations can be very well captured by the relations described in Figure 2. There are 4 approaches. The traditional approach can be implemented using competitive or direct order contracts. Each has both advantages and disadvantages for owners, and thus contractors. The design/construct (Turnkey) approach where the constructor acts as a general contractor with single-firm control of all subcontractors. In other cases the work is on a design manage basis, where construction is carried out by independent contractors. In general, the design/construct approach allows for phased execution, thus allowing projects to be finished in a shorter time, when compared with the traditional approach. Another approach is the owner/builder one, where the owner agency performs its own design and parts or all of its construction. This system has been widely used in Egypt, where agencies have used consultants and contractors for parts of their work. This approach was and is still justified on large work that extends over long periods of time (8).

While these three relationships all exist in Egypt, the professional construction management approach is still not at all widespread. This approach unites the

owner, the professional and the construction manager into a team with non-adversary relationships. This has the potential to overcome some of the disadvantages of the traditional approach, which sometimes puts the professionals, contractors or owners in adversary positions. This approach in the U.S. and Europe was developed to allow for independent evaluation of costs and schedules, together with full-time coordination between design and construction. The approach, however, depends heavily on the construction managers' quality of planning and management skills. Furthermore, the construction manager does not guarantee the price like the general contractors do on the lump sum contracts. This, however, is counter weighted by savings on costs and time, by permitting better project planning; by providing opportunity to save during design, bidding and award phase; and by allowing phased execution of projects.

The professional construction manager holds different responsibilities to the different participants, as shown in Figure 2. This helps prove that the issue of contract award is not that of comparing competitive and direct orders but rather a question of deciding on a strategy that will govern the relationship between the participants. Enforcing this strategy leads to the same kind of relationships shown in Figure 2.

#### Lessons from the U.S. Experience

Considering the effectiveness of the various forms of contracts from the point of view of the various participants in the U.S. can help in the evaluation of systems to adopt here in Egypt. Needless to say these will differ from project to project. Some generalization is, however, possible, especially when it comes to certain issues like risk, and quality control.

The owner's and professional's viewpoints are

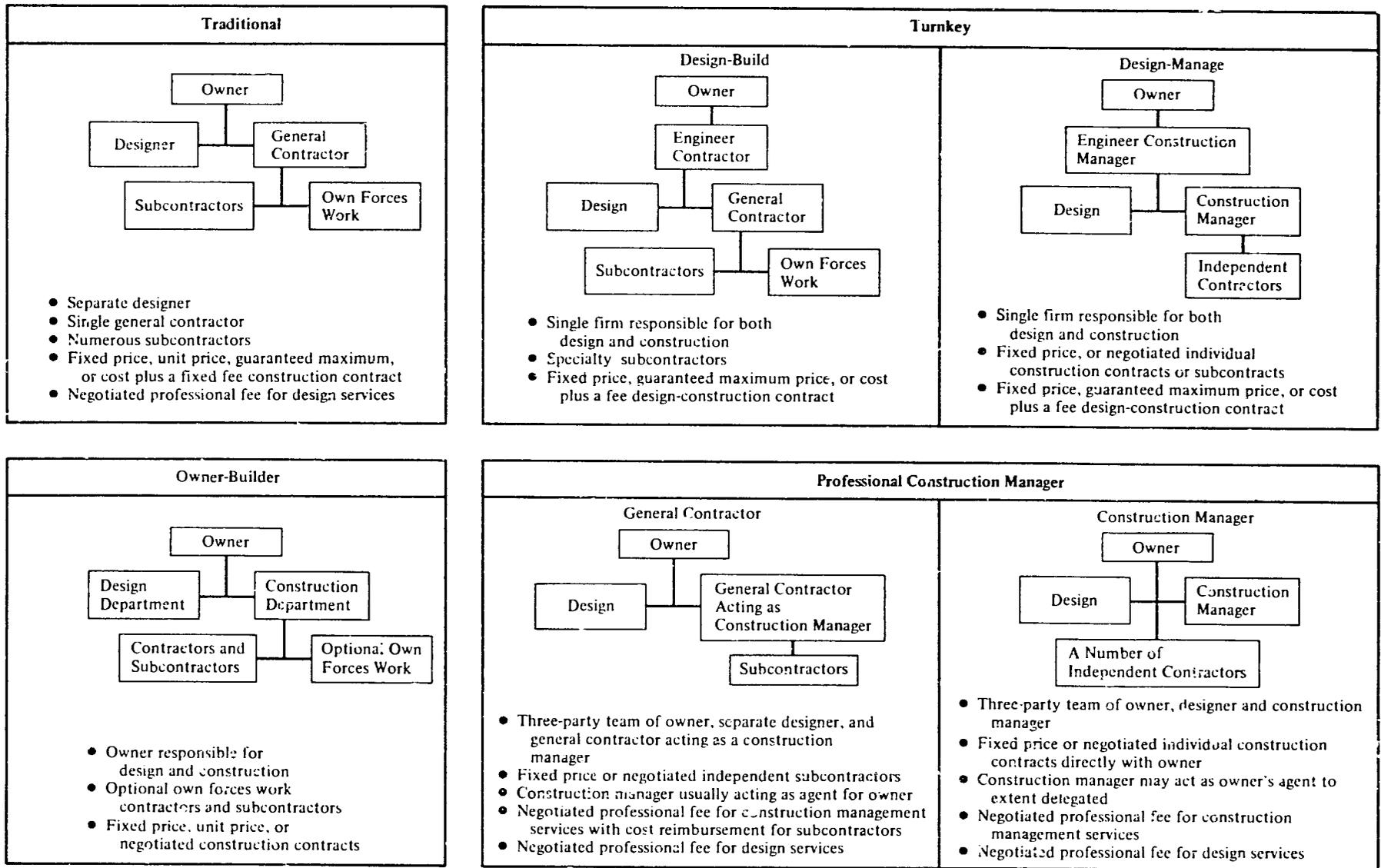


Figure 2: ALTERNATIVE CONTRACTURAL APPROACHES

(From PROFESSIONAL CONSTRUCTION MANAGEMENT, by Donald S. Barrie and Boyd C. Paulson, Jr. Copyright © 1978 by McGraw-Hill, Inc. Used with permission of the McGraw-Hill Book Company.)

summarized in Table 1, which has grouped the contractual relations into 4 groups that can be aligned with those previously described. Single prime is the traditional approach, while multiple primes include owner/builder approach. The advantages and disadvantages of each approach are evident from the table. It is, however, apparent that the table favors the construction manager approach as the one that achieves the balance between the various goals of the participants.

The analysis is extended to cover the responsibilities and rights of the owners and contractors under the various contractual approaches. The main point here is that in addition to the differences between the divisions of these responsibilities, the contracts must be clear and careful in specifying them so that the relationship becomes effective.

#### Considerations for Egyptian Contract Award

As previously explained, the interaction of the government in Egyptian construction has imposed some constraints on contract award and project development. This interference together with the way contractors in Egypt perform their activities have both had effects on the relationship between the participants.

The mixing of interests that results from the different roles that the government plays in the industry has created some conflicts in the industry. The government's role as an owner was influenced by its role as a regulator, as well as its role as main holder of the contracting business itself. As an owner, for example, regulations protect the government from the contractor and responsibility for the adequacy of the design. The law considers the contractors responsible for the design "as if it was their own" even when the client agency is the one that prepared it. Furthermore, it allows the

Table 1:

#### PARTICIPANTS' VIEWPOINT WITH REGARD TO VARIOUS CONTRACTS (Source: Ref. 6.)

Participant	Factor/Consideration	Type of Contract			
		Single Prime	Mult. Prime	Turnkey	Constr. Manager
Owner's Viewpoint	cost/price	low	lower	higher	nebulous
	time of completion	long	shorter	short	shortest
	owner's risk	normal	high	lowest	low
Contractor's Viewpoint	adeq. of design*	owner resp.	owner resp.	contractor	owner
	cost of constr.	contr.	shared**	shared	owner
	liability to subcontractors	Gen'l contr.	Gen'l contr.	subcontractor	Constr. Manager
	Indemnification for casualties	Contr.	Contr.	Contr.	Owner
	Financing	Owner	Owner	Contr.	Owner
Professional's Viewpoint	Coordination of Work	Gen'l Contr.	Owner	Gen'l Contr.	Constr. Manager
	<u>in design</u> Desirable relation with owner	least	least	best	medium
	Engr.'s financing requirements	best	best	least	best
	Capability of control. design costs	least	medium	best	medium
	<u>in construction</u> freedom of action in evaluating claims	least	least	best	medium
	liability from contr. action	best	medium	least	least
	Quality control, freedom	least	least	most	medium
overall risk involved	best	medium	least	medium	

\*The use of performance specification usually shifts risk more to the contractor.

\*\*Risk can be shared depending on the contract being used.

client agency to alter the contract quantities up or down by 25 percent without compensating the contractor, which increases his risks and complicates the coordination of his work. Such regulations when using a traditional approach to contractual relations increase the adversary feeling between the professionals and contractors, thus contributing to the conflicts that might occur during the execution of projects.

The government, in addition, controls the larger contractors and thus has an inclination to protect them at the expense of other participants. In the past, this protection took many forms; the major one of them was the direct order allocation of projects to public sector contractors. Other forms of protection existed. The discrimination in the prequalification for government work is one example, where entry to contracting on government projects is made very difficult. Another example of such discrimination is demonstrated in the fact that contracting activity is not allowed to organize in any organization that would be geared to help the small contractors. Not only that, but the contracting business is not even treated separately by all the registration agencies in the government; it is rather considered together with the activities like supply of material or import/export business despite the differences in the nature of work.

Together with the government regulations and the discrimination that led to problems between the participants in the industry, the lack of standards and specification for the contracting activities is an impediment. This is even more so now than before, because competitive bidding is encouraged and firms are expected to bid. Ever since 1965 the Ministry of Housing has had 10 standing committees to issue codes of practices for the various construction activities; up until 1979 only 4 of

these had issued their codes. This lack of Egyptian codes and standards might support the lack of definition in some of the projects launched for bids, and furthermore complicates the questions associated with subsequent changes. This increases the strain in the relationship between the contractors and the professionals and even creates costs and quality problems. Accusations between the parties become difficult to settle one way or the other.

Not only is the government discriminating in the execution phase of the projects; projects are often launched without adequate preparation. Many projects have been started in Egypt without feasibility studies or with incomplete drawings because of time considerations. This makes contractors skeptical when bidding or even negotiating to work on such projects, since a multitude of changes are usually expected, not to mention the work stoppages and payment delays. The lack of preparation also leads to bad packagings of the projects that are being launched, which in turn leads to difficulties for the contractors to bid.

The problems in securing contracts and performing adequately on projects in Egypt is, however, not entirely caused by the factors imposed on the firms by the government. The systems of operation of the firms themselves have much to do with their ability to bid accurately on projects and to execute them within the budgets. In Egypt this is an area that needs attention from the contractors themselves. The system used by the small contractors that is mostly based on informal communications is not very suited to the needs of planning, forecasting and formal control. The main reason for this problem is the lack of information. The informal system makes the recording of information virtually impossible and at best inaccurate.

The information problem, however, is not entirely due to the informal system of recording. Even the large companies in Egypt have some informational problems because of a lack of integration in their recording and bookkeeping systems. This fact is a major constraint facing the development of the firm's capabilities in planning for its future bids and in keeping its historic data or costs and duration of the various activities. This in turn inhibits the firm's ability to coordinate its activities and those of subcontractors, forcing the firms to incur extra overhead costs and jeopardizing their chances for getting contracting jobs.

#### Conclusions

After briefly reviewing the alternative approaches to contracts in the construction industry in the U.S. and contrasting it with the situation in Egypt, it can be concluded that, as in the U.S., the issue to be addressed in Egypt should be the strategy that governs the relationship between the participants, rather than the type of contract that should be adopted. By studying this matter carefully clients and government would be able to reach mutual agreements with the contractors without the need to revert to decrees banning direct orders or decrees reinstating them.

To do so, research should be focused on developing alternative contract forms based on the Egyptian experience, as well as reviewing existing regulations governing the relationships between the participants to streamline these relations and make them compatible with the different goals.

To achieve this the government will have to change some of its regulations, and the contractors would have to change some of their systems. Furthermore, firms would have to organize their efforts maybe in establish-

ing bodies that would seek and disseminate the information on contracts and contractors regularly so as to give opportunity to the various firms to compete freely for work. It is not enough only to disseminate information or reduce government interference, but it is equally important to enforce the existing laws concerning pre-qualification and awards so as to encourage firms to maintain a formal approach to bidding for their construction projects.

Without such collective action, not only by contractors but also by professionals and clients over the entire life cycle of the projects, the changes in the construction industry will not lead to a stabilized system of contracting erratic changes will continue to occur, and efforts will continue to be wasted in this most crucial sector of the Egyptian economy.

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## LIST OF SEMINAR PARTICIPANTS

Abdel Salaam, Mohamed El Hosseiny  
Vice Director  
Armed Forces Engineers

Abdel Kader, Nasamat  
Lecturer  
Cairo University

Ahmed Badawy, M. M.  
Egyptian Armed Forces

Ahmed, Gharib  
Journalist  
El Gomhoria Paper

Akel, Taalat Ahmed  
Vice Chairman  
Suez Shipyard

Allam, Mohamed Hassan Fahmy  
Chairman  
Allam Company

Amer, Wafa's Abdel Moneim  
Architect, Assistant  
Faculty of Urban Planning  
Cairo University

Azmi, M. Said  
Asst. General Manager - Finance  
Arab Contractors

Azmi, Nabil  
General Manager - Finance  
Arab Contractors

Badawy, Moh. Yehia Abdel Khalek  
Assistant Manager  
Tender and Contracting Department  
Arab Contractors

Bakr, Sawsan El Sayed  
Graduate Research Assistant  
M.I.T.

Baligh, Mohsen M.  
Associate Professor of Civil Engineering  
M.J.T.

Bastrub, Mogens  
Civil Engineer

Bedair, Hassan Mahmoud  
Council Member  
Management Engineering Society of Egypt

Bogle, James E.  
Urbanist  
TAMS

Bosker, Chris M.  
Chartered Civil Engineer  
Ambrik Co.

Chamers, David L.  
Civil Engineer  
TAMS

Dakroury, Ahmed Hany  
Graduate Research Assistant  
M.I.T.

Dluhosch, Eric  
Associate Professor of Architecture  
M.I.T.

El Dib, Fairouz  
Civil Engineer  
General Organization for Housing and Planning Research

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El Gueretly, Hussein Goawdat  
Architect

El Hashimy, Mohamed M.  
Dean, Faculty of Engineering  
Ein Shams University

El Kashef, Abd El Rahman  
Chairman  
Egyco Company

El Kerdany, Dalila Yehia  
Architect

El Marashly, Abdel Fattah Mohamed  
Consultant  
Arab International Consultants (ARICON)

El Nazer, M. Sherif  
Engineer  
Arab Contractors

El Sabbagh, Shawky  
Consulting Engineer

El Sahly, M. Tag El Din  
Vice Chairman  
General Organization for Physical Planning

El Said, Hamed Fahmy  
Chief Architect  
Building Research Centre

ElSayyad, Nezar Mahmoud  
Graduate Research Assistant  
M.I.T.

El Shennawy, Sohair Abdel Aziz  
Manager of Performance Evaluation Dept., PVTD  
Ministry of Industry

Fahmy, Hassan Ali  
Chairman  
Nile General Company for Reinforced Concrete

Fareed, Adel  
Consultant

Fouad, Mohamed Amin  
Consultant Engineer

Ghabour, Nazmy Riad  
Asst. General Manager - Economic and Financial Dept.  
Arab Contractors

Giertz, Lars Magnus  
Deputy Manager  
Construction Industry Study  
World Bank

Hafez, Hassan Aly  
Financial Director  
El Naser City Financial Department

Hjorth, Kai E.  
Project Attache, Project Center  
Royal Danish Embassy

Hosny, Abdel Hady Hussein  
Professor  
Faculty of Engineering  
Ain Shams University

Ismail, Ahmed Hassan  
Civil Engineer

Knauer, Bent  
Engineer  
Larsen and Nielsen, Int. Ltd.

Logcher, Robert D.  
Professor of Civil Engineering  
M.I.T.

Mansour, Mansour Ibrahim  
Engineer  
Arab Contractors

Mogensen, Erhardt Peter  
Engineer, Project Manager  
F.L. Smidth and Co.

Morsy, Ezzat Hashem  
Civil Engineer/Research Professor  
General Organization for Housing, Building and  
Planning Research

Osman, Abdelsalam Ahmad  
Vice President  
Management Engineering Society of Egypt

Ramly, Mohamed Said  
Vice Chief  
General Organization of Major Projects  
Egyptian Armed Forces

Rasmy, Sayed Kamal  
Undersecretary of State  
Ministry of Planning

Sabry, Medhat  
Regional Manager  
Larsen and Nielson, Int. Ltd.

Salem, Rawya Mahmoud  
Scientific Editor  
Al Ahram Newspaper

Shabka, Shahdan Ahmed  
Assistant, Faculty of Engineering  
Cairo University

Shafei, Zakia Hassan  
Professor, Faculty of Architecture  
Cairo University

Shohayib, Kamal El Din Sabri  
Consultant Architect

Taher, Youssef Gamal  
General Manager  
Hassan Allam Co.

Tamam, Salah Hussein  
Arab Contractors

Waly, Tarek  
Architect

Zaghloul, Hassan Farid  
Professor of Environment Engineering  
Helwan University

TECHNOLOGY ADAPTATION PROGRAM (TAP)  
 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The Technology Adaptation Program is a major program at M.I.T. concerned with the technological issues involved in the transfer and adaptation of technology to the conditions prevailing in other countries. TAP was initiated under a grant from the Office of Science and Technology of the U.S. Agency for International Development. Its objectives are to develop an understanding of the characteristics of technologies that are appropriate to countries in various stages of development; to identify criteria for the selection and adaptation of appropriate technologies; and to develop an understanding of the processes by which technological knowledge and skills can be effectively introduced, disseminated, and used in nations. The program is concerned with promoting an awareness of and expertise in the technological problems facing developing countries on the part of both faculty and students at M.I.T. as well as foreign students and scholars who attend M.I.T. TAP's activities thus lie in three interacting areas: development of institutional ties between M.I.T. and educational and governmental organizations in various countries; collaborative research; and educational opportunities at M.I.T.

TECHNOLOGICAL PLANNING PROGRAM (TPP)  
 CAIRO UNIVERSITY/M.I.T.

Under the auspices of TAP, the Cairo University/M.I.T. Technological Planning Program, which is funded by the USAID Mission in Egypt, began two years ago with a focus on improved planning of development projects in Egypt. The overall objective of the program is to expand the capabilities of Egyptian ministries and other government agencies to formulate and implement technical programs designed to achieve national development goals. The research projects focus on a broad range of engineering, economic, and social service topics. The key element in each of these efforts is the interdisciplinary team drawn from faculty and staff from M.I.T., Cairo University, and government projects in the topic area. Effective utilization of the Egyptian academic and government resources has been one of the principal reasons for the success of the program to date. In addition to the specific research projects, emphasis has been placed on the training of in-country personnel in the techniques of project identification, evaluation, and management, and the development and maintenance of the data necessary to design and monitor their projects. To provide a channel for continuous, convenient communication between government agencies and the academic expertise involved in this program, a permanent institute for technological planning is being established at Cairo University. This institute will eventually organize a centralized body of technological, economic, and social science expertise both internal and external to Egypt in the general area of development planning.

HOUSING AND CONSTRUCTION INDUSTRY RESEARCH PROGRAM  
CAIRO UNIVERSITY/MITJOINT RESEARCH TEAM ON HOUSING  
CAIRO UNIVERSITY/M.I.T.

The provision of housing in Egypt today is a diverse and complicated sector in which private enterprise and public regulation are struggling to adapt the country's limited resources towards solving a serious housing shortage. As a step toward solving this critical shortage a joint Cairo University/MIT Research Project has been initiated. The overall objective of this research is to provide a set of pragmatic recommendations and guidelines for the public agencies concerned with housing and construction and to construct a methodology through which these agencies can organize and monitor performance.

The research intends to develop the technical and economic basis for policy analysis. Specific recommendations are to be developed with focus on investment policies, controls and regulations, provision of services and other instruments of government intervention in housing and construction. Specific problem areas were identified during the initial research: 1) Public Policy and the Economics of Housing, with focus on investigating policy options affecting housing; 2) Organization and Operation of the Construction Industry, with focus on the relative roles of the public and private sectors; 3) Materials and Techniques of Construction, with focus on utilizing indigenous materials and available skills; 4) Housing Construction Systems and Design Norms, Prefabrication, with focus on modifications of the new prefabrication systems required to reach lower income groups and to make better use of the elements; and 5) Housing for the Low Income and Informal Sector, with focus on site and services planning approaches, compact physical development models, and core house options as an alternative to existing public housing models.

*Principal  
Investigators:*

Dr. Ahmed El-Erian, Head  
Department of Structural Engineering, CU  
Professor N. John Habraken, Head  
Department of Architecture, MIT

*Housing  
Economy:*

Dr. Abdel Mohsen Barrada, Professor  
Department of Architecture, CU  
Dr. William C. Wheaton, Associate Professor  
Department of Urban Studies and Economics, MIT  
Mr. Philippe Annez, Ph.D. candidate  
Department of Urban Studies, MIT

*Materials and  
Techniques of  
Construction:*

Dr. Albert G.H. Dietz, Professor Emeritus  
Department of Building Engineering, MIT  
Dr. Mahmoud A. Reda Youssef, Asst. Professor  
Department of Structural Engineering, CU

*Management of  
the Resources  
of Construction:*

Dr. David Ashley, Asst. Professor  
Department of Civil Engineering, MIT  
Mr. Omar El Gamal, Engineer  
The Arab Contractors  
Mr. Tarek Selim, Graduate Student  
Department of Civil Engineering, MIT  
Ms. Soraya Abdallah, Graduate Student  
Department of Structural Engineering, CU

*Housing Construction  
Systems and Design:*

Dr. Nasamat Abdel-Kader, Lecturer  
Department of Architecture, CU  
Dr. Sayed M. Ettouney, Lecturer  
Department of Architecture, CU  
Dr. Sawsan Helmi  
Department of Architecture  
Dr. Eric Dluhosch, Associate Professor  
Department of Architecture, MIT  
Dr. Wacław Zalewski, Professor  
Department of Architecture, MIT

*Housing for the  
Low Income and  
Informal Sector:*

Dr. Zakia Shafie, Professor  
Department of Architecture, CU  
Mr. Reinhard Goethert, Research Associate  
Department of Architecture, MIT